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Editor-in Chief

Prof. (Dr) R K Sharma

Former Head, Department of Forensic Medicine & Toxicology
All-India Institute of Medical Sciences, New Delhi-110029
E-mail: medicolegalupdate@gmail.com

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Editor

Dr. R.K. Sharma
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An Evaluation of Colour Change in Abrasion and its Correlation to Time: A Cross-Sectional Study From a Tertiary Care Centre

Anil Mangeshkar¹, P S Varghese²

¹Assistant Professor in Department of Forensic Medicine at Government Medical College Khandwa Madhya Pradesh; ²Prof. and HOD, St. Johns Medical College

ABSTRACT

Ageing of abrasions among Indian population compared to the West has a wide range of variations. There is not much reported work from India as to the healing pattern and morphological appearance of abrasions in correlation to time since injury. A cross sectional study of patients randomly selected for a naked eye examination of the abrasions compared with standard colour-charts. Comparison was then made between the standard literature and the data gathered to ascertain the applicability of the Western findings on Indian population. It is observed that fresh injuries and injuries which are more than 7 days old have a high percentage of agreement with the available literature. The Spearman's rho showed positive correlation between time since injury and colour of abrasion to be 0.902 (p value<0.001). However those abrasions which age between 12 hours to 7 days have a lesser percentage agreement with the available literature in the standard text. The Spearman's test of correlation for abrasions between 12 hours-7 days, after excluding extreme intervals which correlated completely with literature, still showed high correlation (Correlation Coefficient- 0.749, p value <0.001).

In patients with head injury the percentage agreement falls to 50 percent, conveying a delay in healing of abrasions. Subjects with diabetes in this study did not differ from other subjects in terms of healing statistically, possibly due to small sub-sample size.

Keywords: *Abrasion, Colour change, Time since injury*

INTRODUCTION

Dating of an injury in both living and dead is an important medico-legal issue in the field of crime investigation to fix the liability and to correlate with the crime scene. A doctor is required to date injuries specifically and individually while preparing an injury report or while performing a post mortem examination.¹

It is essential to age the injuries on the body of victim or the accused himself as it aids in proving or disproving the guilt or innocence of a person charged with criminal act, for its appearance may or may not correspond to the time when it is alleged that all to have been inflicted

according to the prosecution theory. In Indian scenario, usually, we adopt the 'naked eye examination' method to date an injury.²

There is obvious incongruity existing in the standard textbooks, sufficient enough to pose difficulty for dating of mechanical and thermal injuries.¹ An abrasion is bright red between 12-24 hrs and the scab becomes reddish brown in 2-3 days³ is documented by one author, but reddish brown scab within 12-24 hrs and brownish scabbed abrasion in 24-48 hours by another author.⁴ An eminent author⁵ claims that it is impossible to comment on the age of a bruise less than 24 hours. Another reported bluish discoloration of bruises not later than 18 hours.⁶ A bruise looks bluish black, brown or livid red by 2 to 3 days and become greenish from 5th to 6th day was the observation of a distinguished Indian author.⁷

Corresponding Author:

Dr Anil Mangeshkar
890 Nanda Nagar Stadium Ground Colony
Indore-452011, Madhya Pradesh

Most of the literature available in text books regarding ageing of injuries has been borrowed from western literature

and very less work has been done on Indian population. Our Study is an attempt to study the morphological changes in the most common injuries i.e. abrasions and compare the same with the standard text books.

MATERIAL AND METHOD

A cross-sectional observational study of patients was conducted and data was collected from 100 patients who presented to the hospital with abrasions. Detailed history including time of injury, mechanism of injury, history concerned with head injury, preexisting diabetes, history of previous or chronic medical illness were documented.

Inclusion Criteria:

1. Data collected from trauma patients visiting the hospital
2. Trauma as a result of road traffic accident, fall from height or self fall.

Exclusion Criteria:

1. A known case of bleeding disorders, connective tissue disorders, skin disorders.
2. Patients who have used pigmented ointments prior to hospital visit.
3. Abrasions with super-added infection

The study looks at the pattern of colour change in abrasion over a specific time line. The naked eye appearance of abrasions was matched with a standard colour chart for colour changes over a period of time and the observations obtained were compared with the standard literature

Using standard colour-charts wounds were inspected in proper illumination and were compared with the colour chart to assign a colour code. For this purpose Hex colour codes are used, HEX colour codes are HTML colours defined by using a hexadecimal notation (HEX) for the combination of Red, Green, and Blue colour values (RGB). The lowest value that can be given to one of the light sources is 0 (in HEX: 00). The highest value is 255 (in HEX: FF). HEX values are specified as 3 pairs of two-digit numbers, starting with a # sign.⁸

Minimum of 94 subjects were required for adequate power of the study as calculated by pre-study analyses of past studies. A sample size of 100 was arrived such that it will ensure 80% power to test the hypothesis that colour change occurring one day after injury in 85 %

of the wounds in comparison to past studies which state colour change in 74.33% with 5% alpha error.⁹

Descriptive statistics were applied to present the distribution in gender, subjects' age and frequency of abrasions in various time intervals. To establish the relationship between occurrence of abrasions and time elapsed at evaluation by the examiner Spearman's Correlation test was used. The correlation test was re-administered excluding one group at either end of spectrum to establish robust evidence.

FINDINGS

On a total of 100 patients in the study ninety percent were males, only ten percent of the patients were females.

Table 1: Gender Distribution

Gender	Total (n = 100)
Male	90 (90%)
Female	10 (10%)

Majority of patients were from age group of 16-30

Table2: Age Intervals

Age (Yrs)	Frequency (n = 100)
1-15	04
16-30	48
31-45	28
46-60	13
61-75	07

On a total of 18 fresh abrasions observed 16 appeared bright red in colour, which amounts to 88.9 percent. Hence the percentage agreement between fresh abrasion and bright red colour appearance of wound is 88.9.

Table 3: Percentage agreement with existing literature between fresh abrasion and bright red colour appearance of abrasions

	Bright red colouration (Observed in literature)	Frequency n = 18	Percentage
Fresh Abrasion	Correlating	16	88.9
	Not Correlating	02	11.1

On a total of 29 abrasions observed between 12 to 24 hours, 16 abrasions were covered with red colored scab, which amounts to 55.2 percent. Hence the percentage agreement between 12-24 hours old abrasion and red colour appearance of wound scab is 55.2.

Table 4: Percentage agreement with existing literature between 12-24 hours old abrasion and red colour appearance of wound scab

	Red colouration (Observed in literature)	Frequency n = 29	Percentage
Abrasion 12-24 hours old	Correlating	16	55.2
	Not Correlating	13	44.8

On a total of 24 abrasions observed between 2 to 3 days, 9 abrasions were covered with reddish brown scab, which amounts to 37.5 percent. Hence the percentage agreement between 2-3 days old abrasion and reddish brown colour appearance of wound scab is 37.5.

Table 5: Percentage agreement with existing literature between 2-3 days old abrasion and reddish brown colour appearance of wound scab

	Reddish-brown colouration (Observed in literature)	Frequency n = 24	Percentage
Abrasion 2-3 days old	Correlating	09	37.5
	Not Correlating	15	62.5

On a total of 15 abrasions observed between 4 to 7 days, 7 abrasions were covered with brown colour scab, which amounts to 46.7 percent. Hence the percentage agreement between 4-7 days old abrasion and brown colour appearance of wound scab is 46.7.

Table 6: Percentage agreement with existing literature between 4-7 days old abrasion and brown colour appearance of wound scab

	Brown (Observed in literature)	Frequency n = 15	Percentage
Abrasion 4-7 days old	Correlating	07	46.7
	Not Correlating	08	53.3

All the abrasions observed after 7 days appeared to have a black scab which was fallen off at place, exposing healed hypo pigmented areas of skin. Hence the percentage agreement between a more than 7 days old abrasion and black colour appearance of wound scab is 100.

Table 7: Percentage agreement with existing literature between more than 7 days old abrasion and black colour appearance of wound scab and shedding of wound Scab

	Black colouration and Scab schredding (Observed in literature)	Frequency n = 14	Percentage
Abrasion beyond 7 days	Correlating	14	100
	Not Correlating	00	00

The 20 patients observed with head injury, fifty percent of the patient had healing pattern as described in the standard literature.

Table 8: Percentage agreement with existing literature between healing patterns of wounds with respect to time among patients with Head injury

	colour change pattern (Observed in literature)	Frequency n = 20	Percentage
Abrasion among head injury patients	Correlating	10	50
	Not Correlating	10	50

Among the 11 diabetic patients observed 9 patients showed healing patterns as described in the standard literature, which amounts to 81.82 percent.

Table 9: Percentage agreement with existing literature between healing patterns of wounds with respect to time among patients with Diabetes

	Colour change pattern (Observed in literature)	Frequency n = 11	Percentage
Abrasion among Diabetic patients	Correlating	09	81.82
	Not Correlating	02	18.18

Study looks at the pattern of colour change in abrasion over a specific time line. The naked eye appearance of abrasions was matched with a standard colour chart for colour changes over a period of time and the observations obtained were compared with the standard literature, the percentage agreement of abrasion colour changes observed were then compared to similar studies by Lavlesh Kumar et al and Sandhu S. S et al.^{1,9}

It was noted in our study that 16 abrasions in a total of 18 fresh abrasions were observed to be bright red in colour, which amounts to 88.9 percent. The percentage agreement between fresh abrasion and bright red colour appearance of abrasion is 88.9. Twenty nine abrasions observed between 12 to 24 hours after injury showed 16 abrasions to be red in colour, which amounted to 55.2 percent. Hence the percentage agreement between 12-24 hours old abrasion and red colour appearance of wound scab is 55.2.

Lavlesh Kumar et al¹ noted that on the first day, in their study, out of 45 cases 32 cases appeared dark red instead of bright red and Sandhu S. S et al⁹ noted among the injuries between 7-12 hours 22 had bleeding, 34 depicted red colour scab, and among the 13-18 hours group 85 patients out of 89 depicted red colour scab, by 24 hours all abrasions were covered with a red coloured scab. In conclusion all three studies point red colour appearance of wound at 24 hours after injury. The current study emphasises on the bright red appearance of wound upto 12 hours, distinct from red coloured appearance, which was not commented in the aforementioned studies.

In the 24 abrasions, aged between 2 to 3 days, observed in the study, 9 of them appeared Reddish brown in colour, which amounted to 37.5 percent. The percentage agreement between 2-3 days old abrasion and reddish brown colour appearance of wound scab is lesser than the observed standard progression of wound maturation.

Lavlesh kumar et al¹ reported that on the 2nd day out of 6 cases 3(50%) cases appeared reddish black. On the 3rd day out of 6 cases 4(66%) cases appeared dark red. Sandhu S. S et al⁹ reported that between 25-36 hours 11 injuries depicted red brown scab among the 89 observed. 74 abrasions were covered with a red scab and 49 covered by red brown scab among the 123 abrasions observed between 37-48 hours. Shedding of scab started on day three, among those between days 3 to 5 out of 138 cases 21 cases still had reddish brown scab whereas 70 cases depicted partial shedding of scab and there was complete shedding of scab in 47 cases.

Our study has findings similar to the findings of Sandhu S. S et al⁹ stating the low percentage agreement of reddish brown appearance of abrasion 2 to 3 days after the injury.

Among the 15 abrasions observed in our study which were between 4 - 7 days, 7 appeared brown in colour, which amounts to 46.7 percent. The percentage agreement between 4-7 days old abrasion and reddish brown colour appearance of wound scab is more than the abrasions of 2-3 days old compared to standard literature.

All the abrasions observed in our study, after 7 days appeared to have a black scab which was fallen off at place, exposing hypopigmented healed areas of skin. The agreement between a more than 7 days old abrasion and black colour scab is high.

Lavlesh Kumar et al¹ reports that on the 5th day out of 6 cases, 84% cases appeared dark red. On the 9th day all are dark brown in colour during the first three days, the colour appeared bright to dark red, by 9th day the colour changed to dark brown and complete healing was seen by 20th day in 8.6% of cases.

Sandhu S. S et al⁹ reports that average duration of formation of reddish brown scab is from 36 hrs to 10th day. Partial shedding of scab is seen from 3 days to 10 days. Complete shedding of scab is seen between 5-10 days. Discoloured skin is seen between 7-10 days. Regeneration and appearance back to normal skin is observed 10 days onwards.

Thus all the studies point towards a low agreement on colour change as a method to ageing injuries between 3 to 7 days. Findings are reinforced by the fact that on statistical analysis Spearman's rho showed very strong positive correlation between time since injury and colour of abrasion to be 0.902 (p value < 0.001).

It is also observed that the percentage agreement between the healing patterns of abrasions with the standard literature was higher among fresh abrasions and in abrasions aged more than seven days. The correlation seems above par in comparison to the day-to-day clinical assessment and observation. Hence, the data was reassessed after excluding the two groups with high percentage agreement i.e., less than 12 hours and more than 7 days for correlation by Spearman's test. Then it was observed that there was a significant fall in the correlation coefficient to 0.749 (p value < 0.001) which was still significant.

Among the patients with head injury the percentage agreement falls to 50 percent and among diabetes it is 81.82 percent, much higher as compared to head injury patients inferring that head injury has a greater impact on healing of abrasions as compared to diabetes, also a small sample size of diabetic patients does not provide the real picture as to the effect of diabetes on healing pattern of abrasions.

The Spearman's rho for patients with head injury showed Correlation Coefficient between time since injury and colour of Abrasion to be 0.553 (p value 0.012), which shows that head injury has a significant impact on the healing of abrasions.

The Spearman's rho for patients with diabetes showed Correlation Coefficient between time since injury and colour of Abrasion to be 0.902 (p value < 0.001). The value does not show a significant change in the healing pattern of abrasions among diabetic patients. This could be due to the small sample size of diabetic patients in the study, hence it could be stated that a bigger sample size would be required to study the effect of diabetes on healing pattern of abrasions.

It is evident from the studies that the colour change in abrasion with lapse of time varies from person to person and also among different geographic areas. The current literature can be used for ageing abrasions but can often be misleading. The deviations observed in individuals could be linked to the individual himself or to various external factors.

CONCLUSION

- Ageing of injuries as per the standard literature is not a fool proof method in crime investigation.
- Abrasions within 24 hours and beyond 7 days have a higher accuracy in ageing based on naked eye examination.
- Ageing of abrasions between 12 hours to 7 days have a very high chance of inappropriate judgment of the time lapsed.
- It is noted that head injury prolongs healing in this study and hence needs further inquiry to analyze its affect on healing of abrasion and possibly its correlations with severity of head injury.
- The effect of diabetes is well known and its effect was not evident due to small sub-sample size.

Conflict of Interest: Declared none

Source of Funding: Self

Ethical Clearance: All Ethical parameters were taken care of in the study

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Correlation of the Age of Eruption of Teeth with the Body Mass Index among School Children

Karikalan T¹, Anil R Pandey²

¹Associate Professor, ²Assistant Professor, Department of Forensic Medicine, Karpagam Faculty of Medical Sciences & Research, Othakalmandapam, Coimbatore, Tamil Nadu, India

ABSTRACT

The timing of tooth eruption is influenced by various factors, especially the nutritional status of the individual. Body Mass Index gives an indication about the nutritional status of the child. Hence this study was done to determine the correlation between the mean age of eruption of permanent teeth and the Body Mass Index among school children in Thiruvananthapuram. A cross sectional study was done among the students of Thiruvananthapuram. Two thousand nine hundred students (males and females) were included in the study. Only those with the documentary proof of their date of birth were included in the study. For statistical purposes, only completed year was taken into consideration. Random sampling was done by selecting the alternate students from the attendance register. The dental examination was made in the adequate light with the aid of a mouth mirror and a probe. The details of eruption were observed and charted according to the Modified System of Federation Dentaire Internationale (Modified F.D.I). There were 1568 males and 1357 females out of the total sample of 2925 children. The mean age of eruption of mandibular central incisors, mandibular lateral incisors, maxillary second premolars and maxillary first molars were found to have statistical significant difference among the different categories of BMI status. Among the different categories of BMI, Underweight children were found to have late eruption of teeth compared to overweight children.

Keywords: Mean age of eruption, Permanent Teeth, Body Mass Index

INTRODUCTION

Assessment of age is often required while administering justice to an individual involved in civil and criminal litigation. A documentary evidence regarding the age of a person is required by the law enforcing agencies in matters like criminal responsibilities, identification, judicial punishment, consent, rape, criminal abortion, employment, attainment of majority, kidnapping and prostitution.¹ Teeth are the most indestructible part of the body and exhibit the least turnover of natural structure, and do need special dissection. Hence teeth

provide excellent material in living and non living populations for anthropological, genetic, odontological and forensic investigations.² The clinical method to assess dental age is based on the emergence of teeth in mouth. The timing of tooth eruption is influenced by various factors: physiological factors (i.e. heredity, constitution, geographical factors, sex, race, nutrition, climate, urbanisation), pathological systemic factors (various diseases i.e. endocrine diseases, cerebral palsy, severe intoxications, severe renal diseases, genetic disorders) and pathological local factors (local eruption obstacles, hypodontia, lack of space).³ Demirjian stated that emergence standards should be derived from the population in which they are to be applied, as factors related to emergence may vary considerably.⁴

Very few studies have been published correlating body mass index (BMI) and chronology of tooth eruption among children in India.

Therefore the objective of the present study was to determine the mean eruption time of permanent teeth

Corresponding Author:

Dr Anil R Pandey

Assistant Professor, Department of Forensic Medicine,
Karpagam Faculty of Medical Sciences & Research,
Othakalmandapam, Coimbatore-641032
Tamil Nadu, India.

Phone: +91 9558818622

Email: ankush6987@gmail.com

and to compare the relationship of mean eruption time with BMI of school children in Thiruvananthapuram.

MATERIALS AND METHOD

A cross sectional study was done among the students of three different schools from rural, semiurban and urban areas of Thiruvananthapuram. 2925 students (1568 males and 1357 females) were included in the study. Only those with the documentary proof of their date of birth were included in the study. The study was conducted with the approval letter from the Institutional Ethical Committee, Governmental Medical College, Thiruvananthapuram and the Principals of the schools where survey was done. Students who did not have the documentary proof of date of birth and those who were not willing to participate were excluded from the study. For statistical purposes, only completed year was taken into consideration. Random sampling was done by selecting the alternate students from the attendance register. The dental examination was made in the adequate light with the aid of a mouth mirror and a probe. The details of eruption were observed and charted according to the Modified System of Federation Dentaire Internationale (Modified F.D.I).

The age distribution of the samples was found. The percentage of different teeth erupted at different ages was analysed separately for boys and girls to determine

the mean age of eruption of individual tooth. BMI was calculated where height and weight of the individual child were measured using height chart and weighing machine.

BMI for age percentiles = weight in kilograms/ height in meter².

Underweight was defined as BMI-for-age <5th percentile.

Normal weight was defined as 5th ≤ BMI for age <85th percentile.

At the risk of overweight was defined as 85th ≤ BMI for age <95th percentile.

Overweight was defined as BMI for age ≥95th percentile.

https://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/about_childrens_bmi.html.

ANOVA, *t*-test were used for statistical analysis in SPSS version 17.0. *P* ≤ 0.05 was considered statistical significance.

FINDINGS

Distribution of study population among males and females is shown in Figure 1.

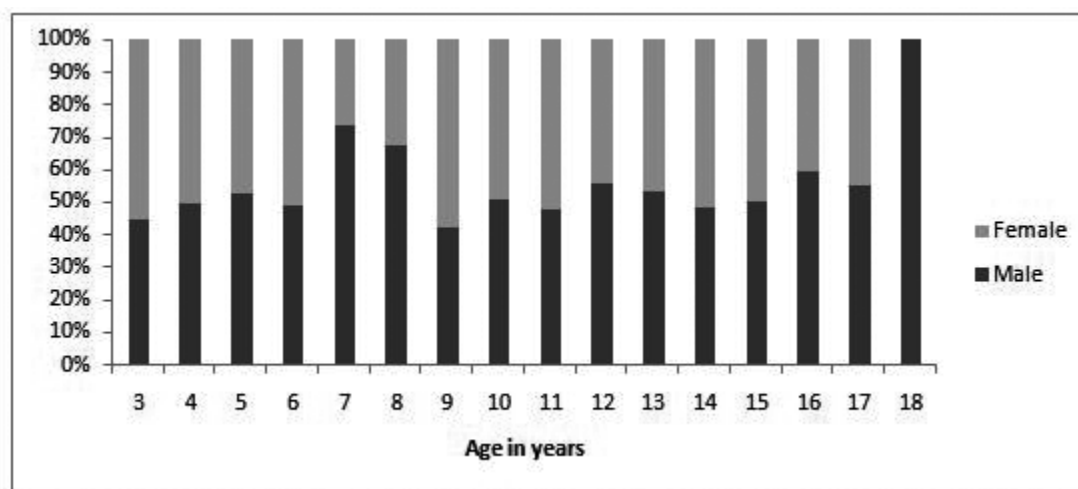


Figure 1

The study subjects were categorized according to BMI scores as underweight, normal weight, at risk of overweight and overweight children. (Table 1)

Table 1

BMI	SEX				Total	
	Male		Female			
	N	%	N	%	N	%
Underweight	300	19.1	203	15.0	503	17.2
Normal weight	1038	66.2	989	72.9	2027	69.3
At the risk of overweight	148	9.4	107	7.9	255	8.7
Overweight	82	5.2	58	4.3	140	4.8
Total	1568	100.0	1357	100.0	2925	100.0

The mean age of eruption (and standard deviation) were obtained and compared with different BMI groups. (Table 2)

Table 2

Age of eruption in years	BMI								p
	Underweight		Normal weight		At the risk of overweight		Overweight		
	mean	sd	mean	sd	mean	sd	mean	sd	
Maxillary central incisor	7.20	0.73	6.96	0.60	6.80	0.39	6.83	0.87	.196
Mandibular central incisor	6.65	0.99	6.46	0.65	6.16	0.66	5.91	0.72	.016
Maxillary lateral incisor	8.19	0.86	7.99	0.92	7.89	0.98	7.94	0.48	.711
Mandibular lateral incisor	7.49	0.85	7.15	0.66	7.62	0.97	7.26	0.92	.043
Maxillary canine	10.54	0.86	10.57	1.07	11.03	1.14	10.83	0.71	.470
Mandibular canine	10.27	0.91	10.16	0.80	10.80	1.52	10.10	0.57	.165
Maxillary first premolar	9.84	0.89	9.74	1.12	10.48	1.45	9.88	0.50	.191
Mandibular first premolar	10.30	0.75	10.33	0.76	10.67	1.79	10.30	0.64	.722
Maxillary second premolar	10.66	0.76	10.40	1.09	11.22	0.64	10.98	0.95	.009
Mandibular second premolar	10.52	1.17	10.71	1.14	11.50	1.08	10.61	0.98	.066
Maxillary first molar	6.24	0.66	6.35	0.62	7.07	1.89	6.21	0.32	.015
Mandibular first molar	6.10	0.60	6.36	1.05	6.74	1.84	6.20	0.33	.301
Maxillary second molar	13.17	2.70	12.43	2.84	12.08	1.62	12.94	2.56	.364
Mandibular second molar	10.64	1.06	10.49	1.35	11.18	1.27	10.67	0.50	.357

P < 0.05 significant

Underweight children were found to have late eruption of teeth compared to overweight children. Among the various BMI groups, mandibular central incisors, mandibular lateral incisors, maxillary second premolars and maxillary first molars were shown to have statistically significant difference in the age of eruption.

DISCUSSION

In this study the mean age of eruption of mandibular central incisors, mandibular lateral incisors, maxillary

second premolars and maxillary first molars were found to have statistical significant difference between underweight, normal weight, risk of being overweight according to BMI status.

The findings in the present study were found to be contradictory to that of Nagaratna B et Al.⁵ in which no statistical correlation was observed incisors and maxillary first molars. However the same study revealed a positive correlation between the mean age of eruption of maxillary second premolar and BMI, which is also noted in the present study.

The findings of the present study were contradicting to that of Khan et al.⁶, in which there was no statistical significance between BMI and mean age of eruption except for mandibular lateral incisor. Observations of the present study were also in contrast to the study of Hoffding et al.⁷, who reported only minor changes in tooth emergence with pronounced acceleration in physical development.

In this study, children in underweight category showed delayed eruption patterns, which was similar to that done by Chohan et al.⁸

CONCLUSION

Correlation between the different categories of BMI with the mean age of Eruption of permanent teeth was studied. Mandibular Incisors, Maxillary First Molars and Maxillary Second Premolars were found to have statistically significant eruption time among different categories of BMI.

Conflict of Interest: None

Source of Funding: Self

Ethical Clearance: Approved by Institutional Ethical Committee

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Profile of Internal Injuries to Thorax, Abdomen and Pelvis Sustained by the Victim During Fatal Road Traffic Accident in Central India

Manu D Sharma¹, Deepak L Bhagwat¹, B. H. Tirpude², P. N. Murkey², I L Khandekar²,
Sharjeel Khan³, Ambedkar Ranjan³

¹Assistant Professor Government Medical College, Gondia; ²Professor, ³Post Graduate Student, Mahatma Gandhi Institute of Medical Sciences, Sevagram, Wardha

ABSTRACT

Road traffic accident is a complex phenomenon. Constant rise in the number of motor vehicles, rampant encroachment of road, easy to avail the vehicle because of loan facility, nasty tendency of violating traffic rules and anarchic traffic systems have greatly contributed to rapid increase in RTAs. Population explosion is a catalyzing factor for a number of accidents. The rise of road traffic accidents has become a major public health problem. The injuries, disability and fatality resulting from unexpected RTAs put a significant drain on the economy of the nation. The present study was a cross-sectional study conducted in central India during 1.6 year period from 1st June 2014 to 1st Jan 2017. During the study period, a total of 757 medicolegal autopsies were conducted in this institute, out of which 109 cases of fatal road traffic accidents (died on spot or within 24 hours of accident) were studied. The purpose of the study was to know the pattern of injuries in victims of fatal RTAs and to establish the correlation between the injury and the cause of death.

Keywords: Fatal road traffic accident, Head Injuries, Thoracic injuries, Shock, death.

INTRODUCTION

Accidents are world's most serious health problem. Road Traffic Accident (RTA) is any vehicular accident occurring on the roadway (i.e. originating on, or involving a vehicle partially on the roadway)⁹. This includes collision of an automobile with a pedestrian, another automobile or with a non-automobile on the roadway or fall from a moving vehicle causing injuries or death of involved individuals.

In recent years, death due to RTAs are increasing at an alarming rate throughout the world. Thereby it poses itself as a major epidemiological as well as medico legal problem. This is due to the tremendous increase in the number of vehicle, high speed technology along with other contributing factors like congestion and poor condition of roads, intoxicating influence of alcohol or drugs, inexperienced drivers without proper driving license, ignorance or intentional violation of traffic rules etc. Victims in RTAs sustain large varieties of injuries, external as well as internal. External injuries may be abrasions, lacerations, contusions etc. Internal injuries

may be fractures, rupture of viscera, destruction of major arteries etc. Fatality in RTAs can be due to immediate cause like hemorrhage, injury to vital organs, vagal inhibition, neurogenic shock, embolism etc.

According to an expert study group appointed by Government of India "RTAs have come to be considered as the third deadly killer, next to heart disease and cancer." Every year the World Health Organization (WHO) hosts an event, usually on 7th April, to celebrate the anniversary of its founding in 1946. Each year the event focuses on one health issue. In response to a growing concern about RTAs the WHO Director-General, Dr. Lee Jong Wook has for the first time in history of WHO devoted 7th April 2004 specifically to road safety and the slogan was "Road Safety Is No Accident." Early detection of the injury and prompt treatment are necessary in saving the lives of many of these victims.

AIMS AND OBJECTIVES

1. To make a detailed study of the internal injuries to the thorax, abdomen & pelvis.

2. To analyze the cause of death due to fatal road traffic accident brought to mortuary of our institute for post - mortem examination with respect to the above injuries.

MATERIALS AND METHOD

The present study was a two year cross-sectional study. The material for the study was the cases of road traffic accidents brought to mortuary for post mortem of this institution situated in central India, during the period from 1st June 2014 to 31st May 2016. The present study includes documenting types of wound, their anatomical location and commonest injuries leading to death in fatal road traffic accidents. Ethical clearance for the present study was obtained from the institutional ethical committee.

On the arrival of the case in Mortuary of this institute, informed expressed consent was taken from the relative of deceased for examination of wound and their documentation. In the present study, detailed information regarding the wounds and various factors regarding the circumstances of the occurrence, like type of road traffic accidents, time and place of accidents, who treat case first, occupation and other relevant information were gathered from relative and were recorded in the predefined proforma. In addition to these, X-ray or CT scan reports were examined for the presence or absence of fracture. In mortuary consent was obtained from relative for examination and medico legal documentation was done in the predefined proforma.

Details of name, age, sex, address, occupation, type of accident etc. were recorded from relative. All the wounds were examined for their location, size and shape. All the fractures were examined by palpation for crepitus, deformity, shortness of limb and by X-ray/CT scan. In the present study though the size of all wounds were noted but it is not included in the analysis because it is beyond the preview of present study.

During the present study period from 1st June 2014 to 31st May 2016 at this institute in central India–

1. Total no of medicolegal autopsies were conducted during the study period = 757.
2. Autopsies of fatal road traffic accident (died on spot, brought dead to hospital or died within 24 hours of accident) = 109.

Inclusion Criteria: All the victims of road traffic accidents who were died on spot or brought dead to hospital or died within 24 hours of accident.

Exclusion Criteria:

1. All the victims who died in an incidence other than road traffic accidents.
2. All the victims of road traffic accidents who were died after 24 hours of accident.

Statistical Analysis:

1. The software for graphs and calculation of statistical values is – SPSS
2. The software used during creation or modification of some of the diagrams
 - a. ADOBE PHOTOSHOP(R) 7.0
 - b. COREL DRAW X3
 - c. WINDOWS -10

RESULTS

Table 1: Profile of distribution of internal injuries in Thorax

Internal injuries on Thorax	No. of cases	Percentage
Rib fracture	32	29.36%
Lungs	16	14.68%
Heart	01	00.92%
Diaphragm	01	00.92%
Thoracic vertebra fracture	01	00.92%

Table 2: Profile of distribution of internal injuries in Abdomen and Pelvis

Internal injuries on Abdomen	No. of cases	Percentage
Stomach and intestine	02	01.83%
Liver	24	22.02%
Spleen	02	01.83%
Kidney	01	00.92%
Lumbar vertebra	01	00.92%
Sacral vertebra	01	00.92%
Bladder	01	00.92%
Genitalia	01	00.92%
Pelvis	04	03.67%

Table 3: Profile of cause of death

Cause of death	No. of cases	Percentage
Intracranial injuries (intracranial hemorrhage/ brain injury)	86	78.90%
Hemorrhagic shock	17	15.60%
Traumatic asphyxia	04	03.67%
Spinal cord injury	02	01.83%
Total	109	100%

DISCUSSION

Profile of Internal injury in Thorax (Table 1): In the present study, out of total 109 cases internal injuries in thorax were seen in 33 cases. Injuries in thorax were classified as rib fracture, lung injury, injury to heart, injury to diaphragm and thoracic vertebra fracture. Rib fracture was seen in 32 cases (29.36%) followed by injury to lung in 16 cases (14.68%) and minimum were injury to heart, injury to diaphragm and injury to fracture thoracic vertebra in 01 case (00.92%) respectively. Most of the lung injuries were associated with rib fracture. All the cases involving heart, diaphragm and thoracic vertebra shows fracture of rib. The findings of present study are similar to studies done by Gupta S, Roychaudhary UB et al at North Bengal,⁴ except in injuries associated with rib fracture. The findings of our study are also comparable with the finding of study done by Singh H, Dhatarwal et al at Rohtak Haryana.⁸ The finding of our study and study done by Suresh Kumar Shetty⁷ are nearly similar 30% and 27% respectively.

Blunt force trauma to the chest can damage the organ without damaging the thoracic wall. Thoraco-abdominal involvement in the RTA can be related to the anatomical location of this region that makes it easily susceptible to impact in any form of blunt force trauma.

Profile of internal injuries in Abdomen and Pelvis (Table 2): In the present study out of total 109 cases the internal injuries in abdomen and pelvis were seen in 26 cases. The abdominal injuries were classified as stomach & intestine, liver, spleen, kidney, lumbar vertebra and pelvis. Amongst them injury to liver was maximum seen in 24 cases (22.02%) followed by injury to pelvis fracture hip bone 04 cases (03.67%), injury to stomach & intestine and spleen in 2 cases (01.83%) respectively

and injury to kidney, lumbar vertebra, sacral vertebra, bladder and genitalia in 01 case (00.92%) each. The findings of our study are comparable with study done by Chaudhary B L, Tarpude BH et al at Mahatma Gandhi Institute of Medical Sciences Sewagram Wardha,² Gupta S, Roychaudhary U B et al at North Bengal region⁷ and NB Kumar, PS Ghormade et al at IGMCM Nagpur.⁶

The findings of our study 23.85% of abdominal injuries are correlated with the study carried out by Chandra et al,¹ who observed 22.52% of abdominal injuries in their study at Delhi. The finding of our study are correlated with the study carried out by Tarpude BH et al¹⁷ who observed 26.25% of abdominal injuries in their study at MGIMS Sewagram, Wardha. The finding of our study injury to the liver correlates with the study done by Chandra J, Dogra TD et al New Delhi,¹ Ghosh PK³ and Honnangar RS, Aramani SC et al.⁵

Profile of cause of death (Table 3): In our study cause of death was intracranial injuries 86 (78.90%) in maximum number of cases. Next to intracranial injuries was hemorrhagic shock seen in 17 cases (15.60%), traumatic asphyxia in 4 cases (03.67%) and spinal cord injury in 2 cases (01.83%). The finding of present study are similar to studies^{11, 10, 2, 12, 14}. In the study conducted in Finland involving RTA during the period 1972 to 1982,¹⁵ in which an injury to cervical spine was the main cause of death. Increasing age seems to increase the risk of fatal cervical spinal injuries. Patients between 16 to 25 years of age had the lowest risk and the patient over the age of 60 years had the highest risk of sustaining a fatal cervical spinal injury¹³. Accordingly in our study most of the cervical spinal cord injury cases were above 40 years.

Source of Funding: Self

Conflict of Interest: Nil

Summary and Conclusion:

1. The most common injury in thorax is rib fracture seen in 29.36 % of cases followed by lung injury in 14.68 % cases.
2. The most common organ involved in abdomen & pelvis is liver in 22.02% of cases.
3. The most common cause of death is intracranial injury in 78.90 % of cases.

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Profile of Cases of Fatal Road Traffic Accident with Respect to Diurnal Variation of Time, Age, Sex and Death of Victim in Central Rural India-Autopsy Based Study

Deepak L Bhagwat¹, Manu D Sharma¹, B. H. Tirpude², P. N. Murkey², I L Khandekar²,
Sharjeel Khan³, Ambedkar Ranjan³

¹Assistant Professor, Government Medical College, Gondia; ²Professor, ³Post Graduate Student,
Mahatma Gandhi Institute of Medical Sciences, Sevagram, Wardha

ABSTRACT

Road traffic accident is a complex phenomenon. Constant rise in the number of motor vehicles, rampant encroachment of road, easy to avail the vehicle because of loan facility, nasty tendency of violating traffic rules and anarchic traffic systems have greatly contributed to rapid increase in RTAs. The rise of road traffic accidents has become a major public health problem. RTAs cost a lot not only to the individuals affected and their families but also to the nation. The injuries, disability and fatality resulting from unexpected RTAs put a significant drain on the economy of the nation.

The present study was a cross-sectional study conducted in central India during 2 year period from 1st June 2014 to 31st May 2016. During the study period, a total of 757 medicolegal autopsies were conducted in this institute, out of which 109 cases of fatal road traffic accidents (died on spot or within 24 hours of accident) were studied. The purpose of the study was to know the age and sex wise distribution, diurnal variation and to correlate the above parameters with the cause of death.

Keywords: *Fatal road traffic accident, Intracranial hemorrhage, Diurnal variation, death.*

INTRODUCTION

Accidents are world's most serious health problem. The motorized transportation media like vehicles, trains, aeroplanes etc, with fast moving vehicular traffic, vast urbanization and changing social patterns, have contributed to increase in the incidence of trauma to human body.

Road Traffic Accident (RTA) is any vehicular accident occurring on the roadway (i.e. originating on, or involving a vehicle partially on the roadway)¹⁹. This includes collision of an automobile with a pedestrian, another automobile or with a non-automobile on the roadway or fall from a moving vehicle causing injuries or death of involved individuals.

In 2013, global rate of death from Road Traffic Injuries was 16.6 per 1,00,000 population, 1.25 million people died globally from road traffic injuries in year 2013¹⁹. In India, more than 4.8 lakh accidents and more than 1.3 lakh deaths were reported during 2013⁵. According

to an expert study group appointed by Government of India "RTAs have come to be considered as the third deadly killer, next to heart disease and cancer." Every year the World Health Organization (WHO) hosts an event, usually on 7th April, to celebrate the anniversary of its founding in 1946. Each year the event focuses on one health issue. In response to a growing concern about RTAs the WHO Director-General, Dr. Lee Jong Wook has for the first time in history of WHO devoted⁹ 7th April 2004 specifically to road safety and the slogan was "Road Safety Is No Accident." Early detection of the injury and prompt treatment are necessary in saving the lives of many of these victims¹¹.

AIMS AND OBJECTIVES

1. To analyze the cause of death due to fatal road traffic accident brought to mortuary of our institute for post-mortem examination.
2. To study age and sex wise distribution of fatal road traffic accidents.

3. To study diurnal variation of time of fatal road traffic accidents.

MATERIALS AND METHOD

The present study was a two year cross-sectional study. The material for the study was the cases of road traffic accidents brought to mortuary for post mortem of this institution situated in central India, during the period from 1st June 2014 to 31st May 2016. The present study includes documenting types of wound, their anatomical location and commonest injuries leading to death in fatal road traffic accidents. Ethical clearance for the present study was obtained from the institutional ethical committee. On the arrival of the case in Mortuary of this institute, informed expressed consent was taken from the relative of deceased for examination of wound and their documentation. In the present study, detailed information regarding the wounds and various factors regarding the circumstances of the occurrence, like type of road traffic accidents, time and place of accidents, who treat case first, occupation and other relevant information were gathered from relative and were recorded in the predefined proforma. Details of name, age, sex, address, occupation, type of accident etc. were recorded from relative. All the wounds were examined for their location, size and shape. In the present study though the size of all wounds were noted but it is not included in the analysis because it is beyond the preview of present study.

During the present study period from 1st June 2014 to 31st May 2016 at this institute in central India—

1. Total no of medicolegal autopsies were conducted during the study period = 757.
2. Autopsies of fatal road traffic accident (died on spot, brought dead to hospital or died within 24 hours of accident) = 109.

Inclusion Criteria: All the victims of road traffic accidents who were died on spot or brought dead to hospital or died within 24 hours of accident.

Exclusion Criteria:

1. All the victims who died in an incidence other than road traffic accidents.
2. All the victims of road traffic accidents who died after 24 hours of accident.

Statistical Analysis:

1. The software for graphs and calculation of statistical values is – SPSS.
2. The software used during creation or modification of some of the diagrams.
 - a. ADOBE PHOTOSHOP(R) 7.0
 - b. COREL DRAW X3
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RESULTS

Table 1: Age and sex wise distribution of cases of fatal Road Traffic Accidents

Age group (in years)	Male	Female	Percentage	
			Male	Female
1 - 10	2	2	01.84%	01.84%
11 - 20	8	4	07.34%	03.67%
21 - 30	30	2	27.52%	01.84%
31 - 40	17	2	15.59%	01.84%
41 - 50	10	1	09.17%	00.92%
51 - 60	12	4	11.01%	03.67%
61 - 70	9	3	08.25%	02.75%
71 - Above	3	0	02.75%	00.00%
Total	91	18	83.47%	16.53%

Table 2: Distribution of cases of fatal Road Traffic Accident as per diurnal variation of time

Time of accident	No. of cases	Percentage
Morning (06:01 am to 12:00 noon)	21	19.27%
After noon (12:01 pm to 06:00 pm)	53	48.62%
Evening (06:01 pm to 12:00 midnight)	33	30.28%
Night (12:01 am to 06:00 am)	02	01.83%
Total	109	100%

Table 3: Profile of cause of death

Cause of death	No. of cases	Percentage
Intracranial injuries (intracranial hemorrhage/brain injury)	86	78.90%
Hemorrhagic shock	17	15.60%
Traumatic asphyxia	04	03.67%
Spinal cord injury	02	01.83%
Total	109	100%

DISCUSSION

Age and sex wise distribution of cases of fatal RTA (Table 1): Out of 109 (91 cases, 83.47%) were male and (18 cases, 16.53%) were female indicating that large majority of victims were males. Male to female ratio was 5.06:1. Maximum number of victims (32 cases, 29.36%) were in the age group of 21 – 30 years, followed by 31 – 40 years (19 cases, 17.43%). Minimum victims were found in age group of 71 years and above (3 cases, 02.75%) followed by 1 – 10 years (4 cases, 03.68%). Youngest victim was 4 years old male child and the eldest was 85 years male.

Our findings are similar to result of following studies. In the study conducted at PGIMS, Rohtak,¹⁵ males were involved in 89.30% of cases and females in 11.70%. Commonest age group involved was 21 – 30 years (27.30%), followed by 31 – 40 years (20.60%). In other study done at Government Medical College, Jammu,⁷ majority of the victims were male (88.13%), while females were involved in 11.87% of cases. Most commonly involved age group was 21 – 30 years

(30%), followed by 31 – 40 years (19.20%). In another study carried out at Office of Judicial Medical Officer, Colombo,¹⁰ 84.54% of victims were male and 15.44% were females. Maximum numbers of victims were in the age 20 – 29 years (20.12%) followed by 30 – 39 years (16.10%). In all the above studies minimum number of victims were in the extremes of age. In the study conducted at Belgaum, Karnataka¹³ majority of victims were male (89%). Male to female ratio was 8.09:1. Maximum number of victims (28 cases, 28%) were in the age group of 21 – 30 years followed by 51 – 60 years (18 cases, 18%). Minimum of victims (3 cases, 3%) were found in the extreme age group of 71 – 80 years old male. Similar findings have also been observed in other studies.^{12, 4, 1, 14}

The male preponderance in fatal road traffic accidents may be due to the paternalistic nature of our society where males lead a more active life and most of the time is involved in outdoor activities such as driving and travelling. On the contrary, females mostly keep themselves indoor because of cultural background and with the habit of watching TV programs. Totally more than half (56.88%) of victims were in the age group 21 – 50 years. This may be due to the fact that persons of this age group lead more active life, more mobile and go out for work and keep themselves outdoors most of the time. Besides, there is craziness in fast driving, less experience, less traffic sense, late night driving, especially after parties is usually seen in this age group. In our study, people in the extremes of age group comprised the minimum number of fatalities. Least fatalities in older persons may be due to more experience, more traffic sense, less tendency to take undue risks and they remain mostly indoors and leads less active life. Lesser involvement of children below 10 years may be because some senior members of the family accompanies them on road or non availability of driving license of motor vehicles.

Diurnal variation of cases of fatal RTA (Table 2): Maximum number of accidents occurred in the afternoon hour's 53 cases (48.62%) and minimum 02 cases (01.83%) in the night. In the evening it was 33 cases (30.28%) and in the morning it was 21 cases (19.27%). Our result is similar to the observations made in the study conducted at Regional Institute of Medical Sciences (RIMS), Imphal, Manipur,¹⁶ in which maximum number of accidents 49.27% occurred during afternoon hours and minimum 03.41% in the night, in the morning

hours the maximum number of accidents occurred were 31.71%. However the result of our study dose not match with the study done by Satish Babu at Belgaum, Karnataka¹³ and Patel NS at Greater Lusaka, Zambia¹² and study conducted by Lal S Kohli et al in North East Delhi.¹⁰ This difference can be attributed to the fact that the biggest period in the area where our study has been conducted is between 12:00 noon to 06:00 PM, where majority of people travel for work, school etc. with a sense of urgency to reach the destination. Moreover the peoples in rural area prefer to stay indoor and do not venture out after dark, there by low incidence of accidents in night. The second in order of the time of occurrence of accidents in our study was in the evening hours 30.28% and the tall of accidents in the evening may be due to high rush hour traffic (people return home from work), tiredness after day work, urgency to reach home, poor visibility due to insufficient road lighting in the rural area.

Profile of cause of death (Table 3): In our study cause of death was intracranial injuries 86 (78.90%) in maximum number of cases. Next to intracranial injuries was hemorrhagic shock seen in 17 cases (15.60%), traumatic asphyxia in 4 cases (03.67%) and spinal cord injury in 2 cases (01.83%). The finding of present study are similar to studies^{6, 3, 2, 8, 17}. In the study conducted in Finland involving RTA during the period 1972 to 1982,¹⁸ in which an injury to cervical spine was the main cause of death. Increasing age seems to increase the risk of fatal cervical spinal injuries. Patients between 16 to 25 years of age had the lowest risk and the patient over the age of 60 years had the highest risk of sustaining a fatal cervical spinal injury 16. Accordingly in our study most of the cervical spinal cord injury cases were above 40 years.

CONCLUSION

Road traffic accident is a complex phenomenon. Constant rise in the number of motor vehicles, rampant encroachment of road, easy to avail the vehicle because of loan facility, nasty tendency of violating traffic rules and anarchic traffic systems have greatly contributed to rapid increase in RTAs. Population explosion is a catalyzing factor for a number of accidents. The rise of road traffic accidents has become a major public health problem. RTAs cost a lot not only to the individuals affected

and their families but also to the nation. The injuries, disability and fatality resulting from unexpected RTAs put a significant drain on the economy of the nation. The deaths due to RTAs accounted for 14.40% of total medico legal autopsies conducted (i.e. died on spot, brought dead to hospital or died within 24 hours of accident). All the victims of fatal RTAs had injuries of one or other system. Intracranial injuries were seen in 80.73% of the cases. In majority of victims, intracranial injuries contributed either directly or indirectly to death. Intracranial injuries cause alone was responsible for death in 78.90% of cases, followed by hemorrhagic shock 15.60%, spinal cord injury 01.83% and traumatic shock 03.67%. This shows that intracranial injuries are most common fatal injuries in road traffic accidents in this region. This could be due to the fact that, the intracranial injuries cannot be treated successfully, even in tertiary level hospitals. This may be because of their physiological and anatomical configuration. Therefore, the old saying, "Prevention is better than cure" holds true even here. Injuries and fatalities due to RTA can be prevented or at least can be reduced by preventing the accidents/crashes, in turn reducing fatal injuries and fatalities.

The present study was cross-sectional study conducted in central India during 2 year period from 1st June 2014 to 31st May 2016. During the study period, a total of 757 medicolegal autopsies were conducted in this institute, out of which 109 cases of fatal road traffic accidents (died on spot or within 24 hours of accident) were studied.

The predesigned and pretested proforma was used to collect the required data and following were the findings

1. Out of 109 victims of fatal RTA, 91 (83.47%) were male and 18 (16.53%) were female.
2. The largest number of victims were in the age group 21 – 30 years (27.52%).
3. Most of the accidents occurred in the afternoon hours (48.62%).
4. An intracranial injury alone was responsible for death in 86 cases (78.90%).

Source of Funding: Self

Conflict of Interest: NIL

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A Two-Year Prospective Study from Punjab Region of India

Mittal D R¹, Jasbir S², Rai G³, Kumar K⁴, Sharma R K⁵

¹Junior Resident, Government Medical College Amritsar; ²Assistant Professor, Saraswathi Institute of Medical Sciences, Hapur; ³Additional Professor & Head, Dept of Forensic Medicine & Toxicology, Government Medical College Amritsar; ⁴Assistant Professor, Government Medical College Amritsar; ⁵Professor & Head, Dept of Forensic Medicine & Toxicology, Saraswathi Institute of Medical Sciences, Hapur

ABSTRACT

On one hand the horizon of human rights is expanding but at the same time the crime rate is also increasing. In this context, custodial deaths are among most contentious deaths for investigation by forensic experts. These deaths sometimes invite mass resentment and condemnation. Not that always such deaths are due to unnatural or violent causes; indeed most of the time they are due to natural causes. To analyse custodial deaths from all aspects present prospective study was undertaken. A total of 135 (119 male and 16 female) cases of custodial deaths were examined in detail over a study period of 2 years. Based on place of confinement 100 cases (74.07%) died in jail custody, 33 cases (24.45%) died in mental hospital custody and in 2 cases (1.48%) death occurred in police custody. Among 92 cases (out of 135) in which final cause of death was declared, the death was natural in 95.65% while in 4.35% it was unnatural. Pulmonary tuberculosis was the most common natural cause among prison custodial deaths (22.8%, n=16). In mental hospital custody coronary artery disease (12.8%, n=9) was the leading cause of natural death. As far as unnatural deaths are concerned, there were two cases each of suicidal and accidental deaths (2.17% each) and no case of homicidal death was noticed.

Keywords: custodial deaths, jail, police, mental hospital.

INTRODUCTION

Unfortunately, the term ‘custody’ has not been defined in Criminal Procedure Code (CrPC). Its core meaning is that the law has taken control of the person. This control is not the final or absolute control of ownership but controlling of a person’s liberty or curtailing in a substantial manner a person’s freedom of action. But at the same time there is implied responsibility for the protection and preservation of the person in custody. The person in custody is thus totally dependent on his or her custodian for proper care and attention.

Custodial death is heard in news and media from time to time and most of the highlighted cases invite public resentment and condemnation. Such events invariably have substantial allegations of omission of proper care and attention or commission of atrocities and torture or abuse of power in one or the other way on part of the authorities’ concerned.

Not that always such deaths are due to unnatural or violent causes; indeed most of the time they are

due to natural causes.^[1,2] Inadequate medical facilities, delayed medical attention, inadequately trained staff and insensitive custodial authorities are frequently blamed causes by the researchers, to contribute to untimely natural or unnatural prison deaths. Therefore all cases of custodial deaths need to be investigated thoroughly to bring out the actual facts surrounding the death.

Every case of custodial death is supposed to be reported to the National Human Rights Commission (NHRC) and the police is also required to report the findings of the magistrate’s inquiry to the Commission along with the postmortem report.^[1] This is an important protection but these steps are frequently ignored. According to Human Rights Watch investigation, a judicial inquiry was conducted only in 31 of the 97 custodial deaths reported in 2015 and 26 cases were not even submitted for an autopsy.^[3]

The autopsy surgeon has a unique role in documenting medical evidence in cases of custodial deaths. His/her role assumes significance in events when the custodial authorities try to hide or alter the

actual facts behind the death to save themselves from any penal action. He/she can find out the cause of death after meticulous examination and may also come out clear about manner of death on thorough evaluation of available information.

MATERIAL & METHOD

The prospective analytic study was carried out in the Department of Forensic Medicine and Toxicology, Government Medical College Amritsar (GMCA) from 1.10.2014 to 30.9.2016 on cases of custodial deaths brought for postmortem examination. The postmortem was conducted as per the guidelines laid down by NHRC.

Custodial deaths were categorized into three groups namely jail custody, police custody and mental hospital custody (in the custody of Government Mental Hospital Amritsar) deaths.

The inquest papers, hospital record, autopsy findings and the results of laboratory investigations including histopathology and chemical analysis were perused. All the observations are tabulated and the results are compared with the previous studies.

OBSERVATIONS

Out of 695 autopsies conducted during this period, the number of custodial death cases was 135 (19.42%). Based on place of confinement 100 cases (74.07%) died in jail custody, 33 cases (24.45%) died in mental hospital custody and in 2 cases (1.48%) death occurred in police custody. (Table-1) Among those dying in jail custody 50% were convicted prisoners, 47% were undertrial prisoners and 3% were internee. (Fig-1)

Out of 135 deaths 88.1% (n=119) were male and 11.9% (n=16) were female. Among males maximum deaths occurred in jail custody (82.35%; n=98) followed by mental hospital custody (16.81%; n=20) and one (0.84%) died in police custody. Among females 13 (81.25%) died in mental hospital, 2 (12.5%) died in judicial custody and 1 (6.25%) died in police custody. (Table-2)

The proportion of overall custodial deaths was highest in 26-35 years (26.7%) age group followed by

36-45 years (21.50%) and 46-55 years (16.30%) age groups. In jail, maximum deaths 32% (n=32) occurred in the age group of 26-35 years. While in mental hospital maximum deaths 45.7% (n=16) occurred in the age groups of 46-65 years. Two cases-a 35 year old female and a 16 year old male-died in police custody. (Table-3)

A total of 104 (77.04%) persons received medical care before their death, while 31 (22.96%) died at their place of confinement and had not received medical care before their death.

In 43 cases of custodial deaths laboratory reports (chemical analysis and/or histopathology) were still pending. So the statistical analysis regarding cause and manner of death could be performed only in 92 cases (out of 135) in which final cause of death were established. Out of these 92 cases 88 (95.65%) died of natural causes while 4 (4.35%) died due to unnatural causes. (Table-4)

Among natural causes 38.64% cases had single organ involved, majority having pulmonary involvement, 28.26% cases had two organ system involved and 20% had multi-organ failure. Pulmonary tuberculosis was the most common natural cause of death in prison custody (22.8%, n=16). In mental hospital custody coronary artery disease (12.8%, n=9) was the main cause of natural death. (Table-5) Out of total 33 cases of mental hospital deaths only 2 cases (6.06%) had pulmonary tuberculosis. (Table-6)

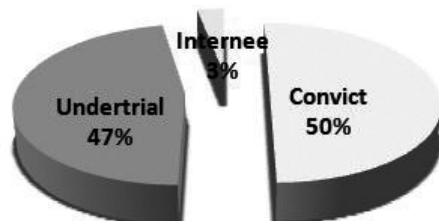
Out of total 102 cases of judicial/police custody deaths 53 cases (51.96%) were suffering either from TB or HIV or HCV or multiple infections. (Table-6)

As far as manner of unnatural deaths is concerned, there were two cases each of suicidal and accidental deaths (2.17% each) and no case of homicidal death has been noticed. Suicide was committed by 2 cases (n=2/92; 2.17%); one each in police and mental hospital custody. Hanging was the method used for suicide in both the cases.

Accidental death also accounted for 2 cases (n=2/92; 2.17%); one each died in jail and police custody. Accidental death in jail occurred due to accidental overdose of intravenous morphine in an undertrial prisoner. In police custody the accidental fall from height and consequent head injury resulted into death of the female inmate. (Table-4)

Table 1: Incidence of custodial death cases as per confinement

Type of custody	No. of cases	Percentage
Jail custody	100	74.07
Police custody	2	1.48
Mental Hospital custody	33	24.45
Total	135	100

**Figure 1: Conviction status of prisoners in jail custody****Table 2: Age wise distribution of custodial death cases**

Age group (in years)	No. of cases	Percentage
16-25	20	14.8
26-35	36	26.7
36-45	29	21.5
46-55	22	16.3
56-65	15	11.1
66-75	11	8.1
76-85	2	1.5
Total	135	100

Table 3: Gender wise distribution of custodial death cases

Gender	Judicial			Police	Mental Hospital	Total
	Convict	Undertrial	Internee			
Male	48 (96%)	47 (100%)	3 (100%)	1 (50%)	20 (61.61%)	119 (88.10%)
Female	2 (4%)	0 (0%)	0 (0%)	1 (50%)	13 (39.39%)	16 (11.90%)
Total cases	50	47	3	2	33	135

Table 4: Manner of death in custodial death cases (n = 92/135)

Manner of death	Mental Hospital	Judicial			Police	Total
		Convict	Undertrial	Internee		
NATURAL	23	36	26	3	0	88(95.65%)
UNNATURAL						
Accidental	0	0	1	0	1	2(2.17%)
Suicidal	1	0	0	0	1	2(2.17%)
Homicidal	0	0	0	0	0	0(0%)
Total	24	36	27	3	2	92(100%)

Table 5: Cause of death in custodial death cases (n = 92/135)

Cause of death	Mental Hospital	Judicial			Police	Total
		Convict	Undertrial	Internee		
Asphyxia	1*	0	0	0	1*	2
Hemorrhage & Shock	0	1	1	1	0	3
Septicemia	2	1	2	0	0	5
Poisoning	0	0	1*	0	0	1
Shock	0	0	1	0	0	1

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Organ failure						
<i>One organ failure</i>						
Brain	2	1	1	0	1*	5
Lungs	4	11	10	1	0	26
Liver	0	2	0	0	0	2
Heart	1	0	0	0	0	1
<i>Two organ failure</i>						
Brain &Heart	2	0	0	0	0	2
Brain &Lung	2	3	3	0	0	8
Heart &Lung	7	4	1	0	0	12
Liver &Lung	1	2	0	0	0	3
Kidney &Lung	0	1	0	0	0	1
Multi-organ failure	2	10	7	1	0	20
Total	24	36	27	3	2	92

*Unnatural deaths

Table 6: Prevalence of HIV, TB and HCV infections in custodial death cases

	TB	HIV	HCV	HIV+ HCV	HIV+ TB	TB+ HCV	HIV+ HCV+TB	Total
Judicial/police (n = 102)	22 (21.57)	11 (10.78)	12 (11.76)	4 (3.92)	1 (0.98)	1 (0.98)	2 (1.96)	53 (51.96)
Mental hospital (n = 33)	2 (6.06)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (6.06)

(Parenthesis indicates percentage)

DISCUSSION

According to the NHRC, the number of custodial deaths in 2000-2001 was 1,037 while in the year 2012-2013 they have increased to 2,157. A total of 1,702 prisoners have died in Indian jails during 2014; out of which 1,507 were natural deaths and 195 were unnatural deaths.^[2]

In present study the incidence of custodial death was 19.42% of the total autopsies. In previous studies from same region conducted by Gargi^[4] (1995-97) and Vohra^[5] (2009-2010) the incidence of custodial death was 0.77% and 2.93% respectively. This increased proportion of custodial deaths is on account of the fact that since 2013, the GMCA is conducting autopsies in custodial death cases and referred cases requiring forensic pathologist expertise besides in-hospital deaths. Autopsies in all other cases are now being conducted at District hospital.

Out of 135 cases of custodial deaths, 11.9% were female and majority of them died in mental hospital

with only two deaths occurred in prison. Vohra^[5] has also mentioned 18.6% female deaths, majority of them died in mental hospital. Gargi^[4] and Bardale^[6] reported all males while Mittal^[7] reported only one female death in prison. Higher incidence of female deaths in mental hospital was during their old age after they had been left here by the relatives for rest of their life.

Predominantly the custodial deaths (26.7%) were seen in the age group of 26-35 years while Bardale^[6] and Vohra^[5] reported maximum age incidence (24.3%) in age group of 31-40 years. It shows that crime rate is enhancing amongst the younger age group.

The present study found more incidence of death among convicts (50%) comparative to undertrials (47%); the finding is in line with findings of Bansal et al^[8] who has reported, respectively 58.7% and 41.3% deaths among convicts and undertrials. Contrary to this observation Vohra^[5] has mentioned 71.4% deaths involving undertrial prisoners.

In present study 77.04% of inmates received medical care before their death. The studies of Vohra^[5], Bardale^[6] and Mittal^[7] put this figure respectively at 55.71%, 64.28% and 69.56%. It points towards a positive trend of timely referral of sick custodial patients.

Natural Deaths: The current study found that natural causes were responsible for majority of custodial deaths (about 95%).^[4-12] Among natural deaths most of the deaths were due to pulmonary system involvement; pulmonary tuberculosis being the leading cause. This finding is supported by various other researchers.^[4-6,11-14] However, Wobeser et al^[9] and Frueshwald et al^[10] found that majority of deaths were due to cardio-vascular diseases. This is attributed to overcrowding, closed living conditions, insufficient ventilation and poor nutrition in Indian jails as compared to western countries.

In our study out of 102 cases in judicial/police custody 21.57% were having tuberculosis, 10.78% were HIV infected and 11.76% were HCV infected. Besides, 8.7% cases were infected with multiple infections. (Table-6) Bansal^[8] and Bardale^[6] found the prevalence of HIV respectively in 13.5% and 14.08% of prison inmates. From above observation it is clear that prisoners constitute high risk group for acquisition of these infections.

Unnatural Deaths: The unnatural deaths comprised only 4.35% of cases which is lowest figure found as compared to figures reported by other authors. General welfare of prisoners and vigilance in Punjab jails might be comparably better than other study regions. The reason for this can be attributed to NHRC activism, media and general public awareness regarding custodial deaths, and constant fights of various NGO's against the custodial torture.

Suicidal and accidental deaths were found to have equal incidence (2.17% each). In this respect, the present study differs from other researchers, who found overall higher incidence of suicides, and also the most common manner of unnatural death. (Table-4)

However present study is in consonance with studies by Vohra^[5], Bardale^[6], Bansal^[8], Agnihotri^[11], Sonawane^[12] and Sonar V et al^[13] as far as most common method used for suicide viz. hanging. Therefore authorities should be careful that the inmates are not in the possession of such materials which may help them in taking the extreme step of ending their lives.

No case of homicide has been noticed in present study and this indicates effective control of authorities over inmates. However one disturbing fact is that all deaths occurring under police custody were unnatural. (Table-4) Moreover these deaths had occurred shortly after arrest and one of the arrestee was detained without any entry in daily diary. These shocking practices used by police undermine public faith in law enforcement.

Accidental deaths were due to drug overdose (poisoning) and accidental fall. The access of prisoners to poisons/drugs of abuse indicates lapses in jail security and has been found to be the commonest cause of unnatural deaths by few authors.^[7,14]

CONCLUSION

Custodial deaths are predominantly due to natural causes and pulmonary tuberculosis is the leading cause in developing countries, which is further compounded by high prevalence of HIV and HCV infections among prisoners. There should be regular health check-up and an effective programme to screen and treat inmates. Better maintenance of prisons, trained, sensitive and more dedicated staff including medical staff and de-crowding of prisons are few of important suggestions to be followed.

Access to various drugs and poisons inside jail is also a matter of concern and this could not be possible without connivance of jail officials. Those involved in such practices should be warned and strict action need to be taken. De-addiction and rehabilitation services to addict prisoners and timely medical care to sick ones should be provisioned as a matter of right.

An unnatural death in police custody is another grave area of concern. The way forward is to strictly enforce existing laws and guidelines on arrest and detention. The Supreme Court's D.K Basu decision particularly with respect to recording detentions, informing families, producing suspects before magistrates and providing medical examinations should be adhered to by the police.

Only a more humane approach towards prisoners and providing care and timely medical aid as a matter of right will go a long way to bring down the incidence of prison deaths in India.

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A Prospective Study of Unnatural Deaths in Married Women within Seven Years of Marriage in Hapur District of Western Uttar Pradesh

Rizwi A¹, Jasbir S², Sharma R K³, Abhishek S⁴

¹Junior Resident, ²Assistant Professor, ³Professor & Head, ⁴Junior Resident, Dept of Forensic Medicine, Saraswathi Institute of Medical Sciences, Hapur (UP)

ABSTRACT

In Indian society marriage is considered sacrosanct and essential for procreation and propagation of humanity. The sizable numbers of deaths in female are unnatural. In young married women more often they are associated with demands of dowry or harassment & cruelty by husband or in-laws. Present autopsy based study was conducted to study the socio-demographic pattern and reasons behind unnatural deaths in newly married females. Females living in Hindu joint family structure from lower socioeconomic strata have shown increased incidence of unnatural death, predominantly during early years of their marriage. The most common incident resulting in unnatural death was vehicular accident injuries (37.14%), followed by Hanging (20%), Strangulation (17%) and Poisoning (14%). Accidental deaths were most frequent comprising 40% of total cases, followed by suicides comprising 37.14% and homicides had a share of 22.86%. Significantly in 20% cases there was allegation of dowry demand/torture/harassment by in-laws/husband of the deceased and most of them were homicides, killed either by strangulation or burning.

Keywords: dowry, unnatural death, marriage, women.

INTRODUCTION

The religious and mythological scriptures in India vividly depict marriage as sacrosanct and an essential phenomenon for procreating and propagating the humanity. In Indian patriarchal society women always have been at receiving end. Death is unnatural when caused prematurely against the order of nature by injury, poison or other means of violence. The sizable numbers of deaths in female are unnatural. In young married women more often they are associated with demands of dowry or harassment & cruelty by husband or in-laws.^[1,2,3,4,6]

Despite so many statutory provisions in law books, dowry death or suicide by young married women due to cruelty or harassment is still continued.^[1-4] Moreover such deaths are not only prevalent in Hindu castes but studies in recent past have also reported cases from non-Hindu religious communities.^[1,3,4,6]

The present study was conducted to find out the incidence and causes of unnatural deaths in married women occurring within seven years of the marriage. Through this study the authors will analyse the

demography, incidence, causes, manner and reasons behind these unnatural deaths and compare the findings with previous studies.

MATERIAL AND METHOD

Study Settings: The present study was carried out at the Saraswathi Institute of Medical Sciences (SIMS), Hapur in western Uttar Pradesh. The college falls under rural area of western UP and all the medico-legal deaths reported at the District Civil Hospital and the Medical College are autopsied here.

Study design: Prospective autopsy-based descriptive observational study carried out from July, 2015 to October, 2016.

Study subjects: The cases of unnatural married female deaths dying within seven years of the marriage autopsied at the mortuary of SIMS Hapur.

Exclusion criteria:

1. Unidentified female deaths.
2. Widow or divorced females dying within seven years of their marriage living with her parents.

Data collection and Analysis: The inquest papers, clinical hospital records and postmortem findings were used to get preliminary details and circumstances of cause and manner of death. Besides, the close relatives and identifiers were interviewed for recording sociological profile of deceased and to find out reasons/motives behind non-accidental deaths by inquiring into the recent past of the deceased. All details were systematically recorded in Performa. Data was organized and statistically analysed using Microsoft Excel to generate tabulated and pictorial representations for deduction of results. These results were compared with other relevant studies from various parts of India.

OBSERVATIONS

Incidence and Demographic profile: A total 688 medicolegal autopsies were conducted at SIMS during this period. Out of these 76% (n = 524) were male and female comprised 24% (n = 164) with male:female ratio of 3.2 : 1. Among female deaths, 74% cases (n = 121/164) were identified, including 35 cases of married females dying within 7 years of their marriage and one widow living with her parents who had complete disconnect with in-laws. The remaining 26% cases (n=43/164) were unidentified/unclaimed females. Thus the study subjects (n = 35) comprised 5% of total deaths, 21.3% of total female deaths and 28.9% of identified female deaths.

Out of these 35 cases, 31.4% female deaths occurred in their late twenties (26-30 years) followed by 25.7% of deaths in early twenties (21-25 years). The least number of cases 20% were found in youngest age group (16-20 years) including two victims of less than the legal age for marriage. [Table 1]

A total of 45.71% of unnatural deaths among married females occurred in initial three years of marriage. The single largest group affecting 25.71% of victims died during the third year of their married life. Another peak was seen in the sixth year of married life comprising 22.86% of victims. Incidence of deaths in very first year (n = 3) and the seventh year (n = 2) of marriage was least. [Table 2]

Socio-economic profile: Mostly the female victims belonged to rural domiciliary region (88.57%). About 83% belonged to Hindu religion predominantly living in joint family structure (58.6%). The remaining 17% cases belonged to Muslim religion with 83.3% living in joint families.

About 74% belonged to lower class while remaining belonged to lower middle class of socio-economic strata. No female belonged to extremely rich or poor class.

Only 20% of females were employed and majority were housewives. About 29% of females were issueless while 37% had both male and female children. Remaining had either female children (17%) or male children (17%).

All females were literate with 97% being matriculate or above. Only one victim studied upto primary level. Those educated upto Intermediate level were 42.86% and significantly graduates comprised 31.43%. None was having any technical/professional education. [Table 3]

Circumstances and cause of death: The most common incident resulting in unnatural death was vehicular accident injuries (37.14%), followed by Hanging (20%), Strangulation (17%) and Poisoning (14%). [Table 4]

Out of total of 43% cases of fatal injuries the vehicular accidents claimed 37.14% lives and remaining 5.71% suffered injuries due to causes other than road traffic accidents (fall from height, homicidal stabbing). [Table 4]

Accidental deaths (n = 14) were most frequent comprising 40% of total cases, followed by suicides (n = 13) comprising 37.14% and homicides (n = 8) had a share of 22.86%. [Table 5]

As regard to circumstances, 40% (n=14) of deaths were accidental deaths and had no acclaimed reasons behind. In 20% (n=7) the reason could never be known. There were seven cases i.e. 20% where allegations of dowry demand and torture/harassment were made by parents/relatives of the deceased and cases were brought u/s 304-B IPC. Of these seven cases, 5 deaths were homicidal (Burns-2, Strangulation-2 and Poisoning-1) and 2 victims committed suicide (Hanging-1 and Poisoning-1).

In remaining 20% cases (n=7) the precipitating event was quarrel with husband/in-laws. Of these infidelities and being issueless were found to be the root cause in three cases. [Table 6]

DISCUSSION

Incidence and Demographic profile: The present study found that the number of unnatural deaths in newly married females had a share of 5% among total autopsies, which is similar to the finding of Arora P et al^[5] (4.95%) but lesser than figure reported by Verma RK et al^[3] i.e 7.74%. Kulshrestha P et al^[1] and Jaswinder S et al^[4] did not mention the incidence in their studies.

Most vulnerable age group has been reported to be 21-25 years by most of authors^[1-4]. They have reported the proportion of victims aged less than 25 years from 58% to 83.75% in their studies. The present study has recorded 45.71% cases died under age of 25 years.

Not in agreement with the findings of these authors^[1-4], 26-30 years has been the most vulnerable age group affected comprising 31.4% of victims, followed by 21-25 years age group with 25.71% of victims. The age of marriage in most of the urban, sub-urban and educated rural societies has certainly gone up to somewhere near early twenties to mid-twenties. The married female if falling prey to the dowry demands or cruelty, would in all probability lie in the age group of mid-twenty or above, even if the incidence occurs in initial few years of her married life. Also the employment opportunities opened up for educated married women (with proportion of graduates near one-third and those of employed one-fifth in present study) have increased the risk of vehicular accidents thereby wobbling the incidence across various age groups.

The various authors have reported majority of victims (about 45% to 60%) died within three years of their marriage with peak incidence occurring during second year of the married life^[1-4]. The present study has found 45.71% victims dying within three years of their marriage with peak incidence occurring during third year of the marriage (25.71%). This shift of victimization from earlier years of marriage could be attributed to the increasing use of divorce by younger population as a rescue to harassment/cruelty/dowry demands during early years of marriage. This has been facilitated by changing social norms.

Social trends originating in metros slowly percolate down to smaller towns and from there to villages. Divorce is no longer a taboo and a divorced daughter is not unwelcome in her parents' home even in smaller towns. In the new socio-economic environment, women do not feel shy of walking out of marriage. The increased communication through mobile phones with their parents

has also emboldened the women to take early decision regarding dissolution of marriage. But once the child is born out of wedlock, the decision of divorce becomes hard to take and the women gives up tolerating the victimization, until the point of catastrophe is reached.

There is another peak in deaths during sixth year of married life (22.86%). Majority of these were on account of vehicular accidents due to involvement and exposure of educated females to the outdoor world. This peak during sixth year of married life has also been observed by Verma^[3].

Socio-economic profile: Religion wise distribution of cases showed the results similar to those of other authors^[1-4]. However, the findings are in slight variance with the study of Kulshrestha^[1], Verma^[3], Jaswinder^[4] and Sinha^[6] who have reported a few cases from Sikh and/or Christian communities in their studies. Very low population, higher or professional qualification and cultural differences may be the reasons for no case having been reported from other religions in present study.

The present study is in concurrence with study of Verma^[3] showing that majority of the victims belonged to lower and lower middle socio-economic strata. The dissimilarity with the studies of Kulshrestha^[1] and Arora^[5] who have reported highest incidence of unnatural deaths in lower middle and middle socio-economic strata, could be on account of comparatively more rural population (88.57%) in present study.

Circumstances and cause of death: The major cause of death in present study was injuries (vehicular accidents), followed by hanging and strangulation. Similar to the present study Lalwani^[7] observed vehicular accidents (32.6%) followed by hanging (17.3%), poisoning (12.6%) and burns (10.2%) as the common causes of unnatural deaths in females. Verma^[3] has also reported vehicular accident as second common cause of death after burns.

Burn as a major cause of death in females was concluded by most of other authors in their studies.^[1-4] This is in variance with the present study which has found burn as cause of death in just 5.71% of cases. The difference could be attributed to the fact that the serious burn cases are referred to higher government tertiary centres in nearby national capital region. Further the government efforts directed to curb dowry related deaths like restricted sale of kerosene oil, prohibiting disbursing of petrol/diesel in free containers etc. might have started

showing the desired results. The stringent view taken by courts in cases of bride burning may be other important deterrent factor.

Hanging was second common cause of death in 20% of victims. Srivastava^[2] and Verma^[3] reported hanging in 29.37% and 18.56% of cases while Jaswinder^[4] and Kulshrestha^[1] noticed hanging as a cause of death in 13.52% and 11.96% of cases, respectively. Hanging has also been found as the most common method for committing suicide which has also been concluded by Srivastava^[2] and Verma^[3].

Study reveals that accidental manner was responsible for 40% of deaths while suicidal deaths were 37.14% and strikingly homicides have accounted for 22.86% of deaths. In consonance with present study Kulshrestha^[1] has reported accident as the most common manner of death and Verma^[3] attributed 42.07% deaths to accidents which is close to the present figure. However present findings are in disagreement with the study of Srivastava^[2] who has reported suicide in about half of cases and accidental deaths only in 23% of cases, which could be due to the fact that vehicular accidental deaths were not included in his study.

Homicidal deaths (22.86%) were responsible for significantly higher proportion of deaths in present study as compared to studies by Verma^[3] (10%) and Kulshrestha^[1] (5.12%). However the finding of Srivastava^[2] who has recorded 25.17% of deaths due to homicides is consistent with present study.

The persistent patriarchal attitude, increasing consumerism and show off is manifesting in constantly rising dowry demands. At the same time increased resistance is offered by wives who are now more educated, employed, and aware of their legal and social-cultural rights and are increasingly interacting with outer world. These opposing factors have led to women becoming more vocal, determined and resistant, not easily giving up to undue pressure and this is punished by more cruelty and violence by husband/in-laws. Moreover decreased kitchen accidents (burns) due to reasons explained above, have led to proportional increase of other violent means of homicide i.e strangulation.

Dowry demand by husband or his family members and quarrel with husband/ in-laws are two important reasons behind homicidal as well as suicidal deaths and this finding is consistent with other authors too ^[1-6].

Table 1: Age-wise incidence of unnatural deaths in married female

Age group (in years)	No. of cases	Percentage
16-20	7	20.00
21-25	9	25.71
26-30	11	31.43
> 31	8	22.86
Total	35	100.00

Table 2: The running year after marriage in which death occurred

Running Year of marriage	No. of cases	Percentage
I	3	08.57
II	4	11.43
III	9	25.71
IV	4	11.43
V	5	14.29
VI	8	22.86
VII	2	05.71
Total	35	100.00

Table 3: Educational status and incidence of unnatural deaths

Educational status	No. of cases	Percentage
Illiterate	0	00.00
Primary	1	02.86
Matriculate	8	22.86
Intermediate	15	42.86
Graduate	11	31.43
Technical/Professional	0	00.00
Total	35	100.00

Table 4: Cause of unnatural death

Cause of death	No. of cases	Percentage
Injuries (vehicular accidents)	13	37.14
Hanging	7	20.00
Strangulation	6	17.14
Poison	5	14.29
Burns	2	5.71
Injuries other than RTA (Fall from height, stab injury)	2	5.71
Total	35	100.00

Table 5: Manner of unnatural death

Manner of death	No. of cases	Percentage
Accidental	14	40
Suicidal	13	37.14
Homicidal	8	22.86
Total	35	100.00

Table 6: Reasons behind the unnatural deaths

Reason behind death	No. of cases	Percentage
Vehicular accident injuries	13	37.14
Dowry demand and Harassment/Torture	7	20
Quarrel with spouse/in-laws	4	11.43
Infidelity	2	05.71
Infertility	1	02.86
Prolonged illness following fall	1	02.86
Not Known	7	20
Total	35	100.00

CONCLUSION

There is high incidence of unnatural deaths among young Hindu females from rural areas, within initial years of their marriage. Most of these victims are from lower socio-economic strata of the society.

The road traffic accidents accounted for majority of deaths in this young adult population owing to increased contact with outer world. Also the shift in peak incidence of these deaths in mid-twenties and during third year of the marriage, reflects a trend of late marriages and probably early decision-within one or two years of marriage- regarding dissolution of marriages being taken by females, if married in a dowry greedy family.

It is unfortunate that the allegation of dowry demands is still responsible for about one-third of non-accidental unnatural deaths among newly married females. It is also evident that more violent means of homicide are appearing to take the place vacated by traditional burn deaths on account of various reasons cited above.

Recommendations: These deaths can be prevented only through increasing efforts directed at educating females; making them self-dependent by providing vocational training and by expanding the network of self-help groups in rural areas, with an aim to empower every woman.

The misogyny attitude and patriarchal societal view of subjugation of women can be changed slowly over time, by glorifying bold fights taken by females against these practices and encouraging mass and print media to focus on reporting such cases, especially from lower strata of the society. Last but not the least every father should be encouraged neither to take nor to offer dowry.

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Pattern and Distribution of Injuries in Victims of Fatal Road Traffic Accident Cases of Bikers in Haryana a Retrospective Study

Jitender Kumar Jakhar¹, Tarun Dagar², Naveen Yadav³, Piyush Jain³

¹Associate Professor, Department of Forensic Medicine, Pt. B. D. Sharma Post Graduate Institute of Medical Sciences, Rohtak; ²Assistant Professor, Department of Forensic Medicine, Adesh Medical College and Hospital Shahabad Haryana; ³Resident, Department of Forensic Medicine, Pt. B.D. Sharma Post Graduate Institute of Medical Sciences, Rohtak

ABSTRACT

Expansion in road network, motorization, and urbanization in the state of Haryana has been accompanied by a rise in road accidents leading to road traffic injuries. Road traffic injuries are one of the leading causes of death in the world. The present study aims at evaluation of pattern and distribution of injuries among bikers thereby planning successful measures to minimize fatalities. The present retrospective study was conducted in the Department of Forensic Medicine and Toxicology, Pt. B. D. Sharma PGIMS Rohtak, Haryana. During one year study period a total of 1557 cases of medico-legal autopsies were conducted out of which 654 cases were of fatal road traffic accidents. This study included 53 cases of bikers victims of fatal road traffic accident, brought for medico-legal post-mortem examination details of which had been recorded regarding the pattern and distribution of injuries. Highest number of fatalities occurred in the age group of 21-30 years followed by the age group 31-40 years. Male victims outnumbered female resulting in male to female ratio of 52:1. Abrasions, contusions and lacerations were the most common type of injuries. The most of deaths were caused by head injury and more than one-sixth of the deaths were due to pelvic and extremities injuries.

Keywords: Bikers, Road Traffic Accident, Victim, Pattern of Injuries.

INTRODUCTION

The term accident has been defined “as an occurrence in the sequence of events, which usually produces unintended injury, death or property damage.”¹ Accidents today are among the leading cause of death. In some countries road traffic accidents are number one cause of deaths; especially in many parts of the world particularly the more highly industrialized nations. The alarming increase in morbidity and mortality owing to road traffic accidents over the past few decades is a matter of great concern globally. Road accidents have become a serious health hazard throughout the world by killing and crippling thousands of persons each year. A middle aged male is more likely to die from injuries

received in traffic accident than from any other cause and motor vehicle accidents are single leading cause of death. By 2020, death and disability resulting from road traffic accidents in comparison to other diseases will rise from 9th to 3rd spot and developing nations will account for 90 percent of world traffic fatalities. Worldwide the number of people killed in road traffic crashes each year is estimated at almost 1.2 million, while the number injured could be as high as 50 million².

India is a signatory to Brasilia Declaration and is committed to reduce the number of road accidents and fatalities by 50 per cent by 2020.

However, with one of the highest motorization growth rate in the world accompanied by rapid expansion in road network and urbanization over the years, our country is faced with serious impacts on road safety levels. The total number of road accidents increased by 2.5 per cent from 4,89,400 in 2014 to 5,01,423 in 2015. The total

Corresponding Author:

Dr. Jitender Kumar Jakhar

Associate Professor

5/8J Medical Campus. PGIMS, Rohtak

number of persons killed in road accidents increased by 4.6 per cent from 1,39,671 in 2014 to 1,46,133 in 2015. Road accident injuries have also increased by 1.4 per cent from 4,93,474 in 2014 to 5,00,279 in 2015. The severity of road accidents, measured in terms of number of persons killed per 100 accidents has increased from 28.5 in 2014 to 29.1 in 2015³.

Motorized two wheelers account for a significant number of premature death and disability cases in developing countries like India⁴. Two Wheelers accounted for a highest share in total road accidents and next to it was the share of the group of Cars, Jeeps & Taxis in 2015 as reported by the States/UTs. Share of two wheelers in total road accidents has increased continuously from 26.3 per cent in 2013 to 27.3 per cent in 2014 and 28.8 per cent in 2015. Motorcyclists constitute a large number among vehicle population, responsible for more road traffic accidents and thereby injuries.³

Bike users involved in crashes are likely to die or be severely injured due to high frequency of head, chest and leg injuries. We carried out a retrospective study to determine crash characteristics and injury distribution and patterns among the autopsy cases brought to mortuary Rohtak Haryana in year 2015.

MATERIAL METHOD

The study is conducted in the mortuary, PGIMS, Rohtak, Haryana. A total of 53 motorcyclists death was studied for the pattern of injuries using a standard proforma. The detailed analysis of these cases was based on the inquest report, medical records and evaluation of autopsy reports. The data thus collected was analysed statistically. Only bike operators were involved not the pillion rider and collision with any object, surface or any animal or fall from vehicle was considered in it. Pedestrians and bicyclers, who died as a result of hit with motorcycle, were not included in this study

OBSERVATIONS

Table 1: Categories of Bike crashes

Category of crash	Number of cases			Percentage
	Male	Female	Total	
Slipped after crashes with breakers	15	Nil	15	28.31%
Crashes with four wheeler	37	1	38	71.69%
Total	52	1	53	100%

Table 1 Shows the category of bike crashes. It shows that 28.30% bike were crashed because of slipping and 71.69% were crashes with four wheelers. The table also depicts the sex wise distribution of bikers involved in fatal bike accidents. It shows that out of 53 bike riders 52 were male and 1 was female.

Table 2 Shows the age wise distribution of fatal cases of bike accidents. It shows that highest number of cases (45.28%) were of age group 21-30 years and second highest (22.64%) were of age group 31-40years. In age group >70years and 0-10 years the affected cases were nil.

Table 2: Age wise distribution of fatal Bike accident cases

Sl. No.	Age in years	No of bike accident fatal cases	Percentage
1.	0-10	Nil	Nil

Conted...

2.	11-20	5	9.43
3.	21-30	24	45.28
4.	31-40	12	22.64
5.	41-50	5	9.43
6.	51-60	4	7.55
7.	61-70	3	5.67
8.	>70	Nil	Nil
9.	Total	53	100

Table 3: Region wise distribution of fatal injuries over the body

Region of body involved	Number of cases	Percentage
Only Head injury	7	13.20
Head and face injury	38	71.69
Neck injury	2	3.77

Conted...

Only Chest injury	1	1.88
Chest injury	29	54.72
Only Abdominal injury	Nil	Nil
Abdominal injury	22	41.51
Only upper extremity	Nil	Nil
upper extremity	9	16.98
Only lower extremity	2	3.77
lower extremity with pelvic girdle	28	52.83

Table 3 Shows the distribution of fatal injuries over different body regions of bikers. The table shows that the only region affected without other body region injury are head (13.20%), chest (1.88%) and lower extremity

(3.77%). The region involved in highest number is head and face (71.69%) and the second highest is chest region (54.72%). The lower extremity with pelvic girdle is also affected in 52.83% cases and abdomen region injury present in 41.51% cases.

Table 4 shows the pattern of head injuries. It shows that intracranial hematomas were present in 67.92% cases and fracture of skull is present in 39.62% of cases. The laceration of brain is present in 16.98% of cases. Abrasion, contusion and laceration of scalp is present in 60.37% of cases. Table also shows the pattern of injuries over the chest. The table shows that the abrasion, contusion and laceration present in 37.74% cases. The fracture of rib present in 28.30% and fracture of clavicle present in 24.53%. The contusion or laceration of pericardium or lungs is present in 33.96% cases.

Table 4: Pattern of Head Injury and Chest Injuries

Head injury cases = 38				Chest injury = 29		
	Fracture of Skull	Cranial hematoma (EDH or SDH or SAH or ALL)	Laceration of brain	Fracture Ribs	Fracture clavicle	Contusion or laceration of pericardium or lungs
	21 (39.62%)	36 (67.92%)	9 (16.98%)	15 (28.30%)	13 (24.53%)	18 (33.96%)
Abrasion or Contusion or laceration of scalp.	32 (60.37%)			20 (37.74%)		

Table 5: Pattern of abdominal and pelvic Injury

Abdominal injury = 22					
Abrasion or Contusion or laceration of abdominal wall	Liver injury	Spleen injury	Kidney injury	Mesentery injury	Pelvis Fracture
12(22.64%)	6(11.32%)	3(5.66%)	5(9.43%)	7(13.21%)	5(9.43%)

Table 5 Shows the pattern of injuries over the abdomen. The table shows that the abrasion, contusion and laceration is present in 22.64% cases. The fracture of pelvic bone present in 9.43%. The liver injury is present in 11.32% cases, spleen injury in 5.66% cases, kidney injury present in 9.43% and mesentery is injured in 13.21% cases.

Table 6: Pattern of extremities Injury:

Extremities Injury = 32					
Abrasion or Contusion or laceration	Fracture of upper extremity bones = 9		Fracture of lower extremity bones = 23		Crush injury
	Fracture of Forearm bones	Fracture of Humerus bone	Fracture of leg bones	Fracture of Thigh bones	
28 (52.83%)	8 (15.09%)	1 (1.89%)	9 (16.98%)	14 (26.42%)	2 (3.77%)

DISCUSSION

This study includes 53 fatal cases of two wheeler accidents. Out of 53 fatal crashes (28.30%) 15 bikes were crashed because of slipping and (71.69%) 38 bikes were crashed with four wheelers. Out of 53 bike riders 52 were male and 1 was female. The maximum cases (45.28%) of deaths were of age group 21-30 years followed by age group 31-40 years (22.64%). In age group >70 years and 0-10 years the cases were nil.

As far as distribution of injuries over the body of victims of bike accident was concerned injuries to head/face occurred in most of the cases (71.69%) followed by the chest injuries (54.72%), the lower extremity with pelvic girdle injury was present in 52.83% cases and abdomen region injury was present in 41.51% cases. Similar results were observed by Hajek S⁵ who recorded 73% head injuries, 62% chest injuries, 30% abdomen injuries, 26% spinal injuries, 52% pelvic injuries, 26% upper extremity injuries and 51% lower extremity injuries. Similar results were also observed by Nilambar Jha et al study⁶.

A fracture of the skull with associated brain injury was the most common cause of death but multiple injuries constitute a typical feature of fatal bike accidents⁷. This was also observed in our study that the head injury was most common cause of death and multiple injuries were present over the different regions of the body only isolated region affected without other body region were head in (13.20%) 7 cases, chest in (1.88%) 1 case and lower extremity in (3.77%) 2 cases. Hossack DW⁸ showed head/chest injuries to be the major cause of deaths. Our study shows that Abrasion, contusion and laceration of scalp was present in 60.37% of cases, intracranial hematomas were present in 67.92% cases and fracture of skull was present in 39.62% of cases. The laceration of brain was present in 16.98% of cases. Similar results were observed by Schmitz M et al⁹ they detected that deaths occurred due to injuries of the head (62%), consequence of bleeding (13%) and because of contusion of medulla oblongata (10.8%) Menon A et al¹⁰ showed 88.88% skull fractures as cause of deaths occurring in fatal accidents.

High incidence of head injuries can be due to reception of maximum force because of restricted movement of the head. In the trunk, the predominance of injuries in chest can be explained by the fragile nature

of bony cage sometimes even damaging the internal organs, while the abdomen is protected by its elasticity and rebound nature. The rolling nature of trunk during accidents makes it more susceptible to injuries.

Our study shows that the abrasion, contusion and laceration in chest region present in 37.74% cases. The fracture of rib was present in 28.30% cases and fracture of clavicle was present in 24.53% cases. The contusion or laceration of pericardium or lungs was present in 33.96% cases consistent with KY Tham et al study¹¹. High incidence of lung injuries can be explained by their anatomical position and more surface area covering antero-posteriorly, medially and laterally, while heart was injured only in few cases because of its anatomical position and the protection offered by lungs, layers of heart and blood.

It was also observed in our study that the abrasion, contusion and laceration in the abdominal region of the body was present in 22.64% cases. The fracture of pelvic bone was present in 9.43% of cases. The liver injury was present in 11.32% cases, spleen injury was in 5.66% cases, kidney injury was present in 9.43% and mesentery was injured in 13.21% cases.

Banerjee et al¹² showed that majority of victims had involvement of both chest and abdomen (29%) in the road side accidental injuries.

Our study shows that the abrasion, contusion and laceration of upper and lower extremity region was present in 52.83% cases. The fracture of forearm bone was present in 15.09% of cases. The fracture of humerus was present in 1.89% cases. The fracture of leg bones was present in 16.98% cases. The fracture of femur bone was present in 26.42% cases. The crush injury was present in 3.77% cases.

In this study, upper and lower limbs suffered maximum with abrasions, contusion as the predominant injuries (52.83%). In upper limbs, humerus fractured in 1 case followed by ulna and radius in 8 cases. In lower limbs, femur was fractured in 14 cases followed by tibia and fibula in 9 cases. Lower limb long bones were comparatively at high risk than upper limb long bones, consistent with Nilambar Jha et al's study⁶. Higher risk of injuries to the lower limbs can be attributed to landing on the lower limbs receiving the first impact, weight of the bike and dragging at the time of accident.

CONCLUSION

Bike users involved in crashes were died due to high frequency of head, chest and leg injuries. Abrasions, contusions were the common injuries observed throughout the body. Skull fracture was the most common fracture. Intracranial haemorrhages were observed more frequently among brain injuries. Lungs, liver suffered more than other organs in their cavities. Limbs suffered maximum injuries second to head injuries when compared to other regions of the body. Cause of death in majority of cases was due to head injury associated with fracture of skull or intracranial haemorrhages or brain injury.

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Conflict-of-Interest Statement: There is no conflict of interest as it was a retrospective study based on the already available record.

Statement of Informed consent: This study is based on the available record so there is no matter of consent.

Statement of Human and Animal Rights: No human right and animal right is violated in this case.

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Applicability of Three Component System of Age Estimation in Haryana Population

Kumaran M¹, Dalbir Singh², Bansal YS², Mandal SP³, Murali G⁴

¹Senior Resident, Department of Forensic Medicine JIPMER, Puducherry; ²Professor; ³Additional Professor, Department of Forensic Medicine, PGI Chandigarh; ⁴Assistant Professor Govt. Medical College Chandigarh

ABSTRACT

Various methods has been postulated to estimate the age of skeletonised remains which is a very essential aspect in forensic medicine. Mc Kern and Stewart formulated three component system of age estimation in pubic bones. Component I, II and III were based on development of dorsal half, ventral half and outline of the pubic symphysis respectively. A total of 300 pubic bones were evaluated of which 225 were male and 75 were females. Each pubic bone was given a score based on Mc Kern and Stewart method. The observation were tabulated according to the Mc Kern Stewart score. Suitable adjustments in the age range should be made in the Mc Kern and Stewart method for using it in different population

Keywords: Mc Kern and Stewart, three component system, pubis symphysis, age, Haryana Population

INTRODUCTION

Estimating the age of a person is very important in the field of forensic medicine. Since the bones resist decomposition it is more reliable in assessing the various identification parameters in decomposed or mutilated bodies and skeletonised remains. Pubic symphysis is one such bony region which can be used to assess the age of the individual even after the epiphyseal closure of the long bones has occurred. The pubic symphysis was first used by Hunter and found that lipping of dorsal side of pubic bone and bevelling on the ventral side occurred at third decade of life.¹ Aeby (1858) discovered morphological changes in symphysis as age progresses.² Cleland (1889) with changes in pubis approximated the age of the individual bone.³ Martin R (1914) measured the height of pubic symphysis and correlated with age.⁴

Later Todd made an exhaustive work on pubic bones in Hamann museum and formulated a ten phase system of age assessment using the morphological changes in the pubic symphysis.^{5,6} In 1957 Mc Kern and Stewart

devised a new system to estimate the age from pubic symphysis.⁷ They published their three component system of age determination from the male pubic symphysis of Americans killed in Korean war with the age documented from military records. The components system was based on the morphological progression of the various features on the dorsal side, ventral side and symphysis face. Each component has different feature and each feature is given a score from 0 to 5.⁷

The Component I-scores were based on developmental features on the dorsal half of the pubic symphysis.

Score 0 - The dorsal margin not present.

Score 1- Dorsal border formation occurs.

Score 2- The dorsal margin formation is complete

Score 3- The dorsal plateau formation occurs.

Score 4- The plateau is formed in most of the dorsal half of the pubic symphysis, vestiges of billowing are present.

Score 5- The dorsal plateau is complete and billows disappear.

The Component II scores were based on developmental features on the ventral half of the pubic symphysis.

Corresponding Author:

Dr Kumaran M

Senior Resident, Department of Forensic Medicine, JIPMER, Puducherry

Email: Mku1983@gmail.com

Score 0- The ventral beveling not present.

Score 1- Ventral bevel formation occurs.

Score 2- There is extension of bevel along the ventral border.

Score 3- Ventral rampart formation occurs either of extremities.

Score 4- Rampart formation is present most of the areas but gaps are evident.

Score 5- Rampart formation is complete.

The Component III scores were based on developmental features on the symphyseal rim of the pubic symphysis.

Score 0- The symphyseal rim is absent.

Score 1- the Dorsal rim is present.

Score 2- Dorsal rim is complete

Score 3- Complete symphyseal rim.

Score 4- The rim starts to break.

Score 5- Break down of the rim especially along the superior ventral rim and rarefaction of face.

Many studies have been conducted on pubic symphysis in India based on Mc Kern and Stewart

method. Since variations are present in different populations this study was conducted on a particular population i.e., Haryana population and this study will provide data for age assessment in this population

METHOD AND MATERIALS

The present study was conducted in a tertiary care centre in North West region of India. With the consent from the deceased legal guardians the pubic bones were removed from the deceased. The pubic bones were cleaned by boiling in water containing caustic soda and the morphological features required for Mc Kern Stewart method were examined. A total of 300 pubic bones were examined. The metamorphic features of the pubic symphysis were analyzed according to three component system of Mc Kern and Stewart criteria and scoring was given to each pubic bone depending on the features present. Each pubic bone was assigned a score ranging 0-15 depending on the features present. Scores for Male and female pubic bones were assigned and tabulated.

RESULTS

Out of 300 pubic bones examined 225 were from males and 75 were from females. Component I was based on the changes on the dorsal side of the pubic bone the scoring system was done the scores were tabulated (Table I)

Table I : Distribution of male and female pubic bones with various scores of Component I

Component I	Mc Kern -Stewart Study	Present study male			Present study female		
	Age Range (years)	Age Range (years)	n	Mean (years)	Age Range (years)	n	Mean (years)
0	17-18				18-22	5	18.50
1	18-21	--	--	--	--	--	---
2	18-21	18-22	15	20.2500	18-24	3	21.40
3	18-24	19-27	35	22.0556	21-26	6	23.17
4	19-29	21-30	13	25.6667	24-32	8	28.60
5	23+	22+	162	43.7516	25+	53	47.45

Component II was based on the morphological changes in the ventral hemi face the component scores were assigned. The table II shows the various scores given to each pubic bone for component II.

Table II: Distribution of male and female pubic bones with various scores of Component II

Component II	Mc Kern -Stewart Study	Present study male			Present study female		
	Age Range (years)	Age Range (years)	N	Mean (years)	Age Range	n	Mean (Years)
0	17-22	18-23	20.59	37	18-22	9	19.78
1	19-23	22-23	22.50	4	22-23	3	22.33
2	19-24	23-32	25.69	16	24-26	3	25.00
3	21-28	24-29	25.90	21	25-31	10	28.00
4	22-23	25-35	33.67	16	27-32	4	30.00
5	23+	>30	47.09	131	30-80	46	50.43

The component III scores were assigned based on the formation, completion, and destruction of symphyseal rim. Table III gives the component III score for each pubic bone

Table III : Distribution of male and female pubic bones with various scores of Component III

Component III	Mc Kern -Stewart Study	Present study male			Present study female		
	Age Range (years)	Age Range (years)	n	Mean (years)	Age Range (years)	n	Mean (years)
0	17-24	18-35	21.54	39	18-27	14	21.40
1	21-28	22-35	27.35	66	25-35	12	28.73
2	24-32	28-45	37.80	41	27-36	9	31.22
3	24-39	40-48	44.04	26	35-40	8	39.50
4	29+	48-72	59.21	39	42-52	10	46.20
5	38+	50-75	58.53	14	45-80	22	61.09

Total Mc Kern Stewart Score: (Table IV, Figure 1).

According to Mc Kern–Stewart study, for score zero, the age was about 17 years and the mean was 17.29 years. In the present study, the score 0 was not observed in males. With regard to female samples, for score 0 the age ranged from 18-22 years with a mean age of 18.5 years.

According to Mc Kern –Stewart study, for score 1-2, the age varied from 17 to 20 years with a mean of 19 years. In the present study, the score 1 to 2 was observed from 18 to 22 in males with a mean age of 20.12 years. With regard to female samples, for score 1 to 2 the age ranged from 18-24 years with a mean age of 21.4 years.

Table IV: Distribution of male and female pubic bones with various scores of Mc Kern Stewart

Mc Kern -Stewart Score	Mc Kern -Stewart (American)		Present study male			Present study female		
	Mean (years)	Age Range (years)	Mean (years)	N	Age Range (years)	Mean (years)	n	Age Range (years)
0	17.29	-17	--	---	---	18.50	5	18-22
1-2	19	17-20	20.12	16	18-22	21.40	4	18-24
3	19.8	18-21	20.28	14	19-22	22.50	2	21-24
4-5	20.8	18-23	22.56	16	22-23	23.00	3	22-25
6-7	22.4	20-24	24.9	7	23-27	24.5	2	24-25
8-9	24.1	22-28	27.05	26	24-35	28.00	9	25-31

Conted...

10	26.1	23-28	30.06	16	25-35	30.50	4	29-32
11-13	29.2	23-39	39.3	77	25-48	36.71	14	30-40
14	35.8	29+	59.19	37	48-72	46.20	10	42-52
15	41	36+	61.44	16	50-75	61.09	22	45-80

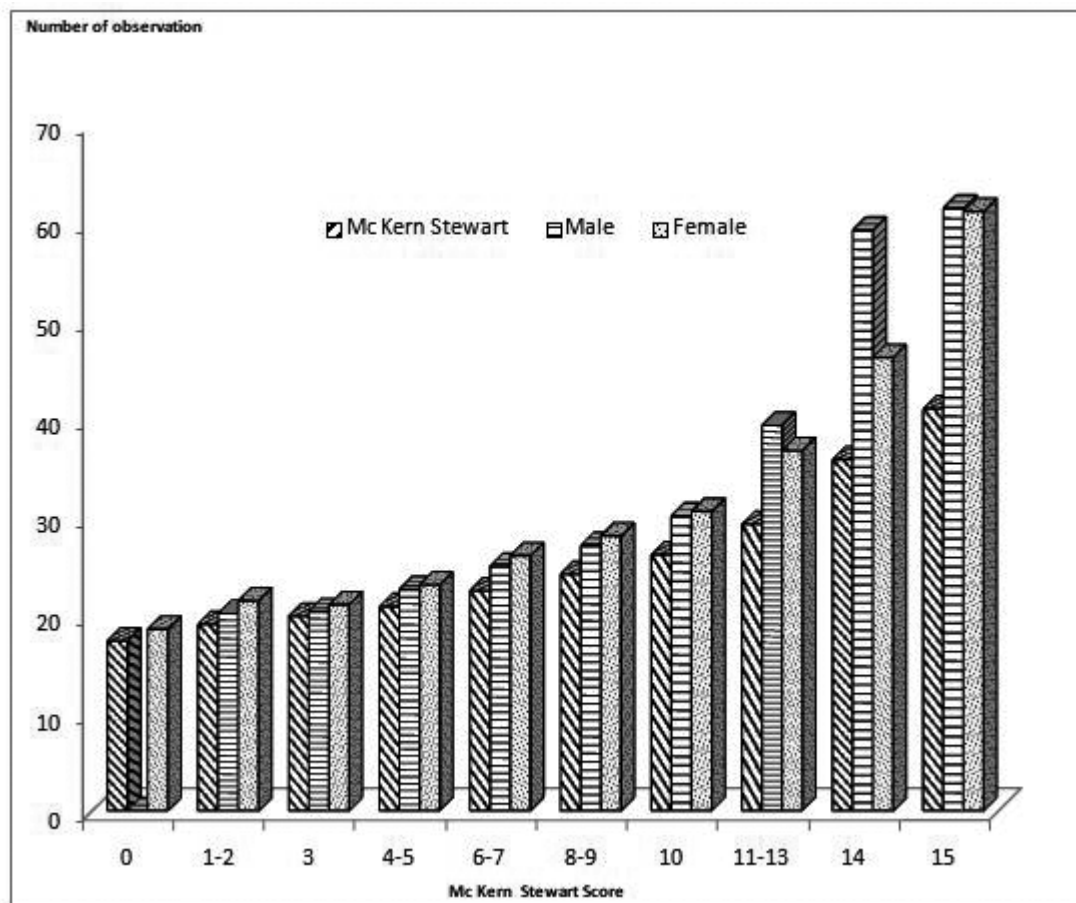


Figure 1: Mean ages of Pubic bones in present study and Mc Kern-Stewart study

DISCUSSION

A comparison of mean ages for different Mc Kern-Stewart score was made with the present study and studies conducted at Delhi⁸, Amritsar⁹, Hyderabad¹⁰ and the original Mc Kern - Stewart⁷ study in male pubic bones (Table V). The morphological variation of the pubic bones for different age groups was reflected in various Mc Kern Stewart scores and their mean ages. The difference in distribution of samples in different age groups might not affect the mean age for the scores to a greater extent except for the extreme scores. So the mean ages for different scores of the Mc Kern-Stewart among different studies were compared and statistical significance was found.

The Mc Kern Stewart scores of present study in males did not show statistical difference in mean for scores 1-2, 4-5, 6-7, 8-9, 10, 11-13 and showed a statistical difference in mean for scores 3, 14, 15 when compared with study conducted at Amritsar⁹. The study showed a significant difference in mean ages for scores 4-5 and 14 when compared with a study at Delhi. When correlated with a study at Hyderabad, significant difference in mean was obtained for scores 1-2, 4-5, 8-9, 10, 11-13, and 14. In the present study, the mean ages for all scores showed a significant difference when compared with Mc Kern Stewart study. Harkrishna (1985)¹⁰ examined 115 pubic bones in the age group of 16-70 years (77 male, 38 female) and applied Mckern and Stewart method to both male and female bones. It

concluded that, in males age estimation by McKern and Stewart method was accurate in the younger age group (17-35 years) and in females age estimation by McKern and Stewart method was not accurate. Snow,¹¹ found that a strong curvilinear correlation exists between symphyseal score and age.

The variation of the present study with other studies could be attributed to *racial variation, geographical*

variation of the studies, environmental, nutritional and dietetic factors. The similarities in the mean ages with the present study and studies conducted at Amritsar and Delhi suggests that the *age range should be adjusted suitably so that the Mc Kern Stewart method can be used for different population.* When the age range for different Mc Kern Stewart scores were adjusted for particular population, Mc Kern Stewart method would prove to be a useful method for age estimation.

Table V: Comparison of mean ages of Mc Kern -Stewart scores of the present study with other studies (Males)

Mc Kern score	Age (Mean)							
	Present study	Harikrishna ¹⁰ (Hyderabad)	Sinha (Delhi) ⁸	Sharma (Amritsar) ⁹	Mc Kern (American)	Arvind Kumar (Delhi) ¹⁰	Pal and tamankar ^{12,13}	Janardhanan ¹⁴
1-2	20.12	18 **	---	20.5	19 *	21#	14.6#	21#
3	20.28	19	----	25.25 *	19.8 *	22#	19.66#	22#
4-5	22.56	20.5 **	20.33***	22.05	20.8 **	25.5#	20.87#	25.5#
6-7	24.9	23	23.8	27.72 *	22.4 **	-	25.6#	-
8-9	27.05	24 *	27.5	28.44	24.1 *	31.87#	29.14#	31.87#
10	30.06	25.25*	27.33	30.23	26.1 ***	34.87#	35.66#	34.75#
11-13	39.3	31.46 ***	38.15	36.87	29.2 ***	36.9#	38.12#	36.9#
14	59.19	42.58***	48.882	42.17 *	35.8 ***	47.83#	45#	47.83#
15	61.44	57.86	59.4	52.07 **	41 ***	49#	55#	49#

*** - p value <0.001. **p<0.01 *p<0.05

data not available for statistical correlation

Conflict of Interest: Declared none

Source of Funding: None

Ethical Clearance: Institutional ethical clearance

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Bite Marks: An Indispensible Tool for Forensic Odontological Evidence

M. K. Sunil¹, Upender Malik², Sourav Malhotra³, Arishah Gulzar⁴, Radhika Sharma⁵

¹Prof and Head, ²Reader, Dept of Oral Medicine and Radiology, Teerthankar Mahaveer Dental College and Research Center, Moradabad; ³Dental Surgeon, Jammu tawi; ⁴PG Student, ⁵Senior Lecturer, Dept of Oral Medicine and Radiology, Teerthankar Mahaveer Dental College and Research Center, Moradabad

ABSTRACT

Forensic odontology has gained wide acceptance in the field of criminal justice because no two people have identical teeth. Presence of physical evidence such as bite-marks in cases of rape, murder and violence are considered very valuable. These are considered to be an expression of dominance, rage and animalistic behavior.

Bite-marks are the commonest form of dental evidence presented in criminal court in rape cases. These marks are also valuable in determining the type of physical abuse and age bracket of the criminal.

With increase in criminal cases like rapes the use of bite-marks as Forensic odontological evidence in nailing the culprits truly points out the important role odontology plays in field of criminal justice. This review highlights the importance of bite-marks as indispensable Forensic odontological evidence in rape cases.

Keywords: Forensic odontology, Bite marks, Rape, Identification, Crime

INTRODUCTION

Forensic Odontology is a branch of forensic medicine that in the interest of justice deals with dental evidence presented in the courts of law. ¹A Forensic Odontologist is involved in the analysis of bite marks on victims and presentation of bite mark evidence in court as an expert witness. As no two fingerprints are alike, neither are two bite-marks.³

The age bracket of the criminal can also be analyzed through these marks. Bite marks can also exclude a suspect on basis of tooth pattern and opening range.⁴

During sexual attacks including sexual homicide, rape and child sexual abuse, bite marks are clustered around parts of body associated with sexuality. Females

are usually bitten on the breasts, nipples, abdomen, thighs, buttocks and pubis, while men are usually bitten on the back, arms, shoulders, chest and penis.⁶

Definition: ABFO defines bite-marks as “a pattern left in an object or tissue by the dental structures of an animal or human,”³

Mac Donald described it as a mark caused by the teeth either alone or in combination with other mouth parts.²

Hence a bite mark shows unique pattern of an individual's teeth, also it can help in excluding suspects to whom the mark does not belong to.²

Historical Review: Bite mark evidence has slowly gained acceptance as a Forensic tool. The earliest recorded bite mark case in the United States was Ohio vs. Robinson in 1870.

Ansil Robinson was suspected of murdering his mistress, Mary Lunsford. His teeth matched to bite marks on the victim's arm, but Robinson was acquitted.⁷

The most famous bite mark case was of Ted Bundy (raped and killed more than 30 women) who was

Corresponding Author:

Dr. M. K. Sunil
Prof and Head
Dept of Oral Medicine and Radiology
Teerthankar Mahaveer Dental College and Research Center
Moradabad
Email: preethipranav2001@gmail.com

convicted of rape and murder of Lisa Levy and Martha Bowman. He had left a bite mark on Lisa Levy's buttock. While investigation, the mark was photographed with a ruler kept alongside.

Bundy's teeth were photographed, the bite mark was matched against his teeth and he was convicted.⁸ Many other rapists and serial killers have been convicted based on bite mark testimony over the years.⁹

Classification of Bite Marks:

- (a) **Cameron And SIMS Classification:** This is based on the type of agent producing the bite mark and material exhibiting
- (b) **Obviously Defined:** first degree pressure
- (c) **Quite Noticeable:** violent pressure¹⁰
- (d) **Lacerated:** skin violently torn from body.¹¹

The severity of the injury gives indications of the mental state of the offender. Accordingly there may be presence of hemorrhage, abrasion, contusion, laceration, avulsion or artefact.

Location: A study done to evaluate the anatomical location of bite-marks in 101 cases from United States courts of appeal found that human bite-marks can be found at almost every anatomical location, with a bias towards certain areas.

The crime type, age and sex of the subject affect anatomical location of a bite injury. Biting is seen in crimes like homicide, rape, sexual assault, robbery and child abuse.¹¹

The study also revealed that females are four times more likely to be bitten than males, and the bites are concentrated on the breasts, arms, and legs. In case of female children bite marks are seen on the face, legs, and arms. Males are most frequently bitten on the arms, back, and hands. Also more than one bite-mark in a different anatomical location from the first can be found in a victim.¹²

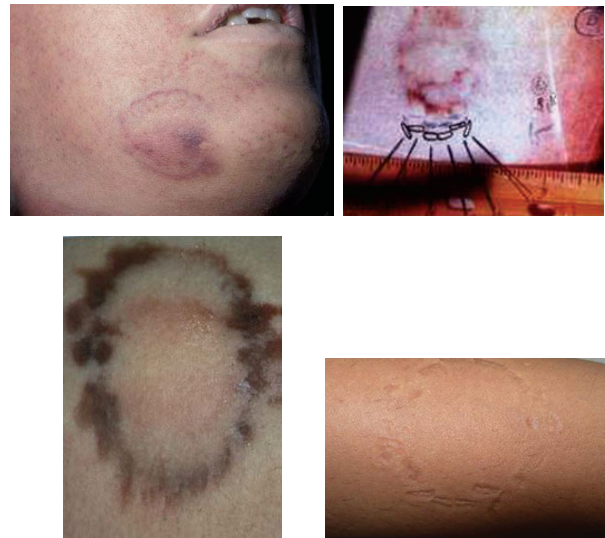
Factors Affecting Bite Marks in Skin:

1. Some marks are made through clothing. Hence clothing is considered a potential source of bite mark impressions and biological evidence from transferred saliva.¹²

2. Loose skin/subcutaneous fat lead to a poor bite mark. Whereas areas of fibrous tissue or high muscle content bruise less easily and demonstrate good bite mark. Infants, elderly and females tend to bruise more easily.⁵

3. The size and shape of bite-mark is affected by its location on the body, because certain areas of the body bend distorting the surface area of the skin due to high viscoelasticity.⁵

Mechanism of Bite Marks: A bite mark occurs mainly due to pressure of teeth on skin. It is accompanied by mandibular closure and suction of skin (as a negative pressure). Upper jaw is usually stationary and holds and stretches the skin and lower jaw is moveable and gives the most biting force. A human bite mark is an elliptical or circular injury with specific characteristics of the teeth. If there is a single "C" shaped mark, then only one jaw (lower jaw) was involved. The diameter of injury ranges from 25-40 mm¹³



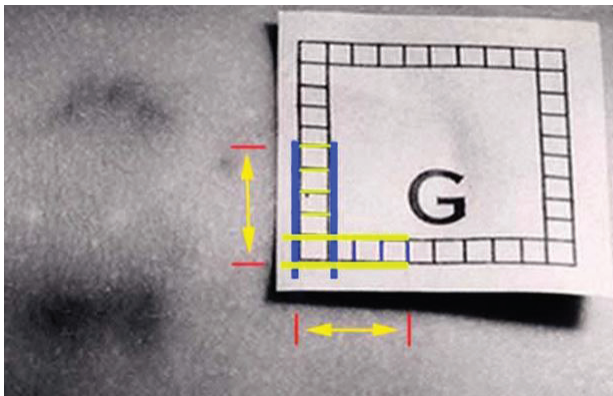
Different Types of Bitemarks (Fig. 1, 2, 3, 4)

Analysis of Bite Marks: Any analysis involves two steps, first the discovery and preservation of evidence and second involves evaluation, comparison and findings of the recovered evidence. In examination and analyzing of bite-marks, first it should be determined if the injury is a bite-mark and whether it is caused by human teeth. Consistency of marks with the time of the crime should be determined.

To standardize the analysis of bite marks the American Board of Forensic Odontology (ABFO) established the following guidelines in 1986:



Bite Mark



**Computer digitization method
ANALYSIS OF BITEMARKS (Fig 5, 6)**

- (1) **History:** Thorough history of any dental treatment carried out after the suspected date of the bite mark should be taken.
- (2) **Photography:** Extra oral photographs including full face and profile views, intraoral should include frontal views, two lateral views and an occlusal view of each arch, a photograph of maximal mouth opening.
- (3) **Extra-oral Examination:** Soft tissue and hard tissue factors that may influence biting dynamics. Measurements of maximal opening and any deviations on opening or closing should be noted
- (4) **Intraoral Examination:** Examination of tongue and periodontal status like mobility of teeth. In case of recent marks, they should be swabbed for DNA from saliva left in the wound.
- (5) **Impressions:** Two impressions of each arch using materials that meet the American Dental Association specifications. The occlusal relationship should be recorded.
- (6) **Sample Bites:** Sample of suspects bite in centric occlusion using wafer of base plate wax or silicone

putty material. The sample is photographed immediately & used for future comparison

(7) **Study Casts:** are prepared using type II stone.^{18,19}

Various Physical Characteristics of a Bite Mark Pattern:

The amount and degree of detail recorded in the bitten surface varies from case to case. First it is important to determine which teeth made the marks. The term 'characteristic', is a distinguishing feature, trait, or pattern within the mark. It is of two types, class characteristic & individual characteristic.

Class characteristic is a feature, pattern, or trait which reflects a given group and is not related to a particular individual. The biting surfaces of teeth are related to their function like incising, tearing or grinding. Front teeth are the primary biting teeth in bite marks.

The two upper central incisors are wide, lateral incisors are narrower and cuspids are cone shaped. The two lower centrals and two laterals are uniform in width and lower cuspids are cone shaped. The upper jaw is wider than the lower jaw. The characteristics of individual teeth are

- (1) **Incisors:** Rectangular shaped mark, sometimes with perforations at the incisal angle areas
- (2) **Canines:** Triangular markings with apex towards labial and base towards lingual
- (3) **Premolars:** Single or dual triangle with bases of triangles facing each other or coming together as diamond shaped
- (4) **Molars:** Rarely leave bite marks, usually quadrilateral markings.¹³

An individual characteristic is a feature, pattern, or trait that represents a variation from the expected finding in a given group, like a rotated, damaged, or broken tooth that differentiates two different dentitions and is helpful in determining the dentition that caused the bite injury or mark.

Cases with class characteristics are used to confirm the events of a crime & those with individual characteristics can identify an individual source.¹⁵

Thus depending on the characteristics it is possible to use terms like "unique", "possible bite mark", "definite bite mark", "positive match", "consistent with" and "probable biter".

For a positive identification to be made there must be marks left by four or five approximate teeth.¹⁶

Types of Distortions: Two associated terms are primary and secondary distortion. Primary distortion depends on dynamics of the bite. Secondary distortion is of three types: time related distortion, posture distortion, and photographic distortion. The longer the time interval after the mark is made, the less distinct the mark will be in both living and dead. In the living, bruising occurs. In the dead, the body begins to decompose and shrinkage by rigor mortis occurs.^{16,17}

Collection of Bite Mark Evidence from Rape Victim: In living and deceased victim the information to be collected from the bite mark is

Demographics: Name, age, sex, race, case number, date of examination and name of the examiners should be recorded.

Location of the Bite Mark: Describe the anatomic location, indicate the contour of the surface (flat, curved or irregular) and state of the tissue characters. Underlying tissue-bone, cartilage, muscle or fat

Shape of the Bite Marks: whether it is round, ovoid, crescent or irregular in shape.

Colour and Size of the Mark: Both vertical and horizontal dimensions should be recorded in metric system.¹⁷

Type of Injury: due to bite mark may be Petechial haemorrhages, Contusion, Abrasion, Laceration, Incision, Avulsion, Artefact etc.

Whether the surface of the skin is smooth or indented should be noted.²⁰

Photographing of the Bite Mark: This is an important step during investigation as the photograph of bite-mark should be accurately produced. The use of digital camera instead of traditional allows the Odontologist to reduce the margin of error.⁸

Problems in Bite Mark Analysis: Doubts have been raised about the accuracy of the bite imprint as skin is considered a poor medium for accurate impressions due to curves and other irregularities producing intrinsic distortion. Thus comparison of a person's teeth to bite-mark on a victim's body is prone to error leading to false implications of persons in crimes they did not commit.²⁴

CONCLUSION

The importance of bite marks providing valuable information in nailing a rape accused is based on the fact that the majority of rapists leave bite marks on their victims. Bite marks carry a high Forensic value based on the characteristics of the bite marks that are similar to the defendant's. Such evidence is as conclusive as DNA and fingerprint evidence in rape cases. Analysis of bite mark evidence has been assisting the judiciary to answer crucial questions about interactions between people at the scene of a crime for years. But currently, there is no agreement among forensic odontologists about the individuality (uniqueness) of the dentition and on the behaviour of human skin during and after biting.

With technological advances and recent use of ultra violet lighting to detect human bite marks on rape victims **Odontology** has proved to be a boon. To conclude it is rightly said 'while the criminal may lie through his teeth, his bite marks reveal all, and do not lie'.

Ethical Clearance: Taken (Review Article)

Source of Funding: Nil

Conflict of Interest: Nil

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A Study on Pattern of Adolescent Deaths- A Retrospective Study

SantoshKumar P¹, Gajanan H Nayak², Mahalaxmi B Karlawad³

¹Assistant Professor, ²Professor and Head, ³Postgraduate, Department of Forensic Medicine and Toxicology, Karnataka Institute of Medical Sciences, Hubballi

ABSTRACT

Adolescence is a transitional stage of physical and psychological development that generally occurs during the period from puberty to legal adulthood. During transition from childhood to adulthood people are exposed to various hazards having potentiality to lead to unnatural deaths by distorting physical, mental and social wellbeing. Studying pattern of unnatural deaths helps stakeholders to formulate policies for prevention of loss of important human resource. The present study is a retrospective study undertaken in the Department of Forensic Medicine and Toxicology, Karnataka Institute of Medical Sciences, Hubballi, to determine the pattern of adolescents deaths (10-19 years) brought for autopsy during the period of January 2016 to December 2016. Total 82 cases were studied and it was observed that the incidence rate of adolescent deaths was 6.49% among which 43 were males (52.43%) and 39 females (47.56%). Rural deaths were higher when compared to urban, accidental deaths were the highest and road traffic accidents followed by poisoning and burns were the commonest causes of deaths. In conclusion, behavior change communication of parents, teachers, career guides, office masters, law keepers etc. for fostering congenial environment for upbringings of adolescents is needed to prevent unnatural deaths.

Keywords: Adolescence, accidental deaths, road traffic accidents, congenial environment, upbringing.

INTRODUCTION

The World Health Organization (WHO) defines an adolescent as a person between the ages of 10 and 19 years old. Around 1 in every 6 persons in the world is an adolescent: that is 1.2 billion people are aged 10 to 19¹. Adolescence is further divided into early adolescence (11-14 yr), middle adolescence (15-17 yr), and late adolescence (18-21 yr)². Adolescents (10-19 years) constitute about one fourth (21.4% or 243 million) of India's population and young people (10-24 years) about one third (or 350 million) of the population³.

Youth - the critical phase of life is a period of major physical, physiological, psychological, and behavioral changes with changing patterns of social interactions and relationships⁴. During this turbulent phase of life the young individuals are exposed to various needs, demands, challenge, failure, conflicts, problems,

uncertainty of career etc. leading to be the prey of stress and addictions. Many of them fail to cope with the growing stress and develop psychiatric illnesses.

In India, nearly 1,36,000 persons voluntarily ended their lives in a suicidal act as per official reports in 2011⁵. About 40 per cent of suicides in India are committed by persons below the age of 30 years⁶. Out of their enthusiasm, curiosity and lack of experience adolescents indulge in risky life styles. Road traffic injuries (1,85,000 deaths; 29 per cent of all unintentional injury deaths) are the leading cause of unintentional injury mortality in India⁷. An average of 565 adolescents and young adults between the ages of 10 and 29 years die each day as a result of interpersonal violence across the world⁸.

Studies from India reported that 19 to 42.8 per cent of adolescent females had experienced domestic violence^{9,10}. Even if the distribution of skills and autonomy varies within the age groups, adolescents will still grow up and become fundamental contributors to development in any country. For this reason alone, it is necessary to investigate the levels and causes of adolescent mortality since it has a direct impact on the size and health of the future population¹¹. That's why the present study was contemplated to describe the state of the art about the unnatural deaths among adolescents.

Corresponding Author:

Dr. Mahalaxmi Karlawad
Postgraduate Student,
Dept. Forensic Medicine and Toxicology
Karnataka Institute of Medical Sciences, Hubballi.
Email: mahalaxmikarlawad@gmail.com

MATERIAL AND METHOD

This study was performed in department of Forensic Medicine & Toxicology at KIMS, Hubballi. The data was collected retrospectively from the police inquest and autopsy reports from January 2016 to December 2016. Finally, the obtained data were tabulated and analyzed.

DATA ANALYSIS

Data analysis was performed by SPSS (version 22), and results were presented as frequency and percentage in figures and tables.

Ethics: Confidentiality of patient's information was maintained when data were obtained from the medical records. All guidelines of the declaration of Helsinki were observed in all stages of the study.

RESULTS

Total 1262 cases were autopsied at KIMS mortuary from 1st January 2016 till 31st December 2016, out of which 82 cases were between the adolescent age group of 10-19 years. So the prevalence of adolescent deaths was 6.49%.

Sex wise distribution: Out of 82 cases studied, 43 were males (52.43%) and 39 females (47.56%).

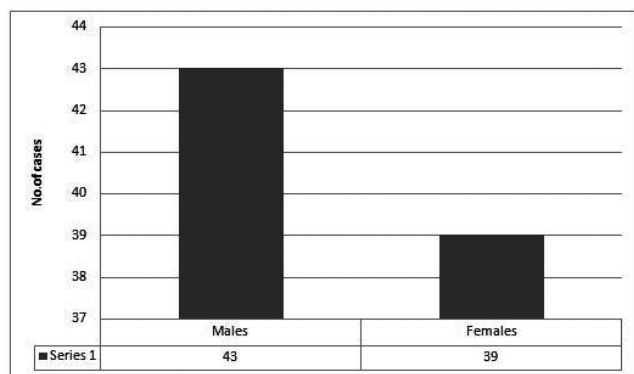


Fig. 01: Showing sex wise distribution of cases

Age wise distribution: Among 43 males, 08 males (18.60%) belonged to early adolescent age group of 10-14 years and 35 males (81.40%) were between 15-19 years. Among females out of 39 cases majority of the cases were between 15-19 years 36 cases (92.30%) while only 03(7.7%) cases were between 10-14 years. From this it can be inferred that late adolescent period that is age group of 15-19 years is more prone and vulnerable group of adolescent unnatural deaths.

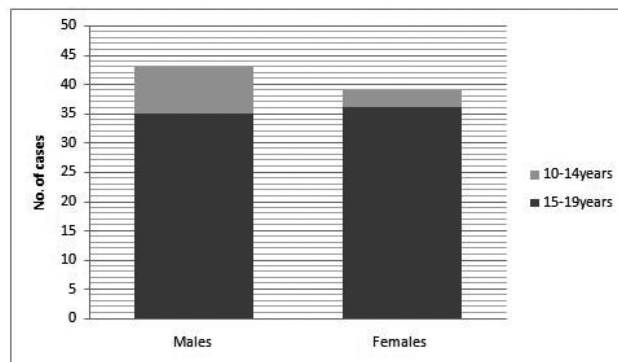


Fig. 02: Showing age wise distribution of cases.

Area wise distribution: The incidence was highest in rural areas when compared to urban areas. 51 cases (62.19%) were in rural area and 31 cases (37.81%) were noted in urban area.

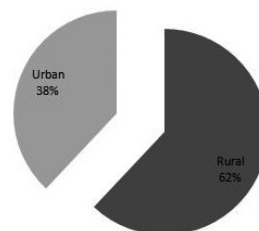


Fig. 03: Showing area wise distribution of cases

Manner of death: Among 43 males, accidental death was most common 27 cases (62.79%), followed by suicidal deaths in 13 cases (30.23%) and homicidal deaths in 03 cases (06.97%).

In 39 females, 21 cases were accidental (53.84%), 17 cases were suicidal (43.58%), no homicidal cases were noted among females and one case was death due to natural disease.

Table 01: Showing manner of death among adolescents

	Accidental	Suicidal	Homicidal	Natural Disease	Total
Males	27 cases (62.79%)	13 cases (30.23%)	03 cases (06.97%)	00	43
Females	21 cases 53.84%),	17 cases (43.58%)	00	01(2.56%)	39
Total	48	30	03	01	82

Cause/Mode of death: In males most common cause of death was road traffic accidents 20 (53.48%), followed by poisoning in 09 cases (20.93%), hanging in 04 cases (9.30%), 03 cases of assault with stab injuries (6.97%), 02 cases each of snake bite and electrocution and one case each of drowning, burns and railway accident were noted.

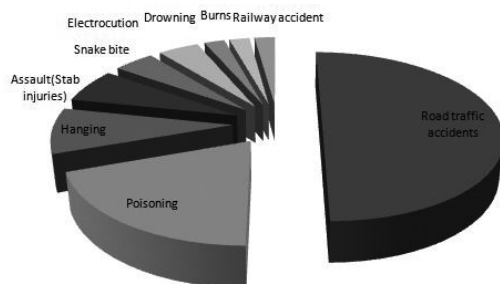


Fig. 04: Showing cause of deaths in males

Among 39 females, most common cause of death was poisoning and burns 18 cases each (33.33%), followed by hanging in 04 cases (10.25%), snake bite and road traffic accidents 03 cases each (7.69%) and one case each of electrocution, fall from height and death due to natural disease (lobar pneumonia).

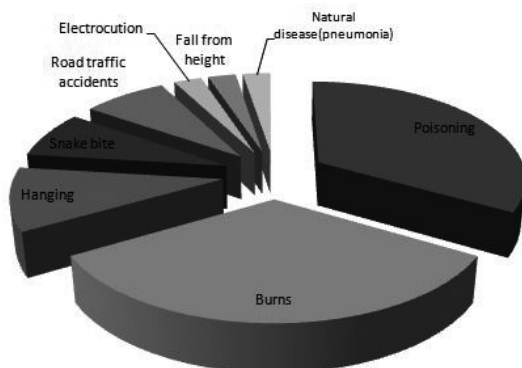


Fig. 05: Showing cause of deaths in females

DISCUSSION

The present study reported higher number of unnatural deaths from rural area (62.19%) and majority were males 43 cases (52.43%) which has concurrence with the observation made by Kumar A et.al¹² who found in their study conducted at Varanasi involving children below 19 years of age that 88.37% were rural inhabitants and male predominance (56.55%) in similar to the present study.

Kanchan T et.al¹³ reported in their study conducted at Manipal that Road traffic injuries were responsible for maximum mortalities (38.4%), followed by those because of burns (24.9%) and poisoning (15.9%), similar

to our study which constituted maximum mortalities due to road traffic accidents (28.04%), followed by poisoning (26.82%) and burns (17.07%).

In this study most of the cases took place in the rural area which might be due to multiple causes like high probability of snake bite, fall, drowning, death caused by easy accessibility of pesticides at household level etc. As per Ghatak S¹⁴, the most suicidal deaths took place in rural areas because of the higher availability of pesticides combined with poorer access to emergency medical care in such areas. Indians prefer to consume pesticides for killing themselves instead of taking an overdose of sleeping pills. Therefore, the fatality rates may be higher in India as compared to the western countries. Nearly, 49 percent suicide deaths in men and 44 per cent suicide deaths in women aged 15 years and above occurred due to poisoning, mostly from consuming pesticides, similar to our study in which poisoning and burns were commonest mode to commit suicide employed by females belonging to rural areas.

Meel B L¹⁵ carried out a study between 1996 and 2004 at Umtata General Hospital (UGH) reviewing medico-legal autopsies of subjects aged 18 years or below and reported that trauma accounted for 70.9% deaths and 29.1% deaths were due to other causes such as hanging, burns, lightning stroke, drowning, gas suffocation, falls from a height and poisoning. Motor vehicle accidents and homicides accounted for 45.6% and 54.4% deaths. Hanging, 81 (19.2%), drowning, 166 (39.4%), lightning strike, 38 (9%), burns, 51 (12.1%), gas suffocation, 24 (5.7%), poisoning, 33 (8.4%) and falls from a height 28 (6.7%) were non-traumatic deaths. Contrary to that the present study reported only 3.65% homicidal deaths. But 58.53% deaths were reported due to trauma, due to hanging, due to burns 17.07% etc. were found to be in concurrence with the present study.

Limitation of the study: Sample size was small consisting of only one year's unnatural deaths. Analysis involving data for few more years e.g. five years could help between groups comparison more effective by meeting the requirement of adequate sample size of different subgroups and also could reflect the changing pattern over time.

CONCLUSION

Adolescence is viewed as a transitional period between childhood and adulthood, whose cultural purpose is the preparation of children for adult roles. It is a period of multiple transitions involving education, training,

employment and unemployment, as well as transitions from one living circumstance to another. Hence it is important to study from all perspectives to prevent the unnatural deaths among adolescents who form the major part of the society and considered to be the future pillars of the nation's development and success.

Multipronged concerted efforts should be taken to develop congenial environment for successful fostering of responsible groups to monitor, evaluate and mentor adolescents. During any behavior change they, specially the parents can help adolescents by providing love, affection, care and concern, and hold their hands for leading a successful life in stressful period, without the journey unreached letting the dreams unfulfilled, the goals unachieved. Parents, teachers, career guides, seniors, office masters, physicians etc. are the stakeholders and increasing awareness and behavior change communication (BCC) of them regarding the problems and needs of adolescence may be the starting block. Measures like strict enforcement of traffic rules, certifying system by Panchayat Raj Institution (PRI) for purchasing of pesticide can also yield palpable outcome. The cause of death was found to vary across gender and sex- specific programmes and interventions need to be developed to avert further increase in mortality with special emphasis in rural settings. Innovation for better treatment modality for burns and mild to moderate degree of poisoning may bring better hope in future. A community based study would help more in this regards.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Taken from institution ethical clearance committee.

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A Study of Thermal Deaths in Rohtak, Haryana

Malik A K¹, Sharma D², Dhattarwal S K³, Panchal K⁴, Singla K⁵

¹Associate Professor, ²Associate Professor, Department of Forensic Medicine, MMMC&H, Solan, HP;

³Senior Professor & Head, ⁴Assistant Professor, Department of Forensic Medicine, PGIMS, Rohtak;

⁵Senior Resident, Department of Forensic Medicine & Toxicology, DR. BSA Hospital, New Delhi

ABSTRACT

Every burn injury recorded in vital Statistics represents a catastrophic injury: catastrophic in the overwhelming insult to the patients, catastrophic in its psychological aspects and catastrophic in cost and suffering to the family involved. A severe burn is the most devastating injury a person can sustain and yet hope to survive. It is a common catastrophe today as burn injury cases are one of the common emergencies admitted in any hospital. As the etiological factors of the burn injuries vary considerably in different communities, careful analysis of the epidemiological features in every community is needed before a sound prevention programme can be planned and implemented. The present study was carried out in the department of Forensic medicine and Toxicology of PGIMS and General Hospital Rohtak, Haryana and total 448 cases were collected for this study purpose. Female victims were most commonly affected as compared to male victims. The majority of deaths 232 (51.8%) occurred in the age group of 20-39 years followed by 119 (26.5%) in the age group of 40-59 years. Married females were most common victim compared to unmarried female victim. The majority of burn deaths were accidental (85.3%) in nature followed by suicidal (8.1%) and homicidal deaths (6.6%).

Keywords: Burns, Dowry Deaths, Manner of death, Marital status, Period of survival.

INTRODUCTION

Among all the discoveries made by men, only a few, such as cultivation of the soil, speech and writing, have borne such eventful developments as has finding out how to make a fire. It can be assumed that the earliest fire man encountered was generated by natural events – falling meteors, lightning, material ejected from volcanoes. Probably it took many thousands of years for man to learn to cherish fire of his own making, and almost every country has a different legend about how the discovery of fire was affected. Whereas it took man a long time to understand, appreciate and reproduce these natural occurrences, it took him no time at all to realize that fire can hurt and hurt badly; and so the search for remedies got underway¹.

Burn injuries have been a major cause of concern since prehistoric times to the present era of modern medicine. It is a common catastrophe today as burn injury cases are one of the common emergencies admitted to any hospital. Approximately seventy thousand patients are hospitalized annually in the United States with burns². Burn injuries were most important as they were commonest cause of unnatural deaths in India. Dowry deaths by burns is most common in India and at the same time accidental burns in female also occur often while cooking food³. As everywhere else, the modes of sustaining burn injuries in India are the same i.e. Flames, scalds, electrical and thermal. The most common cause of flame burn is accidental⁴.

Corresponding Author:

Dr. Deepak Sharma

Associate Professor, Department of Forensic Medicine, MMMC&H, Solan-173229, HP, India

Phone: +918350800303

Email: autopsysurgeon@gmail.com

An accurate estimate of incidence of burns is going to be difficult to obtain for the huge and diversely composed population of our country. Unfortunately, no national figure is available for India. But the number is likely to be high due to socio-economic conditions, lack of awareness, cooking and dress habits etc.

In the present study we made an effort to study the pattern of burn injuries in relation to age, sex, marital status, level of education and occupation of victim, manner of death and period of survival.

MATERIALS AND METHOD

The present study was carried out in the department of Forensic medicine and Toxicology of PGIMS and General Hospital Rohtak, Haryana. The study consisted of 448 cases alleged to have died due to burns and brought to mortuary of PGIMS, Rohtak for autopsy from 2011 to 2013. After obtaining an informed consent, detailed history of the case was obtained from the patient's close relatives, friends, police and the other available persons who were present at the time of incidence and those accompanying the victims, with special reference to general information like Name, Age, Sex, Address, Marital Status, Educational and Occupational Status etc. and other information like Date and time of incidence, Date and time of Hospitalisation, Manner of the events, Date and time of death, and Period of Hospitalisation was recorded from the hospital records and inquest papers and noted on a pre designed and pre tested proforma. Only cases of thermal death due to flame burns were included and deaths due to moist heat, electrocution, radiation, chemical burns and lightening were excluded.

The data was collected and compiled in an excel sheet and proportion, rate were calculated using SPSS (Software Package for Social Studies) version 20 and chi-square test and percentages was applied to find out any significant statistical difference between different groups, and if required logistic regression test was applied.

OBSERVATIONS AND RESULTS

Present study demonstrated preponderance of female 254 (56.7%) victims over male 194(43.3%) victims. The overall female to male ratio was 1.3:1. The maximum incidence was seen in the age group of 20-39 years which comprised of 232 (51.8%) victims. (Table 1). Married females 208(46.4%) were most commonly affected followed by married males 148(33%) (Table2). Majority of victims affected were less educated. The maximum victims 139 (31.3%) affected were educated up to middle level followed by those educated up to primary level 128 (28.4%) (Table3). In our study

housewives constituted the largest single population category amounting to 61.2% of cases, followed by labourers (16.8%) (Table4). Most common manner of death was accidental burns 382 (85.3%) followed by suicidal burns 36 (8.1%) (Table5). The most of the victims 284 (63.4%) survived for a period of 12 to 24 hours. (Table6).

Table 1: Distribution of cases according to Age group

Age Group (years)	No. of Cases	Percentage of cases (%)
01-19 years	84	18.8%
20-39 years	232	51.8%
40-59 years	119	26.5%
60 or above years	13	2.9%
	448	100%

Table 2: Distribution of cases according to marital status

	Males	Females	Total
Married	148	208	356
Unmarried	46	46	92
	194	254	448

Table 3: Distribution of cases according to Educational Status

Educational Status	No. of Cases	Percentage (%)
Illiterate	74	16.4%
Primary Level	128	28.4%
Middle Level	139	31.3%
Secondary Level	69	15.5%
Higher Secondary	35	7.8%
Graduate	02	0.4%
Postgraduate	01	0.2%
Total	448	100%

Table 4: Distribution of cases according to Occupational Status

Occupational Status	No. of Cases	Percentage (%)
Housewife	274	61.2%
Labourer	76	16.8%
Farmer	37	8.2%
Student	13	2.9%
Salaried/Private job	30	6.8%
Self Employed	04	0.9%
Unemployed	14	3.2%
Total	448	100%

Table 5: Distribution of cases according to Manner of death

S. No.	Manner of death	No .of cases	Percentage (%)
1.	Accidental	382	85.3%
2.	Suicidal	36	8.1%
3.	Homicidal	30	6.6%

Table 6: Distribution of cases according to Period of survival

Period of survival (Hours)	No. of Cases	Percentage of cases (%)
Up to 12 hours	110	24.5%
12-24hours	284	63.4%
24-36hours	37	8.3%
36-72hours	17	3.8%
Total	448	100%

DISCUSSION

Age: In our study, maximum cases of burns 232(51.8%) were seen in the age group of 20-39 years, followed by 119 (26.5%) in the age group of 40-59 years, 84 (18.8%) in the age group of 01-19 years and 13(2.9%) in the age group of 60 years and above respectively which was in concordance with studies of other researchers ^{5,6,7,8}.

Sex: Sex distribution in our study shows preponderance of female 254 (56.7%) victims over male 194(43.3%) victims. The overall female to male ratio was 1.3:1. Similar findings have been reported by other researchers ^{5, 6, 7,8,9,10,11}.

Marital Status: On Studying the marital status of the victims, it has been found, out of 194 males, 148 (76.2%) were married and 46 (23.8%) were unmarried. Out of 254 females, 208 (46.4%) were married and 46 (23.8%) were unmarried. This data suggested that, married population was more affected as compared to the unmarried population. Similar observations were made by other researchers ^{6, 9, 16, 17}.

Educational Status: On Studying the Educational status of the victims, it has been found that the maximum victims 139 (31.3%) affected were educated up to middle level followed by those educated up to primary level 128 (28.4%). This data suggested that the less educated were mostly affected. The reason for this might be due to low

educational maturity. The findings were consistent with studies done by other researchers ^{10, 11, 12,13,14,15}.

Occupational Status: In our study housewives constituted the largest single population category amounting to 61.2% of cases, followed by labourers (16.8%), farmers (8.2%), salaried (6.8%), unemployed (3.2%), student (2.9%) and self employed (0.9%) which was in concordance with the studies done by other researchers ^{12,13,14,15}.

Manner of Death: In this study, majority of cases 382(85.3%) were accidental whereas, 36 (8.1%) suicidal and 30(6.6%) homicidal. Similar observations were reported by other researchers ^{3, 5,6,7,8,13,15,16}.

Period of Survival: In our study 284(63.4%) victims survived for a period of 12 to 24 hours, followed by 110 (24.5%) victims up to 12 hours, 37 (8.3%) victims up to 24-36 hours and 17(3.8%) victims up to 36-72 hours of sustaining burn which was in concordance with the studies conducted by other researchers ^{6, 15, 16}.

CONCLUSION

Despite the modernization, the domestic fire is the major cause of burns with maximum involvement of females and the stove burst, being the main cause. The reproductive age group 20-39 years is highly susceptible for burns. Maximum victims were less educated. Hence, literacy should be increased in the society. Dowry deaths, curse to our so called modern society are still prevalent in spite of stringent laws and amendments in the act. As this problem of thermal deaths persist in our country the government along with various groups and bodies need to come together with more sincere efforts so as to minimise burn mortality and also to prevent and reduce their incidence.

Conflicts of Interest: Nil

Source of Funding: Nil

Ethical Clearance: Obtained from Institutional Ethical Committee of Pt. B.D.Sharma PGIMS,Rohtak.

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Does Knowledge and Attitude is Needed Regarding Euthanasia in Clinical Course? A Narrative Review Based on an Available Literature

Mohd. Arif Husain¹, Ishak Mohammad², Nageshwar V³, K M K Sridhar⁴

¹MSc.Nsg 2nd year, ²Associate Professor, ³Assistant Professor, ⁴PG Tutor, Teerthanker Mahaveer College of Nursing, TMU, Moradabad, U.P.

ABSTRACT

Introduction: Euthanasia is one of the commonest morally controversial issues in the end of life care^[4]. It is very important to examine the knowledge and attitude of nursing students because they have an important role to encounter the situations related to euthanasia during clinical courses.

Method: Articles concordant systematically from published literature & journal articles from PubMed & EBSCO. Search was specific to database by using synonyms. Initial search retrieved 19,464 titles then articles screened as per inclusion and exclusion criteria. 10 articles were selected which is clearly selected as per inclusion criteria.

Results: Out of 10 articles, 7 articles showed that there is a need to improve in knowledge and attitude among health care personnels, 3 studies showed that participants are strongly interested to practice euthanasia but no correlation with physician assisted suicide.

Conclusion: Enhancing and improvise the knowledge and attitude regarding euthanasia is necessary to participate in continuing educational programme because health care personnel plays an important role to fulfill patient's needs and care. They are expected to develop insight & implement into a practice.

Keywords: Attitude, Euthanasia, Knowledge, Nursing Students, Physician Assisted Suicide

INTRODUCTION

“Euthanasia” means that administering of a lethal medication to a patient by different persons (physician) with a merciful death after patient's particular appeal. ‘PAS’ refers to a patient's appeal for advised done on purpose and willful death of his or her peculiar life under the cooperation of a physician. Healthcare professionals' knowledge and attitudes regarding euthanasia may influence their behavior in situations in which this issue arises during practice in clinicals. This is mainly

important in nurses cases because they are in constant contact with patients^[6] and, therefore, are often facing this issue of euthanasia^[7]. Euthanasia have a important role in current ethical controversial debates. Now the dilemma for physician assumed to dispense restfulness and mitigate from any of the torture in patient but still is not legalized all over.

The patient appealing euthanasia has to be an adapted adult who has insupportable adversity from a determined therapeutic situation, including mental health illnesses, with no analeptic aspect nor overview of mitigate adversity. According to the Belgian law, uncontrollable distress can be physical and/or mental^[7]. The patients' appeals has to be deliberate and well advised, evidence acceptable managerial amplitude. In an end stage of situations one absolute physician is needed to appraise the patient and provide admonition over the appeal to the physician who got the basic application. If the patient is not in a end stage added compulsion commitment to be met.

Corresponding Author:

Mohd. Arif Husain
MSc. Nursing 2nd year
Teerthanaker Mahaveer College of Nuraing,
TMU Moradabad U.P.
Mobile: 9457190257
Email: mohdarifhusain104@gmail.com

There is a astronomic aplenty of altercation, however, with reference another plausible assumption: explicitly, allowance of the course to advisedly discriminate between the crack and form of one's eradication and to appeal the comfort and association of others, decidedly health-care professionals, in gather this about. This is the discussion of issues over whether a 'distinguished eradication' should accommodate the possibility to appeal euthanasia or physician-assisted suicide (PAS).^[7,8]

Need for the knowledge and attitude regarding euthanasia: Euthanasia altercate that a physician's main aim is to save a life not to end. In 1980s, when first time the discussion of issue on euthanasia was increased by Richard selzer in his short story 'Mercy'.

For that particular time to till now this controversial issue has evaluate ambiguity in perception of his minds of physician & health care personnels worldwide. Some of the steps have been dispatch this issues in all over the world. However, the convenance of euthanasia still under a big dark cloud due to acute religious domination. In many countries from the last decade, discussion of issues about the approval, codification of euthanasia & end of life agreement in medical practice is still a main component of discussion of issues is developing public affection to a ethical to die for end stage wreck patients^[3]. There is a mushrooming pervasiveness of failing affection which in curve can direct to a state of health called "end-stage". In end-stage scheme the altercation on euthanasia and affiliated affairs assume inmost.

It is needed to examine the knowledge and attitudes of nursing students related to euthanasia because they too, may appointment bearings related to the convention during this clinical courses. Bakalis et al examined Greek nursing attitude to euthanasia, in that they found that superiority of participant had a low level of knowledge regarding euthanasia. Further, most of them had an unfavorable attitude towards the legislation. However, the habitude of euthanasia debris inferior a cloud ^[11]. This is mainly due to the acute devotional domination. Many studies were outlined to appraise the appearance of inevitable doctors, nurses on this arguable affair and their knowledge and attitudes regarding euthanasia.

Hence, it was found that this is a controversial issue and necessary to flourish knowledge and attitude in end-of-life decision. Hence a narrative review is defined to find out the evidence from the available literature to

have some knowledge and attitude regarding euthanasia among nursing students, physician, medical students and nurses.

Aim: The aim of this review is to find the affirmation to describe the knowledge and attitude regarding euthanasia of medical students, nurses, nursing students, physicians.

Objectives: To appraise the level of knowledge and attitude regarding euthanasia among health care personnel.

Methodology: Eligibility criteria of the articles were done on the basis of the following criteria:

Search Strategy Method: A exploration of records commodity issued in discrete journals till 2017 was accompany. Search was bounded to only English language. The database exploration done was PubMed & EBSCO. Articles accommodate following key search term was restricted like attitude, euthanasia, knowledge, nursing students, physician assisted suicide.

Study Design:

- Quantitative descriptive study
- Survey study
- Descriptive, cross-sectional study
- Prospective study
- Vignette study

Type of Participants:

- Nursing students
- Oncologists
- Physician
- Medical students
- Nurses
- Family members of patient in hospice

Settings:

- Hospitals
- Medical college
- Nursing college
- Hospice centers

Outcomes: Knowledge and attitude among health care professionals to practice in clinical courses.

Publication Time Scale: Recent and up to date articles are included for the review, only articles from 2009 onwards were included in the review.

FINDINGS

The search was organized by assemble the points singly and composite with all and equivalent, also concede to the database. Initial exploration retrieved 19464 articles, over which 1226 were chosen manually. 1176 articles were excluded because of duplications in two databases. 50 records screened, out of that 40 were excluded, full-text not related to knowledge and attitude regarding euthanasia. Hence, 10 articles were screened which include quantitative studies for qualitative synthesis and meta analysis was not done in this narrative review, detailed description of all studies mentioned below.

Description of all studies include in this narrative review: Anneser et al^[11] in the year of 2016 (Deutschland) conducted Vigenette study; the study suggested that the treatment option for palliative sedation and euthanasia regarding assumed permissibility and personal attitude were have positive correlation. But no correlation found for physician assisted suicide. In this survey, strong interest with high response rate seen among student. Only 0.8% to 2% of students revealed that they had no opinion on ethical acceptable of palliative sedation, physician assisted suicide and euthanasia.

Xioli et al^[16] in the year of 2016 in China conducted a cross-sectional study; this study concluded that Chinese oncologists were totally anomalous with the abstraction of euthanasia & end of life issue. The study revealed that inadequate attention paid towards euthanasia, it should be more on the education of palliative care.

Naseh et al^[5] in the year 2016 in Iran conducted a quantitative descriptive design and study concluded that 52.5% have negative, 2.5% have neutral and 45% have positive attitude towards euthanasia, by using one way ANOVA method, the difference between the different group was not found any significance. The study also conclude that this issues should be handled carefully, deeply and explored more in every aspect especially in terms of determining patient's right.

Hert et al^[12] in the year 2015 in Belgium conducted a quantitative descriptive study; study suggested that overall, 70% was mental health nurses were confronted again and again with a appeal for euthanasia and majority did not oppose euthanasia for those with UMS. It is needed to provide education training and guide clearly to the health care organizations.

Yousuf et al^[4] in the year 2014 in Malaysia conducted a Survey study ; study concluded that both physicians and patients were in favor of eliminate and confining life sustaining doctoring to a patient have no opportunity of continuity. Statistically significance were found against EAS or its legislation. Patients view were basically and they determined by religious acceptance more than the cruelty of illness.

Albers et al^[8] in the year 2014 in Belgium conducted a Survey study; study concluded that majority of nursing staff want to involved in ELD. And awareness on the role of nurses and ELD should be raised which can involved the nurses in patient's care and fulfill needs. Highly educated nursing staff and hospitals personnels indicated that they want to be involved in ELD and need to improve their knowledge and attitude in practice.

Hassan et al^[15] in the year 2013 in Pakistan done Cross-sectional study; finding of study suggested that majority of students disagreed and were confused whether they will practice it or not in clinical courses. The awareness of euthanasia was aerial dispersion through the medical students, but only a small admeasurement of the students were willing to practice it.

Tamayovelazaug et al^[13] in the year of 2012 in Spain conducted Descriptive cross-sectional study ; findings concluded that there is a need to improve the respondents knowledge regarding euthanasia. Most of the percentage of nurses who were helpless to analyze a adequate bearings involving euthanasia or PAS that indicates that nurses should need to participate in deepness education in End- of- life decisions.

Mickiewiz et al^[9] in the year of 2012 in Poland conducted a Survey study ; study suggested that majority of the participants, do not want to participate in the process of end of life decisions, but most of the hospice worker were refused active euthanasia but many of the nursing students were supported it to the person's suffering immediately. The legislation of euthanasia was unfavorable by most of the students, however, it was barely admiration by the hospice workers.

Vilel et al^[14] in the year of 2009 in Brazil conducted a Prospective study ; study concluded that knowledge about euthanasia in public is confined, even among people with good academic accomplishments , this lack of knowledge is not so marked but also might advised confined. A small admeasurement of family caretaker and also functional physician are in admiration of the convenance of euthanasia in severely ill patients.

Summary of findings: Out of 10 articles, 7 articles revealed that there is need to improve in attitude & knowledge of health care personnel, 3 studies revealed that participants are strongly interested to practice euthanasia but no such correlation with physician assisted suicide. Further study is needed for assessing knowledge and attitude regarding euthanasia and end-of-life call decision.

Future Significance: The findings of this narrative review suggested that it is important to develop insight, knowledge and attitude regarding euthanasia and its issue among health care professionals and also in nursing students which help them to encounter and make them able to face a certain situation related to end of life care of end stage ill patients.

Limitation:

- Database search was confined
- Search strategy was precise to use attitude, knowledge and euthanasia only
- Meta-analysis will give more exactness to findings
- Confined to area of medical and nursing

CONCLUSION

Knowledge and attitude can be enhanced among health care personnels through the participation in the continuing education programme. Health care professionals plays an important role in clinical decision making and patient's needs and care. They are expected to learn and develop insight and have to implement in to a practice.

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A Study Pattern of Poisoning among the Autopsies Conducted at Adichunchanagiri Institute of Medical Sciences

N T Satish¹, M G Shivaramu², Jethin Ramadasan³

¹Associate professor, ²Principal and Professor, ³Tutor, Department of Forensic Medicine, Adichunchanagiri Institute of Medical Sciences, BG Nagar. Mandya, Karnataka, India

ABSTRACT

A Prospective analysis of poisoning deaths was conducted at Department of forensic medicine and Toxicology, Adichunchanagiri Institute of medical sciences and research Centre, B.G Nagar over a period of eighteen months (June 2012 to December 2013). Out of the total 160 autopsies conducted in the mentioned period, deaths due to poisoning comprised 35 cases (21.8%) cases. The data was analyzed with respect to age, sex, marital status, motive and type of poisoning. It was observed that the incidence of poisoning was highest in the age group of 31-40 years (33.7%) followed by 21-30 years (22.6%). Male (61.8%) preponderance was more over female (38.2%) and married (60.8%) outnumbered the unmarried (39.2%) in both sexes. The most common type of poisons consumed were organ phosphorus (65.71%). The common reasons of consuming poison were financial constraints (24.28%) followed by marital conflicts (17.28%). This study aims at highlighting the general pattern and factors associated with poisoning deaths. This epidemic of poisoning should be addressed on priority basis and information regarding the adverse effects of poisoning should be disseminated at all levels.

Keywords: Poisoning Pattern, Organ phosphorus compound.

INTRODUCTION

Acute poisoning is an important medical emergency. The nature of poison used varies in different parts of the world and may vary even in different parts of the same country depending on the socioeconomic factors and cultural diversity. Self-poisoning accounts for about one-third of the world's suicides. The proportion of all suicides using pesticides varies from 4% in the European region to over 50% in the Western Pacific region, but this proportion is not concordant with the volume of pesticides sold in each region; it is the pattern of pesticide use and the toxicity of the products, not the quantity used, that influences the likelihood that they will be used in acts of fatal self-harm. With the progress in the industrial and agricultural field and advances in medical sciences a vast number of insecticides have become available. In general, accidental poisoning is more common in children, whereas suicidal poisoning is more common in young adults. It is important to know the nature and severity of poisoning in order to take appropriate preventive measures. Studies of this nature will be a useful tool in planning and management of critically ill acute poisoning cases.¹ In this context

the present study was carried out with the objective to investigate the pattern of poisoning among the autopsies conducted at Aims. It will also help to make the required treatment facilities easily available at every place, health education for prevention and for adequate teaching in the institutes of medical education and upgrading the peripheral health centers to manage cases of poisoning in emergency could possibly help us to bring down the morbidity and mortality rate.²

AIMS

- To determine the age and sex distribution of poisoning cases reported.
- To find out the pattern of poisoning reported to the hospital

MATERIALS AND METHOD

The study was conducted at Adichunchanagiri Institute of medical sciences and Research Centre, between June 2012 to Dec 2013. The study included alleged poisoning deaths, inquest reports, suicidal notes,

PM Reports, hospital records and FSL reports were scrutinized.

The inclusive parameters included Age, sex, socio-economic status, educational qualification, hospital treatment, motive and type of poisoning.

Exclusion criteria: Highly decomposed cases.

RESULTS AND DISCUSSION

Total 160 cases were subjected and studied for autopsy, of which deaths due to poisoning comprised 35 cases (21.8%).

1. Age and Sex: AGE: The incidence of poisoning was highest in the age group of 31 -40years (33.7%) followed by 21-30years (22.6%), the least was encountered in elderly age group.

Sex: Male (61.8%) preponderance was more over female (38.2%) and married (60.8%) outnumbered the unmarried (39.2%) in both sexes. The most common type of poisons consumed were organ phosphorus (65.71%) followed by over the counter medications (17%). The common reasons of consuming poison were financial constraints (21.4%) followed by ill health (15.55%). The maximum incidence of poisoning found in the age group of 31 to 40 years. Similar findings were observed in the studies conducted by S.K Dhattarwal et al.,⁷ and disagreement with Taruni Ng.¹⁰ This is attributed to factors like failures in academics, romantic failure, family disputes, marital disharmony, unemployment, romantic failures, ill health, and dowry harassment in case of females. As this age group are at the threshold of building their career and have the utmost zeal and urge to move ahead of others, the ever increasing demands and stress of the modern mechanical lifestyle, contribute to such an act. In children, the common reasons were due to conflict with parents for trivial issues and failure or less percentage in exams.

Males being the main breadwinner in the family bear the burden of earning for livelihood. This was found to be prime reason for the increased incidence of poisoning in males. Since the study involved the subjects residing more in urban setup, the annual income of the lower middle class could not suffice to meet the basic amenities resulting in disillusionment.

Economics and to the fact that poisoning by agro- chemicals is practically inevitable because modern farming is unthinkable without the use of these and especially for a developing country like ours. The easy availability and accessibility of over the counter medication like barbiturates, benzodiazepine, antihistamines, analgesics etc. and a belief that it causes less suffering assuring peaceful death, are the other causes for choosing these drugs. It is in agreement with the studies done by Dalbir Singh⁴ and Karamjit Singh⁸ and is in contrast with the studies of Adarsh Kumar.⁶

Table 1: Age and Sex distribution

AGE	2012		2013	
	Male	Female	Male	Female
0-10	0	0	0	0
11-20	2	2	3	0
21-30	4	3	3	4
31-40	9	3	8	4
41-50	3	2	3	2
51-60	3	2	2	2
61-70	2	0	2	1
Total	35 cases		35 cases	

2. Motive: The common reasons of consuming poison were financial constraints (21.4%) followed by marital conflicts (17.28%).

Among financial constraints the reason were excessive debts, poverty, not able to pay the loan, extravagant lifestyle, engaging in activities in an urge to achieve instant richness were the prominent financial causes noticed. Among ill health, in majority of cases evidence of chronic illness like bronchial asthma, tuberculosis, gastrointestinal disorders, diabetes, hypertension and gynecological problems as procured through the history and hospital records, on autopsy corroborated with the findings. It is in disagreement with studies conducted by Dalbir Singh.⁴

Table 2: Motive of consumption of poison

Motive	2012	2013
Financial Matters	9	8
Marital constraints	5	6
Family	5	4

Conted...

Education	4	4
Love failure	4	3
Ill health	3	3
Unemployment	3	3
Depression	1	2
Unknown	1	2

3. Treatment: Out of 35 cases 25 cases (71.4%) received treatment and rest (28.57%) did not receive the medical attention. The reasons for rise in the number of victims culminating to death in spite of treatment may be due to the consumption of highly toxic poisons and also due to difference in individual responses. The treatment not received may be due to the delay in transportation and shifting of the victims to the nearby hospital from the site of incident. Improper and inadequate treatment in hospitals could have also played a key role in victims culminating to death without receiving treatment.

Table 3: Treatment status

Treatment	2012	2013
Treated	25 cases	23 cases
Untreated	10 cases	12 cases

4. Type Of Poison Consumed: The majority of cases were due to organ phosphorus compound it comprised to 23 cases (65.71%) followed by combination of alcohol and op compound. 8cases (22.8%) and rest were due to carbamates and phosphide

The reason for more number of victims to choose organ phosphorus were due to low cost, easy availability of highly toxic pesticide, agricultural based In an urban setup, though ample opportunities for employment are present, yet there is stiff competition for these jobs by better qualified, which is the main cause for this group to take this extreme step of ending their lives. Similar opinions have been stated by Dalbir Singh.⁴ But studies conducted by Karamjit Singh⁸ disagree with this view.

The poisoning by agro- chemicals is practically inevitable because modern farming is unthinkable

without the use of these and especially for a developing country like ours. The easy availability and accessibility of over the counter medication like barbiturates, benzodiazepine, antihistaminic, analgesics etc. and a belief that it causes less suffering assuring peaceful death, are the other causes for choosing these drugs. It is in agreement with the studies done by Dalbir Singh⁴ and Karamjit Singh⁸ and is in contrast with the studies of Adarsh Kumar.⁶

Table 4: Type of poison consumed

Type	2012	2013
Op compound	23 cases	21 cases
Alcohol with op	08 cases	09 cases
Carbamates	03 cases	03 cases
Phosphide	01 cases	02 cases

CONCLUSION

Deaths due to poisoning are on steep rise due to which there is huge loss of lives and devastating impact on communities .Health care services particularly emergency resuscitative services should be made available at all levels , promoting poison information centers, introducing separate toxicological units in the hospitals and upgrading the peripheral health centers to manage cases of poisoning in emergency could possible help us to bring down the morbidity and mortality rate There is an urgent need for strict implementation of the Pesticide Act so that it could strengthen the legislature on availability of drugs and poisons substance in the market. This can regulate the import, manufacture, sale, transport, distribution and use of pesticides with a view to prevent risk to human beings. Enlightenment through educating young people about harmful effects of drugs. It is also imperative to provide psychological and counseling services to attempted suicide victim.

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Determination of Sex from Mastoid Dimensions among North Indians

Rajeev Kumar Chaudhary¹, Anupama Mahajan², Monika Piplani³, Baljeet Singh Khurana⁴

¹Associate Professor, Forensic Department, ²Professor & Head, ³Associate Professor, Anatomy Department, ⁴Professor & Head, Forensic Department, Sri Guru Ram Das Institute of Medical Sciences & Research, Amritsar (Punjab)

ABSTRACT

Introduction: Sex determination is the keystone of a biological profile and skulls of unknown provenance are best tested for race and sex using different variables. Determination of sex from the skeleton is vital to medico legal investigations. The mastoid region is analysed for determination of sex from fragmentary crania in Forensic Anthropology as it is one of the most protected region and resistant to damage due to its anatomical position at the base of the brain.

Objective: The purpose of this study was to determine the existence of sexual dimorphism in the dimensions of mastoid process among North Indians.

Material and Method: Material for the study consisted of 70 adult (above 18 years) human skulls (35 of either sex) of North Indians obtained from Anatomy and Forensic department of SGRDIMSAR, Amritsar. Mastoid measurements (Length, Breadth and A-P diameter) of both the sides were taken in millimeters with the help of sliding Vernier Caliper and size of mastoid process was calculated.

Results: All four mastoid variables showed significant sexual dimorphism $p < 0.001$. Canonical discriminant function Coefficient using stepwise analysis was -3.142 in females and 3.142 in males. In statistical analysis using Canonical Discriminant Functions, Eigen value was 10.015 and Wilks' Lambda was 0.091.

Conclusion: Accuracy of determination of gender using all four variables was 97.1% original and 96.4% cross-validated. Therefore, mastoid process can be used as a tool for determination of sex in fragmentary skeletal remains.

Keywords: Mastoid Process, Forensic anthropology, Sexual dimorphism, North Indians

INTRODUCTION

In Forensic science, identification of gender by examination of skeleton has been used widely. Skull alone is still widely used for sex determination because all the other human skeletons show variable degree of sexual dimorphism^{[1][2]}. The mastoid process is

favourable for sex determination because the petrous frequently survives circumstances that cause skeletal fragmentation^[3] and it is less prone to damage due to its safe anatomical position at the base of the skull^[4]. So it stays intact even the skull is fragmented and it remains intact in skeletons of very old age. To identify sex in fragmented skull bones, mathematical dimensions of mastoid are used by craniometric techniques. Many studies have been conducted on different populations on sexual dimorphism with respect to the skull. Nagaoka used two parameters on both sides of skull i.e. height and width of mastoid^[5]. Paiva & Segre calculated the triangular area between Porion, Mastoidale and Asterion which is then used to identify sex^[6]. The present study was undertaken to study the accuracy and reliability of the mastoid process in determination of sex

Corresponding Author:

Dr Rajeev Kumar Chaudhary
Associate Professor
(Deptt. of Forensic Medicine & Toxicology)
Sri Guru Ram Das Institute of
Medical Sciences & Research, Amritsar (Punjab)
Mobile: No 9501726435
Email: crajeev0911@gmail.com

of skulls among North Indians from a fragmentary piece of skull by taking different dimensions of the mastoid process and results were analysed statistically.

MATERIAL AND METHOD

Material for the study consisted of 70 adult (above 18 years) human skulls (35 of either sex) of North Indians obtained from Anatomy and Forensic department of SGRDIMSAR, Amritsar. Skulls with metopic bone in the region of craniometric points, diseased and damaged mastoid processes were discarded. Mastoid measurements of both the sides were taken in millimeters with the help of sliding Vernier Caliper (with a least count of 0.01mm). Average of readings of right and left sides were taken and subjected to statistical analysis using SPSS-17.

1. Mastoid Length: The length of mastoid is measured from a point on the Frankfurt plane vertically downwards to the tip of the mastoid process^[7]. Frankfurt plane is a horizontal plane passing through the upper margin of external acoustic meatus and the lower margin of the orbital opening^[8]

The skull is rested on its right side and the calibrated bar of the caliper is applied just behind the mastoid process, with the fixed flat arm tangent to the upper border of the auditory meatus and pointing (by visual sighting) to the lower border of the orbit. The calibrated bar is perpendicular to the Frankfurt plane of the skull. The measuring arm is adjusted until it is level with the tip of mastoid process, using the base of the skull generally and the opposite mastoid process to control the plane of sighting.



Figure 1: Showing Length of Mastoid Process Using Frankfurt Plane

2. Mastoid Breadth (Medio- lateral Diameter):

It is taken from the highest part of the medial surface of the mastoid process within the digastric fossa to the most lateral point of the process on the same level^[7]



Figure 2: Showing Breadth of Mastoid Process

3. Mastoid A-P diameter: It is taken from the lowest point at which the tympanic plate abuts against the anterior surface of the mastoid process to the posterior border of the process on the same level^[7]



Figure 3: Showing Antero-Posterior Diameter of Mastoid Process

4. Mastoid Size^[7]: It was obtained as following

$$\frac{\text{Length} \times \text{A-P diameter} \times \text{Breadth}}{100}$$

RESULTS

Table No. I

Variable	Females		Males		P value [#]
	Mean	SD	Mean	SD	
Mastoid L	22.880	1.093	27.501	1.137	<0.001**
Mastoid B	8.613	0.946	10.636	0.937	<0.001**
AP Diameter	13.520	1.066	16.768	0.956	<0.001**
Size	34.521	10.239	55.291	10.252	<0.001**

#Student 't' test; **p<0.001; Highly significant

Table II: Canonical Discriminant Function Coefficient using stepwise analysis

Variable	Standardized coefficient	Structure Matrix	Unstandardized coefficient	Raw Coefficient (Constant)	Group Coefficient	
					Female	Male
Mastoid L	0.918	0.659	0.823	-34.895	-3.142	3.142
Mastoid B	0.588	0.342	0.625			
AP Diameter	0.688	0.511	0.680			
Size	-0.489	0.323	-0.048			

Table III: Accuracy of determination of gender using all variables

Gender	Correctly classified	Misclassified
Female	68 (97.1%)	2 (2.9%)
Male	68 (97.1%)	2 (2.9%)
Total	136 (97.1%)	4 (2.9%)

Accuracy was 97.1% original

Table IV: Accuracy of determination of gender Cross-validated

Gender	Correctly classified	Misclassified
Female	68 (97.1%)	2 (2.9%)
Male	67 (95.7%)	3 (4.3%)
Total	135 (96.4%)	5 (3.6%)

Accuracy was 96.4% cross-validated

Table V: Stepwise Statistics

Variables Entered/Removed^{a,b,c,d}

Step	Entered	Wilks' Lambda							
		Statistic	df1	df2	df3	Statistic	df1	df2	Sig.
1	Mastoid L	.187	1	1	138.000	601.073	1	138.000	.000
2	AP Diameter	.119	2	1	138.000	507.416	2	137.000	.000
3	Mastoid B	.103	3	1	138.000	394.861	3	136.000	.000
4	Size	.091	4	1	138.000	337.990	4	135.000	.000

At each step, the variable that minimizes the overall Wilks' Lambda is entered.

- Maximum number of steps is 8.
- Minimum partial F to enter is 3.84.
- Maximum partial F to remove is 2.71.
- F level, tolerance, or VIN insufficient for further computation.

DISCUSSION

Mastoid region has drawn the interest of Forensic experts for its utility in sex determination since long. Larnach and Macintosh calculated size of mastoid process and divided it into five grades (very small, small, medium, large or very large). They reported that females have very small to small sized mastoids while males have medium to large sized mastoids^[7].

Krogman and Iscan stated that determination of sex, age and race in a collection of 750 skeletons was possible with levels of reliability of 92% using the skull alone and 98% using both pelvis and skull^[9]. Bass reported that the skull is probably the second best region of the skeleton to determine the sex^[10].

Hoshi classified the mastoid process into three main types based on the direction of the mastoid process in relation to a vertical plane as assessed visually i.e. M-male, N-neutral and F-female. He observed that when skulls were placed on flat surface, the male skulls rest on the mastoid processes while female skulls rest on occipital condyles or other portions of the skull indicating that male skulls have longer mastoid process as compared to female skulls due to which male skulls rest on mastoid process^[11].

In Cape population^[12] the mean mastoid length in male and female skulls was 29.3 mm and 26.5 mm respectively, in Caucasian population 28.06 mm and 25.21 mm respectively and in Negroes 30.32 mm and 26.34 mm respectively^[13]. Passey et al in their study on 70 adult skulls (44 males and 26 females skulls) reported mean mastoid length 29.7 mm in males and 24.5 mm in female skulls^[14]. Sumati et al in their study on 60 adult human skulls reported that mean mastoid length was 28.3 mm in males and 23.18 mm in female skulls and concluded that subsequent to stepwise discriminant function analysis, mastoid length was found to be the best sex determinant^[15]. This is in accordance with our study where mastoid mean length in male skulls was 27.501 mm and was 22.880 mm in female skulls. Our study was further supported by observations of Nagaoka et al^[5] on Japanese skulls. They reported larger mastoid length in Japanese male skulls, 49.0 ± 3.47 mm as compared to Japanese female skulls where mastoid length was 47.0 ± 2.7 mm suggestive of population differences in measurements of the mastoid process. They concluded that the accuracy of sex classification was more than

80% when single parameter was used and accuracy of 82- 92% was achieved when mastoid height and width were taken together for sex estimation. Sumati et al^[15] correctly classified sex in 76.7% crania included in the study while Gupta et al^[16] observed an accuracy of 90% for the mastoid process in sexing the crania. Franklin et al^[17] reported an accuracy of 68% for mastoid process in sexing of indigenous South African crania. Saini et al^[18] utilized eight different measurements on mastoid process and reported an accuracy ranged between 68.1% and 75.4% using each variable in direct discriminant analysis while in step wise analysis, asterion- mastoidale and mastoid breadth provided an accuracy of 87% which is reasonably good for identification in forensic anthropology. Also, the mastoid process was found to be a good discriminator of sex even in condition of severe malnutrition with 87.3% accuracy^[19]. The average accuracy by direct method was 85% in males and 80% in females^[20], 61% in males and 52% in females^[21]. In our study, accuracy of determination of gender was 97.1% original and 96.4% cross- validated.

So, compared with the results of other studies, the present study shows that the dimensions of mastoid process measured by anthropometric technique could be of great help in medicolegal investigations and it can be taken as a sex indicator among North Indians

CONCLUSION

The Skull plays a vital role in distinguishing the sex when performing a forensic anthropological analysis. Morphological and morphometric are two basic methods of sexing the human skull. In fragmented skull bone, metric analysis provides greater statistical weight than the morphological analysis. In the skull, the mastoid bone is robust, tough and is located at a protected position at the base of the skull making it favourable for sex determination. By taking the mastoid process measurements carefully and after applying proper statistical analysis, it can be used as one of the bone determinant of sex of fragmentary remains.

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Implications of Maxillofacial Injuries on Quality of Life in Trauma Victims

Karan Giriyan¹, Rajesh Kamath², Brayal D'Souza², Sagarika Kamath³, Sneha R Bhat⁴

¹Final Year Postgraduate Trainee, Master in Hospital Administration Program, ²Assistant Professor, Prasanna School of Public Health, Manipal Academy of Higher Education; ³Assistant Professor, School of Management, Manipal Academy of Higher Education; ⁴Lecturer, Department of Periodontics, Yenepoya Dental College, Deralakatte, Mangalore, Karnataka

ABSTRACT

Aim: The objective of this study was to assess the Quality of Life on the patients with maxillofacial injuries.

Materials and Method: A cross-sectional prospective study was designed to identify patients admitted with maxillofacial injuries from June 2017 to February 2018. Details regarding the social demographics, nature and severity of injury, and treatment methods were recorded. To assess the Quality of Life, Short Form-36 Version 2.0 (SF-36v2) questionnaire was administered with recall period of 4 weeks. Analysis involved descriptive statistics and box plots to correlate the quality of life among various age groups and gender.

Results: A total of 129 patients with maxillofacial injuries were identified (115 males, 14 females; mean age = 35.14 years). Road traffic accidents were the cause of injury in 104 patients (80.62%) and slip and fall accounting for 66.7% among the elderly population of above 60 years. Only 36.4% underwent open reduction mode of treatment while the rest were managed conservatively. The overall Quality of life among male and female was not statistically significant, however when correlated with different age groups significant results were seen among the elderly and the middle age group.

Keywords: Maxillofacial injury, trauma, quality of life, SF-36v2

INTRODUCTION

Epidemiological survey adjusts with variation in the geographical region, socioeconomic status, cultural and surrounding factors. These factors can be evaluated for contrast in the statistics and to recognize the differences in the distribution and occurrence of maxillofacial fractures throughout the world. Information acquired can be used as documentary proof for formulating preventive measures taken for such accidents in future.¹ The mechanism of injury and direction of impact influences the anatomic position and fracture patterns. The exposure

to the external environment, when compared to the rest of the human body, is more in case of maxillofacial region and hence will require meticulous assessment and treatment.² The impact of maxillofacial accidents result in interruption of quite a number integral functions of the head and neck region, such as visual acuity, olfaction, auditory perception, speech, breathing, and eating. These are particularly essential for a regular day to day living of a person.³ Subsequently, the Quality of Life of the individual is negatively influenced due to incapacitating outcomes of maxillofacial trauma which make them a burden to their families.⁴ This can lead to mental anguish in the patients after injury. Mental morbidities are one of the complexities following road traffic accidents and maxillofacial injury.⁵

The psychological problems consist of acute stress disorder, post-traumatic stress disorders (PTSDs), and substantial dejection.⁶ These post-traumatic mental problems may additionally occur either quickly or later after injury and dismally, a few sufferers are left without fitting prognosis and treatment. Without suitable

Corresponding Author:

Dr. Rajesh Kamath
Assistant Professor,
Room No.12, Second floor, Old Tapmi Building,
Prasanna School of Public Health,
Manipal Academy of Higher Education, Karnataka-576104
Mobile : (+91)7760218342
Email: Rajeshkamath82@gmail.com

treatment⁷, these psychological troubles can cease up in chronic state and affect the treatment response and normal social potential antagonistically.⁸ Studies have proven that sufferers with maxillofacial injuries experience the ill outcomes of severe anxiety issues. In spite of global familiarity with these issues, there is still a lack of data on mental anxiety in cases of maxillofacial injury. Quality of life is influenced by social, economic, psychological, mental state of an individual. To be more precise, it is the assessment of perceived quality of an individual's daily life of their well-being or lack of it.⁹

The Medical Outcomes Study Short Form 36-Item Health Survey (SF-36) is the most widely used generic instrument to estimate quality of life of patients. The benefit of qualitative research is that it allows the researcher to look at individuals' conduct, represent what is necessary to them and understand how people sense and think about a particular situation.¹⁰ After an accident, the victims are typically left in a risky situation where they long for appropriate treatment when they are brought to the hospital.¹¹ To improve the high-quality of care, appropriate communication between health-care staffs and patients is vital. It is important for the health care providers to apprehend how the patients sense and what they experience for the duration of the length right after the accident to the end of definitive treatment to enhance this communication and as a consequence to develop greater customized care for the individual patient. Medical ethics has constantly stressed that surgical care must include collaboration between surgical care and mental healthcare. Therefore, a trauma victim should be evaluated from both physical and psychosocial perspective. Research on enhancing the maxillofacial trauma care has been continually focused surgically. Surgeons have a tendency to pay little attention to their patient's emotional and psychological aspect. Poor documentation due to low attention of post trauma psychological problems among the doctor has been observed.¹²

In current years, qualitative study has been used to discover patients' experience on trauma care at various levels after an accident. Patient's feeling and understanding towards the nursing care have additionally been explored by the use of qualitative study. The benefit of qualitative study is that it enables the researcher to discover people's behaviour, define what is important to

them and perceive how the patients sense and experience about a particular event.⁴ The aim of this study was to explore and understand the experience of a maxillofacial trauma patient. The finding of this study would help in further improvement of patient care and communication.

METHODOLOGY

A Cross-sectional study with all cases of maxillofacial injury visiting the trauma center from June 2017 to February 2018 were included. Patients below the age of 18 years, brought in dead patients and patients not willing to participate were excluded from the study. The study included 129 participants treated for maxillofacial injuries by Department of Oral and Maxillofacial Surgery. Data collection was done in relation to social demographics, etiology of injury and the fracture area of maxillofacial region. Clinical information pertaining to the maxillofacial injury and treatment modality of the patient was obtained from the medical records department of the hospital.

For the study, the mandible was divided into condylar, coronoid, ramus, body, symphysis and dento-alveolar regions. In the middle-third of the face, injuries were recorded as Le Fort I, II, and III types, zygomatic complex, nasal bones, naso-orbito-ethmoidal complex and dento-alveolar fractures. The frontal sinus and orbital rim were recorded for injuries of the upper face. Etiological factors were classified as road traffic accidents, slip and fall, assault, occupational hazards and sports injuries.

To assess the Quality of Life, the patients were approached when they visited Dept. of Oral and Maxillofacial Surgery for follow-up. SF-36v2 standard Quality of Life questionnaire was administered. With its 36 questions, the SF-36 QoL measure seeks to assess eight life domains of the interviewee: Physical Functioning, Role-Physical, Bodily Pain, General Health, Vitality, Social Functioning, Role-Emotional and Mental Health. The scores range from zero to 100, with higher scores representing better levels of physical and mental well-being. The scores range from zero to 100, with higher scores representing better levels of physical and mental well-being. The data obtained were interpreted using SPSS version 16 on various scales and measures.

RESULTS

A total of 129 patients who fulfilled the inclusion criteria were included for the study. There were 115 male patients and 14 female patients with a mean age of 35.14 years (range = 18-86 years). Road traffic accidents (RTAs) were the largest cause of maxillofacial injuries (104 cases, 80.62%), followed by falls (15 cases, 11.63%), interpersonal assaults and sports injuries (16 cases, 12.4%) and industrial accidents (4 cases, 3.1%). (Table 1-2)

68 (52.71%) of them suffered fractures of the Mid-face, while 20 (15.5%) subjects suffered Mandibular fractures. Another 27 (20.93%) suffered a combination of Mid-face and Mandibular fractures. The frontal fractures accounted for less than 5% of cases. (Table 2)

The Median of Quality of Life for male and female was comparatively similar at 53.67 (Range = 34.47-73.92) and 53.33 (Range = 43.39-65.02) respectively. (Fig 1) However when compared with individual domains, the male counterparts should slightly better results in Physical functioning and social functioning, whereas females fared better in terms of general health and mental health. (Fig 2)

Individuals in the middle age group showed a positive correlation when compared to the elder population. For the younger age group (18-30 years) Median was 52.98 (standard deviation [SD] = 10.2396472; range = 24.5208-76.2708), lower middle age group (31-45 years) Median was 55.541 (standard deviation [SD] = 10.89; range = 24.52-76.2708), upper middle age group (46-60 years) Median was 52.61 (standard deviation [SD] = 8.97; range = 24.52-66.38), elder age group (>60 years) Median was 42.30 (standard deviation [SD] = 5.13; range = 37.41-52.73) (Fig 3)

Table 1: Socio-demographic characteristics of respondents

Characteristics	Frequency (%)
Age (years)	
18-30	60 (46.52%)
31-45	42 (32.55%)
46-60	21 (16.28%)
Above 60	6 (4.65%)

Contd...

Gender	
Male	115 (89.15%)
Female	14 (10.85%)
Medical expenses	
Self	59 (45.74%)
Family	8 (6.2%)
Employer	4 (3.1%)
Insurance	58 (44.96%)
-Medicare	9 (6.98%)
-Manipal Arogya Suraksha	28 (21.7%)
-Manipal Sampoorana Suraksha	4 (3.1%)
-Mukhyamantri Santwana Harish Scheme	12 (9.3%)
-ESI; Corporate TPA	7 (5.4%)
-Charitable trust (Shankar fund; Dr. Hegde fund) (*In addition to other payment methods)	5* (3.88%)

Table 1 shows 60 respondents fall in the age group of 18 to 30 years and only 6 respondents in elderly category, with M: F ratio of 8.9: 1. 44.96% had access to medical insurance whereas 45.74% paid out of pocket.

Table 2: Injury and treatment characteristics of respondents

Characteristics	Frequency (%)
Etiology	
RTA	104 (80.62%)
Slip and Fall	15 (11.63%)
Assault	5 (3.88%)
Occupational injuries	4 (3.1%)
Sports injuries	1 (0.77%)
Fracture site	
Frontal	6 (4.66%)
Mid-face	68 (52.71%)
Mandible	20 (15.5%)
Frontal + Mid-face	5 (3.88%)
Frontal + Mandible	1 (0.77%)
Mid-face + Mandible	27 (20.93%)
Frontal + Mid-face + Mandible	2 (1.55%)
Treatment Procedure	
Open reduction/Surgical	47 (36.4%)
Closed reduction/Non-surgical	82 (63.6%)

In table 2, RTAs accounted for 80.62% of cause of trauma and Mid-face was the most affected constituting 52.71% of respondents followed by mid-face and mandible at 20.93%.

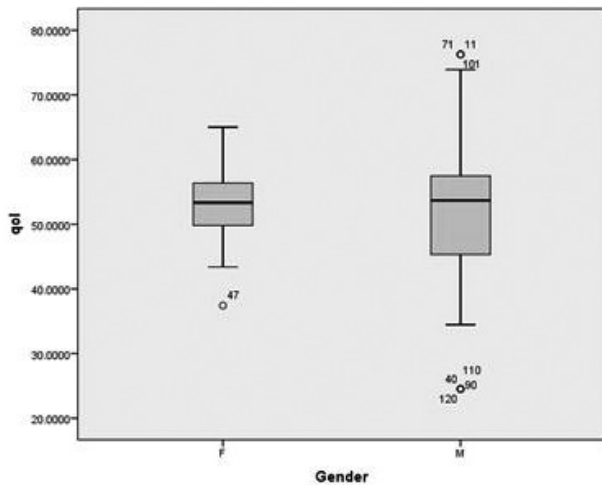


Fig. 1: Box plot comparing the Quality of life among males and females

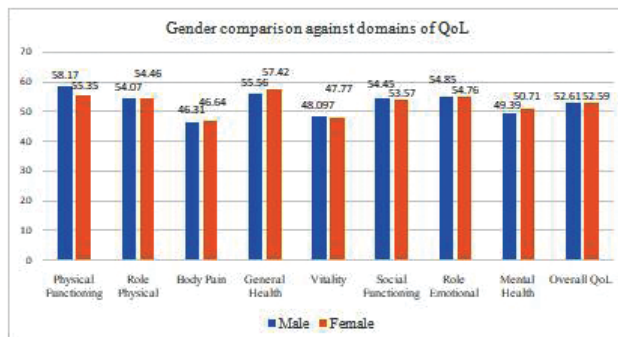


Fig. 2: Gender comparison against 8 domains of Quality of Life

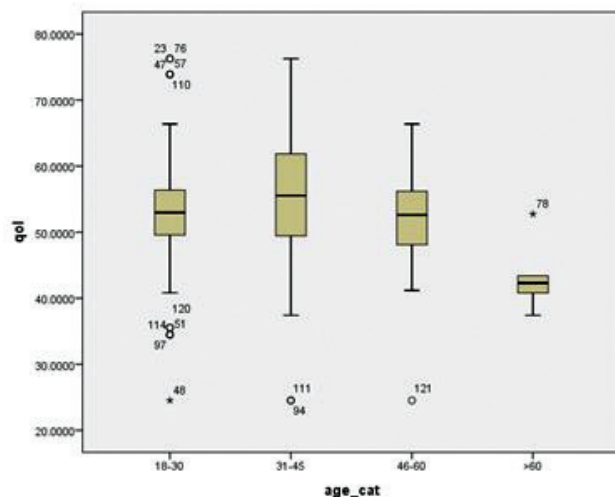


Fig. 3: Box plot comparing the Quality of life among different age groups

DISCUSSION

With a changing population pattern, increasing industrialization and urbanization, there is a rise in episodes of facial injuries, because of which maxillofacial trauma is turning into a burden and leading medical problem in the trauma rooms. Facial trauma is common in assaults and accidents and can be accompanied by distressing psychological sequelae. Numerous factors influence the recovery and rehabilitation from facial trauma, many of which are psychological in nature.

A retrospective study was performed to evaluate the pattern of maxillofacial fractures, associated injuries, and treatment used at AIIMS, New Delhi, between January 2007 and June 2010. The study provided a base for establishing trauma as a major etiology of maxillofacial injuries and planning for preventive strategies. Of the 795 fractures of the maxillofacial skeleton and 86 concomitant injuries from 542 patients, Road traffic accident (RTA) (56.8%) was the most common etiologic factor, followed by falls (22.3%) and fights (18.5%). The age range was from 3 to 75 years (mean-34.7 years) with a peak incidence in the third decade with a male-to-female ratio of 3.7:1. Mandible 615 (77%) was the most common location followed by middle third 180 (23%). Majority of the patients were treated by open reduction and internal fixation (70.6%). Head injury was associated in 16.3% of cases. The researchers also emphasized on the establishment of regionalized, efficient, and focused trauma centres in various parts of the country particularly for acute trauma. Also, the laws regarding the precautions such as use of seat belts, driving as per the prescribed speed limits, and obeying traffic rules must be observed strictly to reduce the incidence of RTA.¹³

A maxillofacial trauma patient not only deals with the physical burden of the injury but also goes through various psychological issues. These range from facial disfigurement to post-traumatic stress disorders accompanied by anxiety and depression. In such cases, the psychological needs of patients with acquired facial trauma are unique. It has been noted that symptoms of depression, anxiety, and hostility were more likely to be reported by patients with maxillofacial trauma when compared to a normal control group for a period of up to 1 year post trauma.¹² The adaption to the normal life post trauma is influenced by medical, social, financial and psychological variables and it is difficult to predict the prognosis and the course of adaption in most of the cases.

Patients with facial trauma also report lower quality of life leading to substance abuse, stigmatization, stress disorders, dejection and lower overall satisfaction with life.¹⁴ Health-related quality of life (HR QoL) of patients with facial trauma was recorded and it was compared with that of healthy controls. A total of 126 patients with facial injuries and 126 healthy controls were recruited for the study for the study. The individuals were measured on WHO Quality of Life Questionnaire and depression was measured with the Hospital Anxiety and Depression Scale (HADS). Scores in all domains of the WHO QoL-Bref (physical, psychological, social relations, and environment) were considerably reduced in injured patients compared with controls. During follow up the researchers found improvements only in the domains of physical health and environment, but not in psychological health. There was a significant reduction in the HR QoL domain of social relationships with time. The regression equation for all four QoL domains as predictors was significantly related to depression scores throughout the study period. Patients with facial injuries are at risk of poor QoL after trauma. There was a high incidence of depression throughout the follow-up period, and poor QoL at baseline predicted depression during follow-up.¹⁵

Another study conducted at Kerman University of Medical Sciences, Iran reported depression and anxiety disorders in patients with maxillofacial trauma. In the study, a cohort of 50 subjects were selected from the patients with maxillofacial traumas and a control group of 50 subjects with no maxillofacial trauma were recruited. Hospital Anxiety and Depression Scale (HADS) and Oral Health Impact (OHIP-14) questionnaires were used. 14% of the subjects were rated as depressed under HADS depression scale, with another 10% borderline cases. However, from the control group only 4% were depressed and 2% of borderline case. The results showed that patients with maxillofacial traumas had higher rates of depression and anxiety, with significant differences between the cohort group and the control group ($P=0.01$). The results showed a significant relation between depression severity and confounding factors. The mean of OHIP-14 parameters were 35.51 ± 5.2 and 22.3 ± 2.4 in cohort and control groups, respectively, with statistically significant differences ($P=0.01$).¹⁶

Patients with all forms of acquired facial disfigurement have many concerns in common, which include challenges in social functioning, body image

adaptation and the possibility for psychological dysfunction.

One study compared plastic surgery patients undergoing treatment for facial cancer with patients undergoing reconstruction for scarring resulting from traumatic injury. Facial cancer patients reported lower levels of depression, anxiety, social concern and concern about their appearance as compared to the facial trauma patients.¹⁷

CONCLUSION

The results of the study show it is very important to provide psychiatric support for all the patients with maxillofacial traumas. Doctors can enhance patients' rehabilitation by keeping themselves updated with the clinical literature on the psychosocial adaptation of patients with acquired facial trauma. It is also vital to follow-up with patients on how they are coping with the social, emotional and psychological changes post trauma care. One should counsel the patients to undergo cognitive-behaviour therapy to address such difficulties, using both formal and self-help methods.

The healthcare provider must ensure that their patients attain the highest level of psychosocial rehabilitation by developing a consistent and trusting relationship with a mental health professional. Clinicians should emphasize this important consideration and also explain it to the patients' relatives who play a major role in rehabilitation of the patient.

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Conflict of Interest: Nil

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Maxillofacial Injuries and Its Implications on Economic Burden in Trauma Victims.

Karan Giriyan¹, Rajesh Kamath², Brayal D'Souza², Sagarika Kamath³, Sneha R. Bhat⁴

¹Final Year Postgraduate Trainee, Master in Hospital Administration Program, ²Assistant Professor, Prasanna School of Public Health, ³Assistant Professor, School of Management, Manipal Academy of Higher Education; ⁴Lecturer, Department of Periodontics, Yenepoya Dental College, Deralakatte, Mangalore, Karnataka

ABSTRACT

Aim: The objective of this study was to assess the Economic burden on the patients with maxillofacial injuries.

Materials and Method: After obtaining institutional ethical clearance, a prospective approach was taken to identify patients admitted with maxillofacial injuries from June 2017 to February 2018. Information related to the nature and severity of injury and treatment were recorded along with the total treatment cost and duration of hospitalization. Maxillofacial injury severity score (MFISS) and facial injury severity scale (FISS) were used to score the maxillofacial injury. To assess the economic burden, the MFISS and FISS scores were correlated with economic burden markers namely cost and duration of hospitalization.

Results: A total of 129 patients with maxillofacial injuries were identified (115 males, 14 females; mean age = 35.14 years). 104 patients (80.62%) were involved in Road Traffic Accidents and only 58 patients (44.96%) were covered under medical insurance. The mean MFISS and FISS scores were 13.62 (standard deviation [SD] = 9.53; range = 3-48) and 2.70 (SD = 1.935; range = 1-10), respectively. The mean expenditure and length of stay in the hospital of the patients were INR 36643.42 (SD = 46165.817; range INR 1657-253948) and 5.5 days (SD = 6.741; range 0-34 days) respectively. Spearman's correlation between the MFISS and FISS scores and the cost and duration of hospitalization, revealed statistically significant correlations (MFISS vs. cost - $R = 0.398$, $P < 0.01$; MFISS vs. duration - $R = 0.477$, $P < 0.01$; FISS vs. cost - $R = 0.429$, $P < 0.01$; FISS vs. duration - $R = 0.433$, $P < 0.01$).

Keywords: Maxillofacial injury, trauma, economic burden, MFISS, FISS

INTRODUCTION

The facial skeleton protects the brain; houses and protects the sense organs of sight, smell, and taste. It provides a framework for the facial muscles to attach onto and help in eating, breathing, facial expressions and speech.¹ The Frontal bone, Maxilla, Zygoma, Nasal bones and Mandible are the important bones forming

the basic structure of the face.²Maxillofacial trauma is any physical injury to the face, which may involve the soft tissue injuries such as cuts, burns and bruises, or fractures of the facial bones such as the fractures of the jaw and nasal bone, as well as eye injuries. The effect of maxillofacial injuries result in interruption of various critical functions of the head and neck region, such as, visual acuity, olfaction, auditory perception, speech, breathing, and eating, which are exceptionally vital for an ordinary day to day living of a person.³This can lead to mental agony in the patients after injury. Mental morbidities are one of the complexities following road traffic accidents and maxillofacial injury.⁴

Corresponding Author:

Dr. Rajesh Kamath,
Assistant Professor, Room no.12, Second floor,
Old Tapmi Building, Prasanna School of Public Health,
Manipal Academy of Higher Education, Karnataka-576104
Mobile : (+91)7760218342
Email: Rajeshkamath82@gmail.com

Emergency physicians and surgical specialists in various specialties like Oral and maxillofacial surgery,

ENT, Neuro surgery, Ophthalmology and Plastic surgery are required to work harmoniously in order to manage multiple trauma victims which accounts for more than 50% .⁵Because of the lack of awareness regarding medical insurance and poor social medical coverage, a major portion of the expenses of the medical services used is borne by the patients' themselves.⁶ Studies have demonstrated that patients with maxillofacial injuries experience the ill effects of severe anxiety issues. In spite of well-known worldwide familiarity with these issues, there is as yet lacking information on mental anxiety in cases of maxillofacial injury.⁷ It is vital to consider that for each death there are numerous survivors who are left with permanent impairing injuries. And the extent of trauma care for these injuries influences the working populace, such that, death or disability diminishes work and their spending capacity.⁸

The World Health Organization (WHO) reports that about 1.25 million people die annually on the world's roads, with 20–50 million sustaining non-fatal injuries.⁹ According to Indian Society for Trauma and Acute Care, India Loses approximately 2-2.5% of its GDP to only Road Traffic Injuries. Transport related Injuries constitutes 22.8% of all trauma cases. Majority of 77.2% accounts for other forms of trauma such as, falls, occupational trauma, intentional self-harm, assault, burns and drowning, natural disaster, terrorist attacks. Every 2 minutes, a trauma-related death occurs in India.¹⁰ Many researchers have published the rate and treatment of facial trauma, all the same, the real cost of dealing with these injuries are not as often as possible revealed.¹¹ In light of the fact, the doctor's choice on the method of treating a patient impact up to 35% of aggregate treatment cost.¹²

The dominant part of treatment costs comprises of the supposed hospitalization costs which include expenses of accommodation, surgery, and drugs which in turn surges with the duration of treatment. When we consider advantages of open treatment procedures, speedy recuperation and higher personal satisfaction weigh down the high expenses incurred in treatment. The study endeavours to evaluate the financial burden incurred post injury. It also explores other options to overcome difficulties so as to make affordable care accessible to the underprivileged.

METHODOLOGY

A cross-sectional study with all cases of maxillofacial injury visiting the trauma center from June 2017 to February 2018 were included. Patients below the age of 18 years, brought in dead patients and patients not willing to participate were excluded from the study. The study included 129 participants treated for maxillofacial injuries by Department of Oral and Maxillofacial Surgery. Data collection was done in relation to social demographics, etiology of injury and the fracture area of maxillofacial region. Clinical information pertaining to the maxillofacial injury and treatment modality of the patient was obtained from the medical records department of the hospital. The pattern of facial injury was determined according to the fractures of frontal bone, mandible, and mid face in relation to the different etiological factors. Patients were scored depending on the nature of their maxillofacial injuries using Maxillofacial Injury Severity Score (MFISS)¹³ and Facial Injury Severity Score (FISS)¹⁴.

For the study, the mandible was divided into condylar, coronoid, ramus, body, symphysis, and dento-alveolar regions. In the middle-third of the face, injuries were recorded as Le Fort, I, II, and III types, zygomatic complex, nasal bones, naso-orbito-ethmoidal complex and dento-alveolar fractures. The frontal sinus and orbital rim were recorded for injuries of the upper face. Etiological factors were classified as road traffic accidents, slip and fall, assault, occupational hazards and sports injuries. For breaking down the financial burden, information on cost and duration of hospitalization was obtained. Cost of hospitalization- The total financial expense incurred by the patient for treatment of the maxillofacial injury which includes pre-treatment investigations, surgical procedures, and post treatment medication, consumables and therapy.

Duration of hospitalization: The number of days from admission until discharge of the patient was taken into account.

Details of hospitalization and treatment procedures, including the nature of treatment, treatment cost (in Indian Rupees [INR]), duration of hospitalization (in days), payment method and medical insurance coverage was obtained from the finance department of the hospital. These variables will be analysed to determine most common gender, age, etiology, fracture site and payment type. The data obtained was then analysed using SPSS on various scales and measures.

RESULTS

A total of 129 patients fulfilling the inclusion criteria were identified. There were 115 male patients and 14 female patients with a mean age of 35.14 years (range = 18-86 years). Road traffic accidents (RTA) were the largest cause of maxillofacial injuries (104 cases, 80.62%), followed by falls (15 cases, 11.63%), interpersonal assaults and sports injuries (16 cases, 12.4%) and industrial accidents (4 cases, 3.1%). (Table 1) The mean MFISS and FISS scores were 13.62 (standard deviation [SD] = 9.53; range = 3-48) and 2.70 (SD = 1.935; range 1-10) respectively. While the mean cost of hospitalization of the patients was INR 36643.42 (SD = 46165.817; range INR 1657-253948), the mean duration of hospitalization was 5.5 days (SD = 6.741; range 0-34 days). (Table 3)

Agreement between the scores and the markers of economic burden were evaluated using Bland-Altman plots (Graphs 1-4). With 58 patients (44.96%) under medical insurance coverage, of the remaining patients, 59 (45.74%) paid for their own medical expense, patient's family paid for 8 (6.2%) of them, while 4 patients (3.1%) were sponsored by their employers. (Table 1) Statistical analysis using Spearman's correlation between the FISS and MFISS scores and the independent variables of cost and duration of hospitalization revealed statistically significant correlations. The FISS scores of the patients showed a positive correlation with the cost ($R = 0.429$, $P < 0.01$) and duration ($R = 0.433$, $P < 0.01$) of hospitalization. Similarly, the MFISS scores of the patients showed a positive correlation with the cost of hospitalization ($R = 0.398$, $P < 0.01$) and duration of hospitalization ($R = 0.477$, $P < 0.01$) (Figs 1-4).

Table 1: Socio-demographic characteristics of respondents

Characteristics	Frequency (%)
Age (years):	
18-30	60 (46.52%)
31-45	42 (32.55%)
46-60	21 (16.28%)
Above 60	6 (4.65%)
Gender:	
Male	115 (89.15%)
Female	14 (10.85%)

Conted...

Medical expenses:	
Self	59 (45.74%)
Family	8 (6.2%)
Employer	4 (3.1%)
Insurance	58 (44.96%)
-Medicare	9 (6.98%)
-Manipal Arogya Suraksha	28 (21.7%)
-Manipal Sampurna Suraksha	4 (3.1%)
-Mukhyamantri Santwana Harish Scheme	12 (9.3%)
-ESI; Corporate TPA	7 (5.4%)
-Charitable trust (Shankar fund; Dr. Hegde fund) (*In addition to other payment methods)	5* (3.88%)

Table 1: The above table shows 60 respondents fall in the age group of 18 to 30 years and only 6 respondents in elderly category, with M: F ratio of 8.9: 1. 44.96% had access to medical insurance whereas 45.74% paid out of pocket.

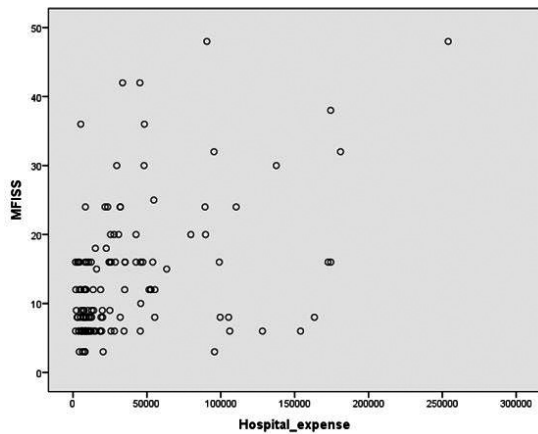
Table 2: Injury and treatment characteristics of respondents

Characteristics	Frequency (%)
Etiology:	
RTA	104 (80.62%)
Slip and Fall	15 (11.63%)
Assault	5 (3.88%)
Occupational injuries	4 (3.1%)
Sports injuries	1 (0.77%)
Fracture site	
Frontal	6 (4.66%)
Mid-face	68 (52.71%)
Mandible	20 (15.5%)
Frontal + Mid-face	5 (3.88%)
Frontal + Mandible	1 (0.77%)
Mid-face + Mandible	27 (20.93%)
Frontal + Mid-face + Mandible	2 (1.55%)
Treatment Procedure	
Open reduction/Surgical	47 (36.4%)
Closed reduction/Non-surgical	82 (63.6%)

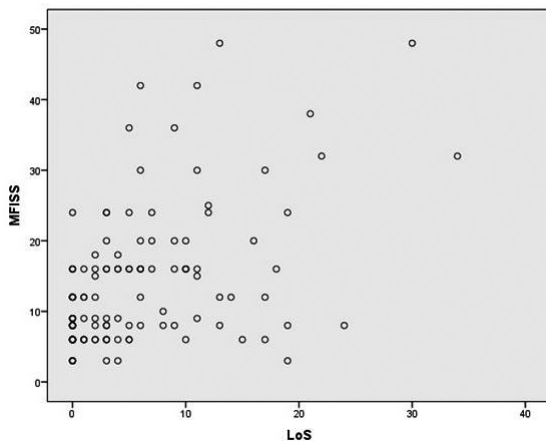
Table 2: RTAs accounted for 80.62% of cause of trauma and Mid-face was the most affected constituting 52.71% of respondents followed by mid-face and mandible at 20.93%.

Table 3: Range scores for Hospital expense, Length of stay, FISS, MFISS among the participants

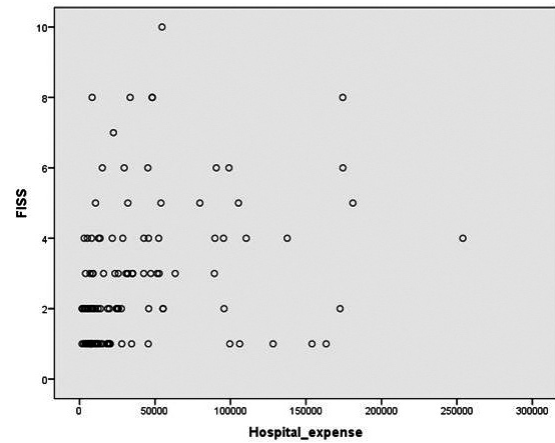
	Minimum	Maximum	Mean	Std. Deviation
Hospital Expense	1657	253948	36643.42	46165.817
Length of Stay	0	34	5.50	6.741
FISS	1	10	2.70	1.935
MFISS	3	48	13.62	9.530



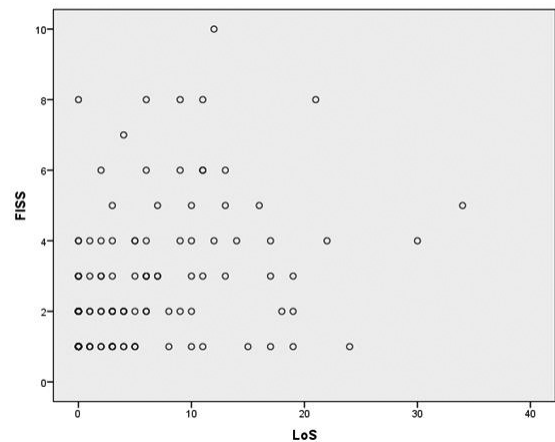
Graph 1: Bland-Altman plot showing the correlation between Maxillofacial Injury Severity Score (MFISS) and the Hospital expense. Rho value – 0.398 (weak positive correlation)



Graph 2: Bland-Altman plot showing the correlation between Maxillofacial Injury Severity Score (MFISS) and the hospital length of stay. Rho value – 0.477 (weak positive correlation)



Graph 3: Bland-Altman plot showing the correlation between Facial Injury Severity Scale (FISS) and the Hospital expense. Rho value – 0.429 (weak positive correlation)



Graph 4: Bland-Altman plot showing the correlation between Facial Injury Severity Scale (FISS) and the hospital length of stay. Rho value – 0.433 (weak positive correlation)

DISCUSSION

The injury severity measurement is a widely discussed topic and commonly executed approach. It is a very useful in determining the possible prognosis, treatment outcomes in trauma patients, and also to assess the cost of injuries post trauma.¹³ The available scoring systems does not focus solely on the maxillofacial region and in few circumstances the importance of such injuries have been undermined. The development of trauma specific scoring system can aid the clinician in classifying and prompt assessment of such injuries.

The Maxillofacial Injury Severity Score (MFISS) proposed by Zhang et al. limits the evaluation of injuries to the maxillofacial region setting aside of other bodily

injuries that may be present in the patient. It made use of the Abbreviated Injury Scale (AIS). MFISS is designed for selecting the three highest maxillofacial injury severity scores according to the AIS-90 standard and then combine them with the ISSs for three maxillofacial functional parameters: malocclusion (MO), limited mouth opening (LMO) and facial deformity (FD). MFISS being a derivative of AIS, inherits the problems in evaluation of comminution. Another drawback being the functional parameters cannot be recorded in retrospect.¹⁴

Facial Injury Severity Score (FISS) on the other hand, includes the classification of laceration of the facial soft tissue and that of bone. Here, the facial bones are divided into the upper, middle, and lower thirds, with an addition of 1 item for facial laceration. However, because of insufficient description of the classification of bones, it cannot be used to distinguish displaced and comminuted fractures.¹⁵ In a study reported by Ramalingam S, the treatment expenses borne by the patients as a result of traumatic injuries was analysed retrospectively in a small subset of the South Indian population. It was interesting to note, only 17.9% of the studied patients had access to medical insurance, and the remaining patients managed their medical expenses out of pocket. The author found a direct relationship between the length of hospitalization and the burden of expenditure. Furthermore, a positive correlation was found between the MFISS score and the duration of hospitalization ($R = 0.828$, $P < 0.01$), and that with the cost of treatment ($R = 0.862$, $P < 0.01$).⁶

In another study by Chen et al. to select a scoring system which will be suitable for the scoring of maxillofacial trauma by comparing four commonly used scoring systems. For this study, twenty-eight subjects who had experienced maxillofacial trauma were recruited as the cohort. Four commonly used systems were selected: New Injury Severity Score (NISS), Facial Injury Severity Scale (FISS), Maxillofacial Injury Severity Score (MFISS), and Maxillofacial Injury Severity Score (MISS). Each patient was graded using these 4 systems. An expert scoring table was created, using their experience at the trauma centre. The injuries of these 28 patients was graded by 35 experts in maxillofacial surgery, using the expert scoring table according to their clinical experience. A normal distribution was demonstrated by the results of the 4 scoring systems and expert score. A significant difference ($P < .01$) was

also noted. Pearson correlation coefficient between the MFISS and expert score was the greatest (0.801). They also found the correlation coefficient between the NISS, FISS, and MISS and the expert score to be 0.714, 0.699, and 0.729, respectively. In comparison with the other 3 scoring systems, the correlation and agreement between the MFISS and expert score was greater. Their finding suggested that the MFISS is more suitable for scoring maxillofacial injuries.¹⁶

CONCLUSION

The practice of assessment of maxillofacial trauma has come a long way. Availability of trauma specific scoring systems can aid clinicians in evaluating and assessing cases of high severity with gross comminution.¹³ From the present study, using MFISS and FISS we can not only predict indicators of maxillofacial injury severity, but also use the scores as indicators of the economic burden to the patient as a result of maxillofacial injury. The study involved only a small subset of the population. A multi-centre study would be helpful to obtain a bigger picture of the injured population.

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Conflict of Interest: Nil.

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Study of the Impact of Quality of Patient Care on Discharge against Medical Advice Patients in a Tertiary Care hospital

Aswathi Raj L¹, Rajesh Kamath², Somu G.³, Biju Soman¹, Brayal D'Souza⁴, Sagarika Kamath⁵, Sneha R. Bhat⁶

¹Final Year Postgraduate Trainee, Master in Hospital Administration Program, ²Assistant Professor, Prasanna School of Public Health, Manipal Academy of Higher Education; ³Professor and Head of the Department, Department of Hospital Administration, Kasturba Medical College Manipal Academy of Higher Education, Karnataka; ⁴Assistant Professor, Prasanna School of Public Health, Manipal Academy of Higher Education; ⁵Assistant Professor, School of Management, Manipal Academy of Higher Education, Karnataka; ⁶Lecturer, Department of Periodontics, Yenepoya Dental College, Deralakatte, Mangalore, Karnataka

ABSTRACT

A cross sectional study was conducted with a sample size of 200. Among the 200 cases of DAMA, 7.5% of cases were in the age range of 15–25 years, 11% were in the age range of 26–30 years, 19% were in the age range of 36–45 years, 16.5% were in the age range of 46–55 years, 20% were in the age range of 56–65 years. 26% were above the age of 65 years. 35.5% of patients who took discharge against medical advice were illiterate (n = 200), followed by 28.5% with secondary education. The least number was distributed among pre-degree and graduation (5%, 14%). The peak DAMA rate was seen among dependent participants (43.5%), followed by the self-employed (36%) and private employees (15%). The least was noted among government employees (5.5%). 68% of the cases were diagnosed with acute illness and 32% were diagnosed with chronic illness. DAMA cases were considered from 11 units of in-patient service such as Medicine, Gastrology, Neuro Surgery, Neurology, Pulmonary Medicine, Obstetrics and Gynaecology, Orthopaedic Surgery, Oncology and Cardiology. The reasons for DAMA can be considered under two categories: patient related factors and hospital related factors. Patient related factors include the following: Wanting to go to another hospital (77.5%), financial burden (53%), no improvement in condition (45%), distance from hospital (43.5%), unsatisfied with treatment (43.5%), worsening of symptoms (18.5%), family issues (9.5%), re-admission (7.5%), influenced by other patients (1%) and language barrier (0.5%). Medical conditions included addiction to alcohol (2%) and decision to go for alternative treatment (2%). The hospital related factors were: Expensive hospital stay (60%), ineffective care (28.5%), inefficient staff (27%), unnecessary diagnostic procedures (25.5%), long waiting time (18%), neglected by hospital staff (16%), uncomfortable hospital stay (11.5%), crowded hospital (4%), inadequate facilities (3.5%), improper communication by staff and strict hospital policies (3%). The third objective was to assess the impact of the quality of patient care on discharge against medical advice patients in a tertiary care hospital. The study result shows that Quality related issues do have a significant impact on DAMA. The quality related issues consist of the following sub areas: Wanted to go to other hospital (77.5%), no improvement in patient condition (45%), unsatisfied with treatment (44.5%), inefficient staff (27%), ineffective care (20.5%), worsening of symptoms (18.5%), neglected by hospital staff (16%) and uncomfortable hospital stay (11.5%).

Corresponding Author:

Dr. Rajesh Kamath
Assistant Professor,
Room No.12, Second floor, Old Tapmi Building,
Prasanna School of Public Health,
Manipal Academy of Higher Education, Karnataka-576104
Mobile: (+91)7760218342
Email: Rajeshkamath82@gmail.com

Keywords: Discharge against medical advice;
Quality of patient care

INTRODUCTION

DAMA (Discharge against medical advice) is when a patient leaves a hospital against the advice of their doctor. There are wide spread legal and ethical

concerns that competent patients are entitled to decline recommended treatment.¹In general,patients discharged AMA (against medical advice) have an increased risk of hospital readmission,potentially death.¹

Although common hospital practice for an AMA discharge involves the patient being asked to sign a form stating that he or she is aware that they are leaving the facility AMA, releasing the hospital from liability,the hospital is generally not legally required to do so. Rather,the legal and ethical requirement is that the authorised healthcare professional has an informed consent discussion with the patient regarding the DAMA.This discussion which includes the disclosure of the risks,benefits and alternatives to hospitalization must be in a manner and language that the patient understands. It should be documented in the patient's chart. While most practitioners believe that the AMA discharge form is needed to limit liability on the part of medical facility in case there are complications,critics call this an invalid assumption that may in fact lead to coercive practices that do not support patients.¹

Prior to discharging a patient against medical advice, the physician should be convinced that the patient has given an informed refusal and had an opportunity to ask questions. The physician must determine and document that the patient is functionally competent.²Leaving the hospital against the physician's advice may expose the patient to the risk of an inadequately treated medical problem and result in a need for readmission.³Understanding why patients choose to leave the hospital AMA has obvious importance because of the potential to identify those at higher risk and therefor intervene earlier to prevent excess morbidity,mortality,and healthcare costs.³A high DAMA rate could be an indicator of poor healthcare quality.

Patients with Asthma who were DAMA had a four times higher risk of readmission to the emergency department within thirty days and a three times higher risk of readmission to the hospital within thirty days. Ayed found that DAMA cases in general medicine have a seven times higher chance of getting readmitted within 15 days.40% of them had a risk of death or repeat admission for myocardial infarction or unstable angina within two years of discharge.³ Both payers and physicians tend to interpret a shorter length of stay as a favourable outcome because of lower short-term costs and reduced exposure to the potential risks of a hospital stay. Furthermore, evidence is accumulating to indicate

that many hospital stays last longer than the period of acute illness,with uncertain,if any,additional benefit over shorter stays.⁴

The identification of demographic factors associated with discharge against medical advice might help health care administrators to predict such occurrences,but they might not be particularly helpful for clinicians or patients. Patients need to be interviewed to find out what motivates them to leave in the face of medical advice.⁴Many patients do not trust medical care providers,because of their experiences with inadequate progress in their condition,improper treatment and poor attitudes of health care providers toward the poor. This lack of trust interferes with communication regarding the diagnoses, prognoses and appropriate treatment.⁴Direct communication of the reasons for continuing the hospital stay,involvement of patients in decision making,specific advice about treatment and empathy with the difficulties associated with being in hospital are associated with a decrease in discharges against medical advice.⁵

DAMA occurs in both inpatient wards and emergency departments. The majority of studies on DAMA have been done on inpatients. The phenomenon of DAMA is worldwide and is not limited to the developing world⁵. It is prevalent in both rural and urban settings. However,research in this area has generally focused on large urban hospitals and on specific patient groups, such as general medicine and psychiatric patients. Reports of DAMA incidence vary widely,from >20% in large urban hospitals,especially among alcoholics,drug abusers and psychiatric patients,to <4% for medical admissions and <1% in small rural hospitals.⁶

Patients with a significant probability of leaving the hospital against medical advice can often be identified on the basis of their medical histories or on the basis of their behaviour while in the hospital. Such behaviour can be mentioned in the nursing notes.⁶ The factors influencing DAMA fall within two broad categories: patient variables—socio-demographic characteristics,diagnosis,treatment history, behaviour; and attitudes toward treatment—and provider variables—hospital setting and structure,staffing patterns,admission and discharge policies,and physicians' clinical style and experience. Regarding patients' demographic data,results have been diverse and sometimes conflicting.However,certain trends have emerged : Younger age,male gender,absence of insurance,low socio-economic status,history of alcohol and drug abuse,history

of psychiatric illness, inadequate social support, lack of a primary care physician and a past history of DAMA all have been reported as risk factors for DAMA.⁷ Other factors that can lead to DAMA are: a punitive or threatening atmosphere in the inpatient unit, difficulties in the doctor-patient relationship, inadequate unit staffing patterns and a perceived lack of progress in patient care.^{7,8,9}

Aim: To study the impact of quality of patient care on discharge against medical patients in a tertiary care teaching hospital.

OBJECTIVES

1. To study the cases of Discharge against medical advice.
2. To ascertain the reasons for Discharge against medical advice.
3. To assess the impact of quality of patient care on Discharge against medical advice patients.

METHOD AND METHODOLOGY

Research Approach: Cross sectional study

Research Design: Cross sectional study design.

Study Period: June 2016 to May 2017.

Data Collection Period: October 2016 to April 2017.

Study Setting: Kasturba hospital, Manipal.

Study Population: Discharge against medical advice patients.

Sample Size: 200.

Sampling Technique: Purposive sampling.

Inclusion Criteria: Discharge against medical advice cases during the study period.

Exclusion Criteria: Cases of death, out patients

Study Tool: Structured questionnaire.

RESULT

The data is organised in five sections

Section 1: Frequency distribution of demographic variables with regard to the DAMA patients.

Section 2: Frequency distribution of responses to the questionnaire.

Section 3: Identification of various reasons for choosing DAMA.

Section 4: Association of demographic variables with the reasons for DAMA

Section 5: Association of healthcare quality related reasons with DAMA.

Total number of discharges and DAMAs for the period of seven months from October 2016 to April 2017 was 40,000 and 525 respectively.

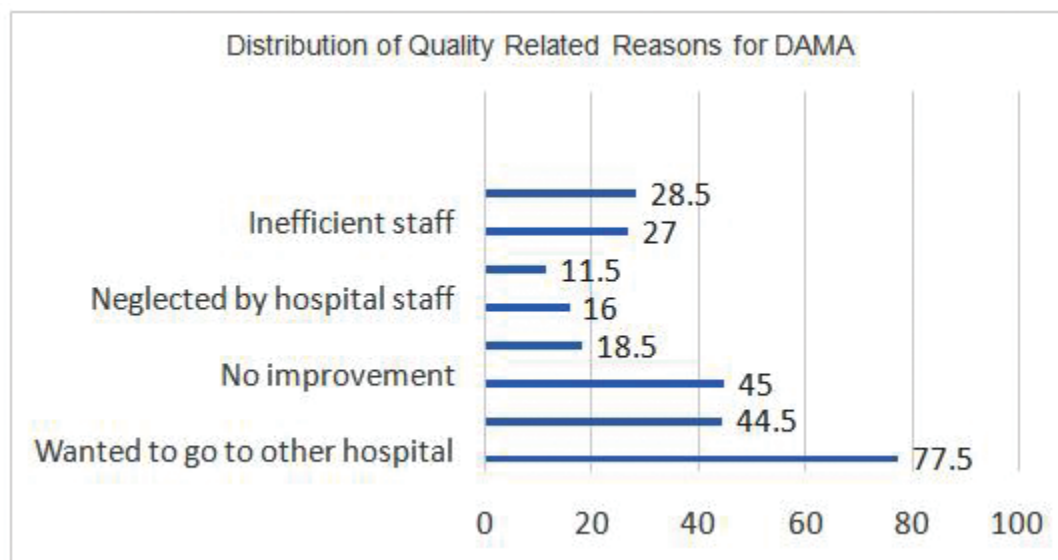


Figure 1: Distribution of Quality Related Reasons for DAMA

Table 1: Association between demographic variables and reasons for DAMA

Variable	X ² Value	P-Value	Significance
Education* Financial Burden	39.537	0.001	√
Education* Expensive Hospital Stay	35.995	0.003	√
Occupation* Financial Burden	22.600	0.031	√
Occupation* symptoms are aggravated	17.415	0.043	√
Occupation* no improvement	21.373	0.011	√
Occupation* expensive hospital stay	21.280	0.046	√
Diagnosis*no improvement	8.282	0.041	√

Table 2: Association of diagnoses with no satisfaction with treatment, wanting to change hospitals, inefficient staff, unnecessary tests, long waiting time, uncomfortable hospital stay, neglected by hospital staff

Variable	X ² Value	P-Value	Significance
Diagnosis* No satisfaction with treatment	11.306	0.010	√
Diagnosis* Wanting to change hospitals	14.695	0.012	√
Diagnosis* Inefficient staff	12.500	0.014	√
Diagnosis* Unnecessary tests	27.995	0.000	√
Diagnosis* Long waiting time	18.970	0.001	√
Diagnosis* Uncomfortable hospital environment	19.738	0.001	√
Diagnosis* Neglected by hospital staff	26.467	0.000	√

Table 3: Association of length of stay and speciality with financial burden, inadequate facilities, inefficient staff, hospital crowd, family problems and aggregative symptoms.

Variable	X ² Value	P-Value	Significance
Length of stay* Financial burden	9.990	0.041	√
Length of stay* inadequate facilities	11.505	0.021	√
Length of stay* inefficient staff	9.948	0.041	√
Length of stay* Hospital crowd	9.5948	0.048	√
Speciality* Family problems	15.575	0.011	√
Speciality* Financial burden	88.689	0.000	√
Speciality* Aggregative symptoms	58.034	0.002	√

Table 4: Association between speciality and hospital related reasons for DAMA

Variable	X ² Value	P-Value	Significance
Speciality* No improvement in condition	49.735	0.013	√
Speciality* Unsatisfied with treatment	45.538	0.034	√
Speciality* Want to go to another hospital	87.590	0.001	√
Speciality* Ineffective care	56.522	0.043	√
Speciality* Hospital crowd	56.261	0.046	√
Speciality* Expensive hospital stay	83.274	0.000	√
Speciality* Unnecessary tests	26.840	0.003	√
Speciality* Long waiting time	64.843	0.008	√
Speciality* Uncomfortable hospital environment	80.681	0.000	√

DISCUSSION

The reported incidence of LAMA shows great variation depending upon the patient population and the type of treatment setting. It ranges between more than 20% in large urban hospitals, especially among alcoholics, drug abusers and psychiatric patients, to less than 4% for medical admission and less than 1% in small rural hospitals and medical wards. Underreporting is a reality. LAMA studies in children are scanty.^{6,10}

Multifactorial reasons for DAMA are dissatisfaction with the care, expectations of a shorter stay not being fulfilled, the need to take care of personal, family or financial affairs, patients feeling better, patients not improving, patients not receiving adequate nursing/medical care, preference for another hospital, beliefs that the condition was terminal, dislike of the hospital environment, not wanting to be used for learning/teaching purposes, and financial burden. Complications of DAMA include worsening of health status, occurrence of chronic diseases from acute stage, and death of patients. Skilful communication, flexible routines, policies and procedures, negotiable management options, good clinical care and thorough documentation constitute the corner stones of dealing with the problem of DAMA.¹¹

Moyse observed that DAMA accounted for 5.6% of total admissions. The main reason for DAMA was related to patient factors (43.9%), with hospital environment and medical staff being reported as reasons by 41.2% and 35.2% respectively. The majority of patients (65.9%) reported not being informed about the complications of their decision.¹²

A prospective study on DAMA was conducted at Federal Staff Medical Centre, Abuja, with the aim of prospectively evaluating the process of DAMA and suggesting strategies to reduce it. All consecutive patients who got DAMA from the medical centre during the study period (2013 – 2014) were included in the study.¹³

Every year in the region of Federal staff medical centre, Abuja, thousands of people leave the hospital before treating physicians recommend discharge. The phenomenon of discharge against medical advice can lead to serious clinical, ethical and legal challenges to physicians as well as the hospital.¹³ Brook et al observed that the overall DAMA rate was 2.1% within the study period. 66 males (44.6%) and 78 females (55.4%)

were discharged against medical advice: with ages ranging from 2 hours to 85 years. The data showed that the majority of patients who have DAMA were paediatric cases (44.6%), while obstetric/gynaecological/surgical and internal medical patients accounted for 34 (24.1%), 26 (18.4%) and 18 (12.7%).¹³

Diagnoses of DAMA by closed long bone fractures represented the highest number of DAMA (24.8). Infections, severe hypertension, severe malaria and neonatal jaundice were diagnosed in 27 (19.1%), 20 (14.2%), 18 (12.8%) and 17 (12.0%) patients respectively. Other diagnoses included severe dehydration secondary to acute gastroenteritis (7.8) and complicated diabetes mellitus (5%).¹³ The most commonly cited reasons for discharge against medical advice were financial constraints (32.6), dissatisfaction with management plan (7.1%), feeling of wellness (13.5%), seeking alternative therapy (17.7%), tiredness of staying in the hospital (12.1%), attending to personal or family matters (4.3%) and unspecified 12.8%.¹³

Jeffer discusses the prevalence and risk of discharge against medical advice to the quality of healthcare. AMA discharges continue to be a highly prevalent problem in healthcare, accounting for 2% of all hospital discharges. Patients discharged AMA are at a higher risk for morbidity and mortality. Patients with asthma who were discharged AMA had four times higher risk of readmission to the emergency department within 30 days (21.7% vs. 5.4%) and almost a three times higher risk of readmission to the hospital within 30 days (8.5% vs. 3.2%). In the general medicine service, patients who left AMA were 7 times more likely to be readmitted within 15 days (21% vs. 3%). Patients who left AMA had a 40% higher risk of death or readmission for myocardial infarction or unstable angina up to two years after discharge. In a review of medical records, Link et al found a 15.7% mortality rate after one year of discharge among 57 patients discharged AMA. Using a case control design, Corley and Link found 19% mortality at six months among 33 medical patients who left AMA from a Veterans Affairs institution.^{14,15} Very little data is available on the estimated total cost to the health care system of unanticipated AMA discharges. Multiple studies have found that patients who leave AMA are at risk for early readmission which can result in higher healthcare costs.

The second objective was to identify the reasons for discharge against medical advice. Among the 200 cases of DAMA, 7.5% of cases were in the age range of 15–25 years, 11% were in the age range of 26–30 years, 19% were in the age range of 36–45 years, 16.5% were in the age range of 46–55 years, 20% were in the age range of 56–65 years. 26% were above the age of 65 years. 71.5% of DAMA cases were males. 28.5% were females. 169 patients stayed more than 22 kilometres away from the hospital and 31 patients stayed within 22 kilometres of the hospital.

35.5% of patients who took discharge against medical advice were illiterate ($n = 200$), followed by 28.5% with secondary education. The least number was distributed among pre-degree and graduation (5%, 14%). The peak DAMA rate was seen among dependent participants (43.5%), followed by the self-employed (36%) and private employees (15%). The least was noted among government employees (5.5%). 68% of the cases were diagnosed with acute illness and 32% were diagnosed with chronic illness. DAMA cases were considered from 11 units of in-patient service such as Medicine, Gastrology, Neuro Surgery, Neurology, Pulmonary Medicine, Obstetrics and Gynaecology, Orthopaedic Surgery, Oncology and Cardiology.

The reasons for DAMA can be considered under two categories: patient related factors and hospital related factors. Patient related factors include the following: Wanting to go to another hospital (77.5%), financial burden (53%), no improvement in condition (45%), distance from hospital (43.5%), unsatisfied with treatment (43.5%), worsening of symptoms (18.5%), family issues (9.5%), re-admission (7.5%), influenced by other patients (1%) and language barrier (0.5%). Medical conditions included addiction to alcohol (2%) and decision to go for alternative treatment (2%).

The hospital related factors were: Expensive hospital stay (60%), ineffective care (28.5%), inefficient staff (27%), unnecessary diagnostic procedures (25.5%), long waiting time (18%), neglected by hospital staff (16%), uncomfortable hospital stay (11.5%), crowded hospital (4%), inadequate facilities (3.5%), improper communication by staff and strict hospital policies (3%).

The third objective was to assess the impact of the quality of patient care on discharge against medical advice patients in a tertiary care hospital. The study

result shows that Quality related issues do have a significant impact on DAMA. The quality related issues consist of the following sub areas: Wanted to go to other hospital (77.5%), no improvement in patient condition (45%), unsatisfied with treatment (44.5%), inefficient staff (27%), ineffective care (20.5%), worsening of symptoms (18.5%), neglected by hospital staff (16%) and uncomfortable hospital stay (11.5%). Inferential statistical analysis shows a significant association between the demographic variables like education and financial burden and expensive hospital stay ($p < 0.05$).

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Body Mass Index and Suicide

Jayanthi Yadav¹, Sujeet Kumar Samadder², Rajneesh Kumar Pandey³

¹*Additional Professor, Forensic Medicine & Toxicology, All India Institute of Medical Sciences, Bhopal;*

²*Assistant Professor, Forensic Medicine & Toxicology, Mahaveer Institute of Medical Sciences, Bhopal;*

³*Forensic Medicine & Toxicology, Gandhi Medical College, Bhopal*

ABSTRACT

Background: In recent years a growing body of evidence have suggested an association of Body Mass Index with suicide. Most researches favoured inverse linear relationship between the two i.e. suicide decreases with increase in body mass index. The current research aims to find out mean body mass index score difference between suicide and non-suicide groups and to examine the association between body mass index and suicide in Indian scenario.

Method: Case-control study was conducted in the Department of Forensic Medicine and Toxicology, Gandhi Medical College, Bhopal. 171 study sample (cases N = 121, controls N = 50) brought for medicolegal autopsy were selected. Height and weight measured, body mass index calculated and categorised. Data were analysed using R version 3.3.3.

Conclusion: Victims of suicide had lower mean body mass index compared to control ($p < 0.001$). The study resulted in inverse linear relation between body mass index and suicide between BMI $< 18.5 \text{ kg/m}^2$ to 24.99 kg/m^2 . Association between BMI and suicide is inverse but not strong in overweight.

Keywords: *Body Mass Index, Suicide, Autopsy, Manner of death.*

INTRODUCTION

Body Mass Index¹ (BMI) is an anthropometric index of obesity based on weight and height, defined as weight in kilograms divided by height in meters square (kg/m^2). BMI, as a measure of relative obesity, has flaws most importantly the index cannot distinguish between heaviness due to adiposity, muscularity, or edema.² Despite this flaw, BMI has great merit that the measurements can be made easily with a fair degree of accuracy. These advantages are widely utilized in epidemiology, and in individual patient assessment. Current classification system of obesity is based on BMI.³

Suicide is the act of deliberately killing oneself.⁴ It is described in International Statistical Classification

of Diseases and Related Health Problems 10th Revision (ICD-10) as Intentional self-harm (X60-X84).⁵ In year 2015, worldwide, about 8,00,000 people committed suicide.⁶ In India, during the same period, 1,33,623 persons committed suicide.⁷

Anthropometric indices of obesity as predictor of suicide was first studied by Paffenbarger and Asnes (1966).⁸ In recent years a number of studies have reported the association of BMI and suicide, with generally similar results—a stepwise lower risk of completed suicide with heavier BMI, throughout the normal, overweight, and obese ranges (i.e., from 18.5 to $\geq 30 \text{ kg/m}^2$). Cumulatively the studies suggest an association is not by chance alone.⁸⁻¹³ In a few studies no association could be found.¹⁴⁻¹⁶

Most of the studies relating BMI to suicide were conducted in the Western countries. The objective of the current study is to examine the difference between mean BMI score between cases (suicide group) and controls (non-suicide group) and to find out association, if any, between BMI with the suicide in a postmortem study in Indian scenario.

Corresponding Author:

Rajneesh Kumar Pandey
L-504, Signature Residency,
Shirdipuram, Kolar Road, Bhopal (M.P.)-462042
Mobile: 8965090480
Email: rajneesh.nightwalker@gmail.com

METHOD

The case-control study was conducted in the Department of Forensic Medicine, Gandhi Medical College, Bhopal (M.P.) during the period September, 2014 to November, 2015. Study samples (N = 171) were deceased brought by police for medicolegal autopsy. Cases (N = 121) were those who committed suicide whereas controls (N = 50) had manner of death other than suicide.

History of the incidence was obtained from inquest papers, hospital records and from available relatives. Death-to-postmortem interval was estimated from hospital records, inquest papers, and history. In cases where information differs between inquest papers and history by relatives, the time when the deceased was last seen alive was used as a proxy for time since death. Length (vortex-to-heel) and weight of the deceased were taken in supine position, after removing clothes and articles. Weight was measured on digital weighing scale with accuracy upto 0.020 kg. Deceased body length was taken by placing two vertical aluminum

square tubes, one at head end and another at heel. The horizontal distance between the two aluminum tubes were measured using another metallic tube mounted with measuring tape (accuracy upto 0.01 meter). Weight and length were measured up to two decimal places. BMI was calculated using the following formula. BMI obtained was categorized according to standard weight status categories (Table 1).

$$\text{BMI (in kg/m}^2\text{)} = \text{Weight (in kg)} / (\text{Height (in meter)}^2)$$

Known cases of suicide brought for medicolegal autopsy; both genders, male and female; and samples with age between 15 to 60 years were included in the study. Exclusion criterias were decomposed or mutilated bodies; duration of hospitalization more than 24 hours, death-to-postmortem interval more than 24 hours, clinical history of ascites, renal disease or cardiovascular disease and, in case of females, history of or postmortem finding of pregnancy.

Statistical analysis were performed using R version 3.3.3 after removing the identification data. A two-tailed p-value < 0.05 was considered statistically significant.

Table 1: The International Classification of adult underweight, overweight and obesity according to BMI

Classification		BMI (kg/m ²)	
		Principal cut-off points	Additional cut-off points
Underweight		< 18.50	
	Severe thinness		< 16.00
	Moderate thinness		16.00 - 16.99
	Mild thinness		17.00 - 18.49
Normal range		18.50 - 24.99	18.50 - 22.99
			23.00 - 24.99
Overweight		≥ 25.00	
	Pre-obese	25.00 - 29.99	25.00 - 27.49
			27.50 - 29.99
Obese		≥ 30.00	
	Obese class I	30.00 - 34.99	30.00 - 32.49
			32.50 - 34.99
	Obese class II	35.00 - 39.99	35.00 - 37.49
			37.50 - 39.99
	Obese class III	≥ 40.00	

Table 2: Distribution of study population according to BMI

BMI categories	Study Sample							Total
	Case			Control				
	N	Ncol%	Nrow%	N	Ncol%	Nrow%	N	Ncol%
Underweight	29	24%	94%	2	4%	6%	31	18.13%
Normal	81	67%	69%	37	74%	31%	118	69%
Overweight	11	9%	50%	11	22%	50%	22	12.87%
Total	121	100%	70.76%	50	100%	29.24%	171	100%

Table 3: Descriptive Statistics

Study Sample	BMI Category	N	BMI (Mean $\pm$ SD) (kg/m ²)
Complete sample		171	21.24 $\pm$ 2.92
Case		121	20.39 $\pm$ 2.63
	Underweight	29	17.37 $\pm$ 0.77
	Normal	81	20.67 $\pm$ 1.35
	Overweight	11	26.32 $\pm$ 1.04
Control		50	23.27 $\pm$ 2.58
	Underweight	2	18.32 $\pm$ 0.01
	Normal	37	22.43 $\pm$ 1.59
	Overweight	11	27.02 $\pm$ 0.83

Table 4: Comparison of Group Means

Groups	t (df)	p-value	95% CI
Case vs. Control	t(169) = -6.55	< 0.001	-3.75, -2.01
Underweight (Case vs. Control)	t(28.26) = -6.67	< 0.001	-1.24, -0.66
Normal (Case vs. Control)	t(116) = -6.21	< 0.001	-2.32, -1.12
Overweight (Case vs. Control)	t(20) = -1.75	0.096	-1.54, 0.14
Case (Underweight vs. Normal)	t(87.06) = -15.99	< 0.001	-3.71, -2.89
Case (Normal vs. Overweight)	t(90) = -13.35	< 0.001	-6.49, -4.81
Case (Underweight vs. Overweight)	t(38) = -29.88	< 0.001	-9.55, -8.34
Control (Underweight vs. Normal)	t(36.1) = -15.75	< 0.001	-4.64, -3.58
Control (Normal vs. Overweight)	t(32.58) = -12.67	< 0.001	-5.33, -3.85
Control (Underweight vs. Overweight)	t(10.03) = -34.56	< 0.001	-9.26, -8.14

Table 5: Analysis of linear trend between BMI and suicide

BMI category	Case	Control	Odds Ratio	X ²	p-value
Underweight	29	2	1.00	13.46	< 0.001
Normal	81	37	0.15		
Overweight	11	11	0.07		

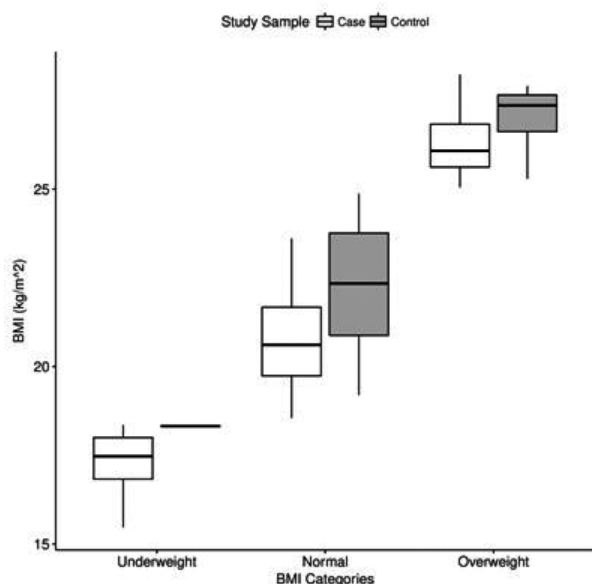


Figure 1: Difference of Mean between Cases and Controls by BMI categories

RESULTS

Study sample (N = 171) comprises of 70.76% cases and 29.24% controls. Normal BMI category (18.50 – 24.99 kg/m²) forms 69% of the study population (N = 118). Underweight (18.13%, N = 31) and overweight (12.87%, N = 22) forms the rest. No study sample, either case or control, with BMI ≥ 30 kg/m² was found during the study period.

Significant difference ($t(169) = -6.55$, $p < 0.001$, 95% CI: -3.75, -2.01) in mean BMI score between cases (20.39 ± 2.63 kg/m²) and controls (23.27 ± 2.58 kg/m²) suggests, overall, BMI does have an effect on manner of death. Difference in mean BMI between cases and controls in underweight and in normal BMI categories were also significant ($p < 0.001$). In overweight, comparison of mean between case (26.32 ± 1.04 kg/m²) and control (27.02 ± 0.83 kg/m²) was not significant ($p > 0.05$). (Figure 1)

BMI (underweight vs. normal) differs significantly between suicide and control samples ($X^2(1, N = 149) = 7.88$, $p < 0.001$). Significant difference was also observed for BMI (underweight vs. overweight) between cases and controls ($X^2(1, N = 53) = 13.13$, $p < 0.001$). In contrast, BMI (normal vs. overweight) do not differ significantly between cases and controls ($p > 0.05$).

Linear trend between BMI and suicide show that, overall, death by suicide decreases with increase in BMI

($X^2 = 13.46$, $p < 0.001$). The odds ratio compared with BMI < 18.50 kg/m² were 0.15 and 0.07 for BMI 18.50–24.99 kg/m² and BMI 25.00–29.99 kg/m² respectively.

DISCUSSION

This case-control study was conducted on 171 postmortem samples (121 suicide and 50 control) to explore the mean BMI score difference between cases and controls; and to explore the association between BMI and suicide.

In the current study the cause of small sample size is stringent inclusion and exclusion criteria, so the BMI is least affected by antemortem pre-existing disease and/or by postmortem changes. The present study is the first study, to the best of our knowledge, to relate obesity to suicide in Indian setting.

Samples in the current study belong to both genders, age from 15 to 60-years and both married and unmarried. As suicide is observed in both genders, this study included both male and female; this is in contrast with the studies where study participants were male only.^{9,10} Most of the researches were done in age > 18 years old population, except for the study conducted in 11 Caribbean Islands¹⁵ which included age group 15–100 years in the study. The present study included cases between 15 to 18 years, provided they fulfill selection criteria, keeping with the finding of National crime record bureau (NCRB). According to NRCB in 2015, 7% of suicides occurred in the age group below 18 years.⁷ On the other hand, samples over age > 60 years were excluded from the study, because in older age group many possible disease confounders may be present which may affect the results of the study.

In the study BMI ≥ 30 kg/m² were not found fulfilling the selection criteria. Hence, the study was restricted to underweight, normal and overweight BMI categories. The study resulted in a significant difference in mean BMI score between cases (20.39 ± 2.63 kg/m²) and controls (23.27 ± 2.58 kg/m²), $p < 0.001$. The finding is consistent with other studies. In this study comparison of mean of overweight subgroup between case (26.32 ± 1.04 kg/m²) and control (27.02 ± 0.83 kg/m²) was not significant ($p > 0.05$). These results suggest that overall, BMI does have an effect on manner of death.

The current study shows suicide decreases with increase in BMI in underweight, normal and overweight

BMI categories. Odds ratio between BMI groups compared to underweight were 0.15 and 0.07 for normal and overweight groups respectively ($= 13.46, p < 0.001$). This suggest decrease in suicide with increase in BMI from Underweight to Overweight. The study suggests an inverse linear tendency between BMI and suicide. This inverse linear relation between BMI and suicide is supported by studies despite racial and geographical differences.^{9-12,17}

In contrast to present study a prospective cohort of 1.1 million adults resulted in nearly equal adjusted hazard ratios for completed suicide for BMI values < 18.5 (0.99 (95% CI: 0.72, 1.37)) compared with a BMI of 18.5-22.9 kg/m².¹³ Study on cohort of Taiwanese people resulted in an increased risk of suicide in both underweight and extremely obese subjects which is different from our finding. There was a non-linear, J-shaped association between BMI and suicide risk (p for the quadratic term $= 0.033$). Compared with individuals whose BMI was 18.5–22.9 kg/m², adjusted hazard ratios for those with a BMI < 18.5 kg/m² or ≥ 35 kg/m² were 1.56 (95% CI: 1.07, 2.28) and 3.62 (95% CI: 1.59, 8.22), respectively.¹⁸

On the other hand, ecological study in the Caribbean Islands¹⁵, National Mortality Follow-back Survey data¹⁴, and South Australian autopsy cohort¹⁶ have found no association.

CONCLUSION

The study resulted in significant difference in mean BMI score between cases (suicide) and controls (non-suicide) ($p < 0.001$) suggesting BMI does affect manner of death. Overall, suicide decreases with increase in BMI specifically in underweight and normal BMI category. Association between BMI and suicide in overweight is inverse but not strong.

Stringent inclusion and exclusion criterias were main strength of the study, though it resulted in small sample size. Such strict criterion were necessary to ensure the BMI measurement is least affected by antemortem pre-existing disease and/or by postmortem changes. Information on any incident psychiatric disorders or suicide attempts suffered by study samples was not obtained. Nevertheless, there is no clear indication that the presence of such disorders at baseline greatly influenced any of our assessments of BMI-suicide associations.⁹ This study has limitations too, most

importantly single measurement of BMI and study cohort is a selected population of medico-legal cases referred by police for medicolegal autopsy.

Study with longitudinally design and a larger sample size may provide additional insight into the issue. Healthy diet, regular exercise, regulation over sale of insecticides and pesticides, and establishment of help centers for the person who are at the moment of psychological conflict or crisis, are among other recommendations of this study.

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A Study on the Association Between Extradural Hemorrhage and Skull Fractures in Head Injury

Parinita¹, Renju Raveendran², K. Valsala³

¹Junior Resident, ²Associate Professor, ³Assistant Professor, Department of Forensic Medicine, Government Medical College, Thiruvananthapuram

ABSTRACT

Fatal Intracranial haemorrhages have always been a major cause of mortality especially in traumatic head injuries. With the exponential growth in motor traffic and drastic changes in lifestyles, trauma especially involving the head has been a saddening reality in today's advanced urban life. This study involving 235 cases of deaths due to intracranial haemorrhages of varying aetiologies, specifically focuses on the propensity of association between Extradural Haemorrhage and skull fractures. It has been revealed in this study that of the various types of haemorrhages involving the brain, Extradural Haemorrhage is the least common, accounting for a meagre 3.8% (9cases) of the total number of cases. A total of 111 cases involved in the study manifested with skull fractures on the whole. Eight out of the aforementioned nine cases (88.8%) with Extradural Haemorrhage showed associated skull fractures. It therefore supports the observations made by several previous researchers that Extradural Haemorrhages are almost always associated with a fracture of the skull with exceptions that has mostly to do with age of the victims.

Keywords: Extradural Haemorrhage, Skull fracture, Intracranial Haemorrhages.

INTRODUCTION

Intracranial haemorrhage can be caused due to traumatic brain/ head injury or due to natural causes. Traumatic causes being road traffic accidents fall from height, railway incidents, assaults and other accidents. Natural causes being strokes, tumours and bleeding disorders to name a few. Fatal intracranial haemorrhages cause one million deaths in India annually. Regardless of severity of the head injury, there is always a possibility that intracranial haemorrhages may arise. According to Bullock and Teasedale two thirds of patients presenting in coma had intracranial haematoma. These may be present at the time of injury, or develop secondarily or expand later on¹.

Most cases of Extra Dural Haemorrhage (EDH) are associated with skull fractures and lie immediately below the fracture at the site of impact. It consists of an ovoid mass of clotted blood that lies in between the skull and the duramater. It is uncommon and present in only 5 to 15 % of fatal head injuries and 85% of them are associated with fractures^{2,3}. In one study by Rowbotham, these cases represented about 3 to 5% of any large series of acute cerebral trauma⁴. Their incidence amongst head injuries in the post-mortem rooms is somewhat lower, since many are cured by surgical intervention⁵. Extradural haemorrhage is almost always due to trauma, chief exception being blood dyscrasias of infancy⁶.

Extradural bleeding commonly occurs in the presence of a skull fracture that causes the dura to separate from the bone, causing tears in the blood vessels (mostly the middle meningeal artery) and sinuses. In individuals with more elastic skulls, particularly children, skull deformation separates the dura and skull and causes an extradural haematoma without a skull fracture being present. Rare case reports with extradural haematomas without skull fracture have been reported in adults below 30 years of age⁷. Although a skull

Corresponding Author:

Dr Renju Raveendran
Professor of Forensic Medicine
Government Medical College
Kottayam-686006, Kerala State
Mobile: 9846808533
Email: vasudharenju@gmail.com

fracture is a prerequisite, the haematoma occurs only in about 20 percent of all skull fractures. And in relative correlation, 85% of extra dural haemorrhages are found to be associated with fractures⁸. The commonest area of occurrence of an extradural haematoma is the sides of the head on the convexity or the lateral aspect of the cerebral hemispheres. Around 70% of extradural haemorrhages occur in temporo-parietal area corresponding to an overlying fracture of the squamous temporal bone.³

This study endeavours to evaluate the propensity of an association between extradural haemorrhage and skull fractures and to put it into perspective against available evidence on the same.

MATERIALS AND METHOD

235 cases of deaths due to fatal intracranial haemorrhages brought to the mortuary wing of Government Medical College, Thiruvananthapuram for autopsy over a time span of eight months were utilized for the purpose of this study. Objective findings including types of intracranial haemorrhages and skull fractures, entered in the post-mortem certificates recorded during autopsies were collected, and the data thus collected was analyzed using SPSS software.

RESULTS

235 cases of Fatal Intracranial haemorrhage victims autopsied in the Department of Forensic Medicine, Government Medical College Thiruvananthapuram were analyzed and studied.

Age and sex incidence: The maximum number of victims of fatal Intracranial haemorrhages were in 51 to 60 year age group(47), closely followed by age group 71 to 80 years(45) and the minimum number of victims were in 21 to 30 year age group (1), there were only 2 victims below 10 years. There were 10 victims in age group of 11 to 20 years, 33 in 31 to 40 group, 38 in 41 to 50 years, 47 in 51 to 60 years, 38 in 61 to 70, 14 in 81 to 90, 7 in 91 to 100 age groups.

Table 1: Age incidences in victims of Intracranial Haemorrhages (N = 235)

Age in years	Frequency	Percent
0-10 years	2	0.8

Contd...

11-20	10	4.6
21-30	1	0.4
31-40	33	14.3
41-50	38	16.0
51-60	47	19.8
61-70	38	16.0
71-80	45	19.0
81-90	14	5.9
91-100	7	3.0
Total	235	100.0

Sex incidence of victims: out of 235 cases of fatal intracranial haemorrhage, 186 victims were males and 49 were females.

Table 2: Showing Causes for Intracranial Hemorrhages (N = 235)

Cause of injury	Frequency	Percent
RTA	150	63.7
Fall	31	13.1
Railway occurrence	16	6.8
Natural	15	6.3
Assault	8	3.4
Other occurrences	13	5.5
Not known	2	0.8
Total	235	100.0

Types of intracranial hemorrhages: Among the cases of Intracranial haemorrhages, extradural haemorrhages(EDH) was seen in 9 cases (3.8%), subdural haemorrhages were seen in 173 cases(73.6%), sub arachnoid haemorrhages were seen in 228(97.02%), intra parenchymal haemorrhages were seen in 19 cases(8.08%), and intraventricular haemorrhages were seen in 28 cases (11.9%).

Table 3: showing types of intracranial haemorrhages

Intracranial haemorrhage	n	%
Extradural	9	3.8
Subdural	173	73.6
Subarachnoid	228	97.02
Intraparenchymal	19	8.08
Intraventricular	28	11.9

Table 4: showing the incidence of skull fractures in cases of intracranial haemorrhages (N = 235)

Skull fracture	Frequency	Percent
Present	111	47.2
Absent	124	52.7
Total	235	100.0

Proportion of extradural haemorrhages associated with fractures of skull: Among the 9 cases of extradural haemorrhages, 88.8% of cases were associated with fracture and 11.2% cases revealed no fractures.

Table 5: showing proportion of Extradural Haemorrhages associated with fractures of skull

Extra dural Haemorrhages	n	%
With fractures	8	88.8
Without fracture	1	11.2
Total	9	100

DISCUSSION

The objective of the study was to find out the proportion of cases with Extra dural Haemorrhages associated with skull fracture.

Age and Sex incidence: In the present study, among the 235 cases of Intra Cranial Haemorrhages the maximum incidence was in sixth decade with 47 victims. This observation did not correlate with studies of Raja Ram⁹ and Rajeev¹⁰ where the maximum age incidence was in fourth and fifth decade respectively. The difference in this incidence could be due to the changes in patterns of deaths over a period of time due to increased life expectancy, changes in life style and modes of transport and also due to the fact that the age groups from 30 to 60 years are the main bread winners, and ply more frequently on the roads. The minimum incidence was in third decade. This was not in agreement with the study by Rajeev and Rajaram, which could be explained as these particular age groups were found to be using high-end bikes with better safety and sophisticated balance features compared to other age groups, and if they happen to meet with an accident, they tend to recover earlier given their better state of health.

Sex Incidence: The majority of the victims in the present study were males (79.3%) followed by females (20.7%), which is in complete agreement with all the

studies, where male involvement was definitely higher than females. This observation could be due to increased use and exposure to vehicles and occupation by males in our society. Males are also the main bread winners, especially in lower and middle socio-economic strata.

Skull fracture: Fractures of skull were seen only in 47.2% of the cases in the present study. This was not in agreement with the studies of Rajeev (64%), Rajaram(73%) and Vijayakumar(57%)¹¹. The reason for the increase in incidence of intracranial haemorrhages without skull fractures may be due to the increase in high velocity accidents where the mechanisms of injury are due to acceleration-deceleration shear strains rather than the effects of a direct impact.

In the present study the Extra Dural Haemorrhage had the least incidence of 3.8%, which was in agreement with the observations of Rowbotham who stated that EDH was uncommon and accounted for only 3 to 5% of cases of any large series of cerebral trauma⁴. There was only one case of extradural hematoma in the present study which had occurred without accompanying skull fracture. This was a case of a 14year old boy who showed bilateral frontal EDH. The above observation agrees with the fact that younger and elastic skulls can present with EDH without fracture although it's a rare occurrence. It is also consistent with the observation made by Galbraith⁷. The aforementioned case also showed bilateral Extra dural Haematoma. Hence, this observation agrees with that of Mckissock et al who stated that bilateral EDH was a very rare occurrence.¹²

In the present study, there were 47.2% instances of skull fractures, but only 3.4% of them had extra dural haemorrhages. This agrees with the opinion of Lindenberg, who stated that even though a skull fracture is a prerequisite, only less than 20% of skull fractures are associated with an Extra dural Haematoma⁸.

CONCLUSIONS

1. The maximum age incidence for sustaining intracranial haemorrhages including Extradural Hemorrhage in general was in the 6th decade (19.8%).
2. Males constituted majority of the victims (79.3%) in the present study in deaths due to intra cranial haemorrhages.

3. The commonest intracranial Haemorrhage was Sub arachnoid haemorrhage (97%), followed by Sub dural haemorrhage (73.6% of the cases), Intraventricular haemorrhage (11.9%), Intraparenchymal haemorrhage (8.1% of cases), the least common being the incidence of Extradural haemorrhage, (3.8 %.)
4. Among the cases of Extradural haemorrhages, 88.8% of cases were associated with skull fracture and in 11.2% of cases they were not.

Statement: This study is an original self-funded research work and does not involve either issues of conflicts of interest or ethical implications. Ethical clearance has duly been obtained from the Institutional Review Board, Government Medical College, Thiruvananthapuram.

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A Rare Case of Suicide by Multiple Gunshot Wounds to the Head

Filippo Milano¹, Michele Treglia¹, Anna Mancuso¹, Stefania Urso¹, Gian Luca Marella²

¹Department of Biomedicine and Prevention, ²Department of Experimental Medicine and Surgery,
University of Rome "Tor Vergata", via Montpellier 1, 00133, Rome, Italy

ABSTRACT

Firearm injuries represent a significant topic of forensic pathology. The literature in this regard is innumerable, and can seem to have extensively covered the topic of this paper. However, the biological reality and the unpredictability of the concrete cases, continue and will always continue to present unusual circumstances that are worth examining for forensic pathologists. In this case report, we performed a comparative analysis between a particular case and the scientific literature. The case in question concerns suicide by single-shot short firearm, in which the subject shot himself three times on two sides of the head, without affecting the brain during its self-suppressive intent. Cases similar to this are always cause for reasonable doubt, which can only be solved with the contribution of forensic pathology and in-depth research.

Keywords: forensic science, multiple gunshot wounds to the head, suicide, ability to act, firearms, suicide, gunshot injury

INTRODUCTION

According to the data from the Italian Institute of Statistics (ISTAT) on total suicide rates in 2014, the percentage of suicide by gunshot wounds was 11.3%. Firearm injuries with suicidal purpose are therefore a significant component of the total medical-legal cases¹⁻³. Ordinarily, it is commonly believed that use of a firearm is an immediate and painless way of achieving suicide. However, suicide with multiple gunshots is mentioned in the literature, although quite rare, it occurs when there is a non-immediate onset of subject's incapacitation^{4,5}. The authors submitted a rare case of suicide with three self-inflicted gunshot wounds to the head.

Case Report: A 75-year-old man was found dead in his home. Through the information reported by the family members, the victim's psychological profile was characterized by various overlapping medical problems

that would have caused the onset of deep depression, enhanced by the news of having to undergo permanent dialysis and another surgery to create an arteriovenous fistula. Investigators also learned from the victim's son that his father had already stated in the past the will to act insane if he had not been self-contained. At the crime scene investigation, the corpse was found supine on the bed, with the right arm flexed on his chest and the left positioned on the bedside table, his head was facing the roof and the lower half limb was protruding from the bed (figure 1). A "STAR" brand handgun was found on the nightstand near his left hand; also, a 7.65 caliber bullet and a case were found nearby on the floor. Unused bullets of the same size were also found in the kitchen, with a letter from the victim. The corpse was wearing a white-colored long-sleeved jersey and blue pants heavily covered in blood, two plastic sheets and numerous towels were placed on the bed beneath the body. The puddle of blood, at the time of the inspection, extended from the left shoulder of the jersey to the entire right side of the chest, and a lot of blood was found on the trousers. Blood splatters were found in other parts of the house: in the bathroom on the sink, on the bedroom closet, and near the doorjamb. A scratch caused by one of the bullets and small blood stains were also found on the wall behind the bed.

Corresponding Authors:

Dr. ssa Stefania Urso,
Department of Biomedicine and Prevention,
University of Rome "Tor Vergata",
via Montpellier 1, 00133, Rome, Italy
Email: stefania.urso18@gmail.com

Autopsy Findings: Twenty-four hours after the crime-scene inspection, the autopsy examination was performed according to the guidelines of the Italian Group of Forensic Pathology (GIPF) in case of death due to gunshot wounds⁶. The presence of a star-shaped entry hole with frayed edges was found on the left mandibular angle with the involvement of the ear lobe, from which there was a deep hole starting from the underlying planes and terminating behind the left ocular bulb with traumatic left eye enucleation (figures 2, 3). There were also two additional entry holes, both located on the right jaw and covered with a bloody gauze (figure 4, 5). The medial hole was in the mandibular body and the lateral hole was near the corner of the mandible. The two sites were observed using a probe; the medial entry hole had a superficial interface that resulted in a maximum 2.8 cm semicanalicular-shaped exit wound. At the opening of the oral cavity, there was extensive ecchymosis on the mucous membrane of the entire right cheek, with the absence of continuous solutions. The lateral entrance hole was deep into the underlying tissues with a downward-upward direction, a right-to-left inclination with a posterior obliquity, ending in an exit hole irregularly oval-shaped at the level of the left eyebrow in the medial position. The cadaveric dissection was performed revealing the following findings: a bilateral infiltration of temporal bones, the integrity of the cranial vault, with congestion of the leptomeninges (figure 6). The brain presented a normal shape and size with edema, did not exhibit significant traumatic alterations except a modest subarachnoid hemorrhagic spread in the left frontal lobe (figure 7). We also observed that the basal vessels and neurocranial bones were intact. By prolonging the scalp up to the nasion, chipping of bone tissue from the left orbit medial angle was observed. The enucleation of remaining tissue of the left eye showed the dislocation and fracture of all periorbital bones. Nothing worth noting was observed at the chest level, while at the abdominal level the organs appeared pale, the spleen was shrunk and there was a slight presence of hypostasis.

Toxicological Findings: Biological samples (femoral blood, urine, bile, brain and liver) were collected to perform toxicological analyses during the autopsy. Enzyme immunoassays of bile and urine were performed. GC/MS of bile, blood and urine did not show any presence of drug-related peaks or antipsychotic drugs. The blood alcohol content was 0.05 g/L.



Figure 1: the corpse was found supine on the bed, with right arm flexed on his chest and the left positioned on the bedside table, his head was facing the roof and the lower half limb was protruding from the bed. A scratch caused by one of the bullets and small blood stains were also found on the wall behind the bed



Figure 2; Figure 3: at the left mandibular angle, there was the presence of a star-shaped entry hole with frayed edges with the involvement of the ear lobe, from which there was a deep hole starting from the underlying planes and terminating behind the left ocular bulb with traumatic left eye enucleation



Figure 4; Figure 5: two additional entry holes, both located on the right jaw



Figure 6: no fractures of the cranial bones were found

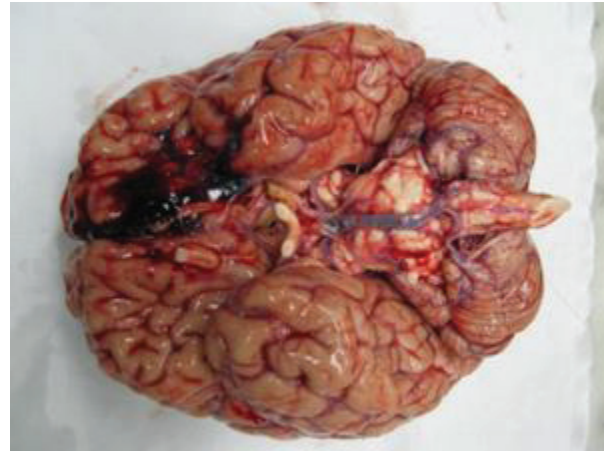


Figure 7: the brain presented a normal shape and size with edema, did not exhibit significant traumatic alterations except a modest subarachnoid hemorrhagic spread at the level of the left frontal lobe.

DISCUSSION

Suicide by firearms represents a significant topic of forensic pathology, but it rarely involves multiple self-inflicted gunshots. The occurrence of suicide by multiple wounds (gunshots or sharp force injuries) is usually linked to a psychiatric illness⁷. The frequency varies between 1% and 8% of all suicides with firearms, based on the nationality of the sample being analyzed⁸⁻¹³. These percentages also have a high degree of variability in relation to permissive laws on firearm possession, also because they include suicidal events with gunshots to different parts of the body not just to the head. Specifically, compared with the results found in the literature, the location and number of victim's self-inflicted blows to the head without causing immediate death, essentially represent the peculiarity of this case. In fact, the subject was able to move around the various rooms of the apartment after the first two shots, even roughly medicating the two entry holes with gauze, before the last shot was fired, which was likely responsible for the loss of consciousness. This fact is indicative, at least initially, of slow blood loss, probably less than 25% of the total volume, which became significant with the third blow responsible for the rapid incapacitation of the subject until death⁵. The subject's extended survival is mainly attributable to the sagittal position of gun during the shot. Johnson et al. report that it is statistically evident that the sagittal direction of shots with an entry hole near the jaw are associated with minor fatalities, since the bullet hitting

the bone structure of the splanchnocranium disperses a substantial part of its kinetic energy before entering the brain. The subject examined in this case didn't have any traumatic direct lesion to the brain, because the first two gunshots did not injured the neurocranium, while the last gunshot caused a hemorrhagic suffusion of the left frontal lobe, due to indirectly propagating the kinetic energy through bone structures^{14,15}. Therefore, considering the findings from the inspection and autopsy, the cause of death was attributed to an hemorrhagic shock due to heavy blood loss consequent to three gunshot wounds, two of them did not damage the neurocranial membrane of the splanchnocranium, or cause lesions of particularly vascularized regions. The most reliable reconstruction hypothesizes that when the subject shot himself the first time he was holding the handgun with his right hand, the bullet entered the right mandibular region resulting in a deep hole into the subcutaneous underlying tissues, with a downward-upward direction, a slight tilt from right to left and slightly oblique back to front, which produced a semicanicular-shaped lesion of the zygomaticotemporal process. After the first self-inflicted wound, the subject gripped the handgun once again with his right hand and shot himself for a second time on the right mandibular angle, the bullet perforated the splanchnocranium and exited medially from the contralateral eyebrow. Finally, the subject shot himself for the last time holding the handgun with his left hand, penetrating the left jaw corner and ending at the level of his left eye. The characteristics of the entry wounds indicate that the right-side shots were fired at close range, but not at a contact distance, while the contralateral hole, due to its star-shaped appearance and large dimensions, is compatible with a much closer firing distance, almost in contact with the skin.

CONCLUSION

Suicide by multiple gunshot wounds is a plausible conclusion, especially in cases where the subject's incapacitation is not immediate. However, in the literature it is now established that a significant percentage of subjects do not die and do not undergo immediate incapacitation even after more than two gunshots at a cranial level. In these cases, it is important to exclude a homicidal hypothesis through an in-depth analysis both in the examination and in the psychological history of the victim. However, a definite conclusion can only be reached by performing an autopsy, which allows for

a clear understanding of the connection between the environmental findings and the actual disabling ability of self-inflicted lesions that caused the fatality.

Conflict of Interest: The authors have no conflicts of interest to declare.

Ethical Clearance: Informed consent was obtained from legal guardian for uses of the case materials for research purposes and publication findings.

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A Study to Estimate the Reliability of “Moritz Rule of Thumb-Method A and Method B” Method of Estimation of Time Since Death in Tropical Climate of Central India

Jayanthi Yadav¹, Rajneesh Kumar Pandey², Sujeet Kumar Samadder³

¹Additional Professor, Forensic Medicine & Toxicology, All India Institute of Medical Sciences, Bhopal, M.P.; ²M.D., Forensic Medicine & Toxicology, Gandhi Medical College, Bhopal; ³Assistant Professor, Forensic Medicine & Toxicology, Mahaveer Institute of Medical Sciences, Bhopal, M.P.

ABSTRACT

Background: There are numerous methods available for estimation of time since death (TSD) in early post-mortem interval. But, precise determination of TSD is always a big challenge. There are some methods which can be employed for precise determination of TSD, but those have been used in temperate climatic region, such as Henssge nomogram method and Moritz formula. This paper is a humble trial to test the reliability of Moritz formula in tropical climate of central India.

Methodology: A cross sectional study was carried out on 173 randomly selected cadavers which were brought for autopsy in department of Forensic Medicine & Toxicology, Gandhi medical college, Bhopal. After collecting routine data like age, gender, height, weight etc. following data were also collected – ambient room temperature, rectal temperature, known TSD, determined TSD by Moritz formula. Data were analysed by using SPSS software.

Conclusion: Moritz rule of thumb–method A and method B is a reliable method for determination of TSD in 24 hour time frame and in all time slots except that Moritz-A rule cannot be used in 0-6 hour time slot, both in <23 °C & >23 °C ambient temperatures in the present study circumstances.

Keywords: *Algor Mortis, Time since Death, rectal temperature, ambient temperature, Moritz rule of thumb.*

INTRODUCTION

Estimation of time since death is one of the most important objectives of postmortem examination. Exact time of death cannot be determined, except in very rare case, where wrist watch of the victim stopped due to drowning, the blow of a weapon or fall from height⁵. Time since death can be determined by physical and biochemical methods. Physical methods are rigor mortis, livor mortis, algor mortis, adipocere, mummification, and progress of decomposition. Biochemical methods constitute changes in blood, serum, cerebrospinal fluid

etc. Out of all the methods employed no single method is yet capable of telling TSD precisely. Algor mortis is the cooling of cadaver, which happens due to difference of temperature between the cadaver and environment i.e. a temperature gradient develops⁶. There is heat dissipation from cadaver to environment at a certain rate, which is 1.5 degree centigrade per hour in temperate climate and 0.7 degree centigrade per hour in tropical climate¹ is called as rate of cooling. Various routes of temperature monitoring from cadaver are–rectal, infra-hepatic, tympanic membrane, cribriform plate, out of which rectal route is the ideal route for measurement of core body temperature. Rectal temperature ranges from 36.5 degree to 37.5 degree centigrade¹. Insertion of thermometer in rectum is controversial, and cost-benefit analysis must be made, to decide if the difficulties of taking a rectal temperature are worth the small potential advantage of an earlier measurement⁴. In order to determine precise TSD there are several methods based on algor mortis

Corresponding Author:

Dr Sujeet Kumar Samadder
L-504, Signature Residency, Shirdipuram,
Kolar Road, Bhopal-462042, (M.P.)
Mobile: 8319142407
Email: drsujeet2522@gmail.com

and one of them is Moritz rule of thumb - method A and method B which have been used in temperate climatic region. This study aims to test reliability of the above mentioned method in tropical climate of central India. In 1954 Alan R. Moritz mentioned both formulae in his book "The pathology of trauma". The above mentioned methods was used by many to calculate the postmortem period. The first rule of thumb method is in degrees Fahrenheit² which is as follows;^{3, 8}

$$TSD = (T-T_1)/1.5$$

Where,

T = Rectal temperature at the time of death which taken as 37°C or 98.6°F by them.

T₁ = Rectal temperature at time t₁ in °Fahrenheit.

To convert degree Centigrade to degree Fahrenheit the formula used is -

$$(C \times 9/5) + 32 = F$$

Method B is as follows:

$$TSD = (T-T_1) + 3^*$$

T = Rectal temperature at the time of death which taken as 37°C or 98.6°F by them.

T₁ = Rectal temperature at time t₁ in °Centigrade.

* = often includes as compensation for possible delay in cooling, i.e. plateau.²

To convert degree Fahrenheit to degree Centigrade the formula used is -

$$(F - 32) \times 5/9 = C$$

METHOD

A cross-sectional observational study was conducted at department of Forensic Medicine & Toxicology,

Gandhi medical college, Bhopal during the period of July 2015 to August 2016.

A total of 173 cadavers brought for medico-legal autopsy were randomly selected for this study. Those cases in which time of death was known and documented were included and those in which time of death was not known and the temperature at the time of death was either high or sub-normal were excluded. The post-mortem requisition form, along with the inquest papers, were received from the police. The dead bodies were studied in the same condition in which they were brought. No disturbances was done as far as possible with regard to clothings and coverings.

Exact time since death has been recorded from hospital and police documents. After noting the external appearance, the clothings were removed and rectal temperature was recorded in supine position, after spreading both legs apart exposing the perineal region. Laboratory thermometer of length 32 centimetres with a temperature range of 0 to 50 degree centigrade was inserted 10 centimetre deep in rectum of cadaver. The reading was noted down two minutes after keeping the thermometer inside the rectum, then thermometer was taken out. Simultaneously ambient temperature was also recorded with ambient temperature thermometer. Further details such as age, gender, built, height, weight, actual time of death, time of reading of rectal temperature etc. were noted down from the documents and history.

Actual TSD (in hours) was calculated by subtracting the time of recording of rectal temperature from actual time of death. Then determination of TSD was done by formulae given by Moritz.

Data was analysed by using SPSS software.

Table 1: Comparison between known TSD and Moritz rule A & B TSD in 6 hour time slots

Time slot & number of samples	Mean time since death			P value	
	Known	Moritz A	Moritz B	Moritz A	Moritz B
0 to 6 hours, n = 41	4.15	3.61	6.02	0.326	0.000
6 to 12 hours, n = 48	9.68	6.6	8.6	0.000	0.028
12 to 18 hours, n = 56	15.27	9.07	10.54	0.000	0.000
18 to 24 hours, n = 24	20.83	8.46	10.17	0.000	0.000
0 to 24 hours, n = 173	11.75	6.94	8.83	0.000	0.000

Table 2: comparison between known TSD and Moritz rule A & B TSD in 6 hour time slots in ambient temperature <23 °C

Time slot & number of samples	Mean time since death			P value	
	Known	Moritz A	Moritz B	Moritz A	Moritz B
0 to 6 hours, n = 12	4.08	6.8	8.6	0.037	0.000
6 to 12 hours, n = 11	9.6	12	13	0.010	0.000
12 to 18 hours, n = 16	15.75	15.9	16.2	0.748	0.304
18 to 24 hours, n = 5	20	15.24	15.7	0.015	0.015
0 to 24 hours, n = 44	11.5	12.36	13.3	0.244	0.003

Table 3: comparison between known TSD and Moritz rule A & B TSD in 6 hour time slots in ambient temperature > 23 °C

Time slot & number of samples	Mean time since death			P value	
	Known	Moritz A	Moritz B	Moritz A	Moritz B
0 to 6 hours, n = 29	4.1	2.3	4.93	0.000	0.029
6 to 12 hours, n = 36	9.4	4.8	7.0	0.000	0.000
12 to 18 hours, n = 42	15.2	6.6	8.5	0.000	0.000
18 to 24 hours, n = 19	21.1	6.7	8.6	0.000	0.000
24 hours, n = 129	11.8	5.1	7.2	0.000	0.000

RESULTS

This study suggest that average rate of cooling in the study sample is 1.0°F or 0.54°C. Males cool more rapidly than females. Extreme age group have extreme rate of cooling. ARC is inversely proportional to BMI. It was observed that cooling was inversely proportional to environmental temperature, not against Newton's law of cooling per se. Hospitalized cases cool in slightly faster rate than non-hospitalized cases. Cooling is fastest when cause of death is Myocardial Infarction, followed by drowning and strangulation, then road traffic accidents. Minimum ARC is in the cases of deaths due to electrocution. It was observed that ARC was found to be slow initially and became rapid after three hours of death, then again decreased as temperature difference between corpse and environment decreases, following Sigmoid shaped curve, not as in Newton's law of cooling. In manner of death ARC is maximum in natural deaths then accidental and suicidal.

Moritz rule of thumb 'A' – It is reliable method for determination of TSD both on 24 hour time frame and 6 hour time slots except in 0-6 hours ($p = 0.326$), which were found to be statistically significant ($p < 0.05$) Table

1. In ambient temperature < 23 °C this method cannot be used to determine TSD in 24 hour time frame ($p = 0.244$) along with 12-18 hour time slot ($p = 0.748$) but it can be used in other time slots of 0-6, 6-12 & 18-24 hours which were found to statistically significant ($p < 0.05$) Table 2. In ambient temperature > 23 °C Moritz first rule can be used reliably for determining TSD both on 24 hour time frame and in all four time slots of 0-6, 6-12, 12-18 and 18-24 hours, which were found to be statistically significant ($p < 0.05$) Table 3.

Moritz rule of thumb 'B' – This method can be used reliably for determining TSD both on 24 hour time frame and in all four time slots of 0-6, 6-12, 12-18 and 18-24 hours, which were found to be statistically significant ($p < 0.05$) Table 1. In ambient temperature < 23 °C this method cannot be used to determine TSD in 12-18 hour time slot ($p = 0.304$) but it can be used in other time slots of 0-6, 6-12 & 18-24 hours and in 24 hour time which were found to statistically significant ($p < 0.05$) Table 2. In ambient temperature > 23 °C Moritz first rule can be used reliably for determining TSD both on 24 hour time frame and in all four time slots of 0-6, 6-12, 12-18 and 18-24 hours, which were found to be statistically significant ($p < 0.05$) Table 3.

DISCUSSION

This cross-sectional study conducted on 173 postmortem samples for estimation of time since death by the algor mortis in early post-mortem interval. In this study rectal temperature and weight were measured of those corpses whose time of death is known. The data obtained was analyzed and results and observation were done. TSD was calculated by Moritz rule of thumb A & B method and compared with known TSD in 24 hour time frame and also in different time slots in $< 23^{\circ}\text{C}$ & $> 23^{\circ}\text{C}$ ambient temperatures.

It was evident from the results that Moritz both rules were appropriate in the present study circumstances except few conditions for which no explanatory literature was found. Although both methods have given good reliability for determination of TSD, it was also observed that method 'B' is more reliable than method 'A', and supported by Leonard Nokes in his book as he mentioned that "the rule of thumb (method B) produced the most consistent results"².

CONCLUSION

It can be concluded here that this study will be beneficial with respect to determination of TSD as Moritz rule of thumb A & B can applied for estimation of TSD in both types ambient temperature i.e. $< 23^{\circ}\text{C}$ & $> 23^{\circ}\text{C}$, except in 0-6 hours in Moritz A formula. And if only $< 23^{\circ}\text{C}$ ambient temperature is considered then in 12-18 hour time slot both Moritz A & B formulae is not reliable to estimate the TSD in early postmortem interval in tropical climate of central India.

Ethical Clearance: Taken from Institutional ethics committee, Gandhi Medical College, Bhopal on 05/03/2015.

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Conflict of Interest: Nil.

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Effect of Role Play Video-An Innovate Tool on Court Room Procedures to Educate Medical Graduates

**B. Suresh Kumar Shetty¹, Sharada Rai², Rohit C Shet³, M S Kotian⁴, Navjot S Dhillon⁵,
Ishika Mahajan⁵, Ciraj A M⁶**

¹Professor and Head, Dept. of Forensic Medicine, ²Associate Professor, Dept. of Pathology, ³Tutor, Dept. of Forensic Medicine, ⁴Selection Grade Professor, Dept. of Community Medicine, ⁵Undergraduate Students, Kasturba Medical College, Mangalore, ⁶Professor, Dept. of Microbiology, Melaka Medical College, Manipal Academy of Higher Education, Manipal.

ABSTRACT

Background: There is a need to understand the concepts especially like court room procedures among the medical students as the practical experience is encountered in many medico legal cases in future as doctors. Creating an educational instructive video for promotion of understanding the concepts of forensic medicine among all budding doctors in their curriculum.

Aim and Objectives: To study the utility and assess of role play using videos in improving the knowledge and attitude of students regarding courtroom procedures in an Indian court.

Methodology: A descriptive questionnaire based study survey was done after obtaining informed consent from students. The pretest and posttest were randomized by giving a number to the students and also to avoid inter participation bias. Validation of questionnaire was then done. The video on court room procedure was done and validated with the help of forensic experts and lawyer colleagues. Statistical and comparison analysis was done.

Results: The present study about 222 second year medical students were assessed, the study showed gender and varied age distribution between 18 to 23 years. The study showed various aspects of knowledge and attitude. In knowledge component, some of the questions posed required a definitive positive or negative response. In the knowledge component, out of the total 28 questions posed, 22 questions showed highly significant changes [$p < 0.5$ significance] in the questionnaire results. In the attitude component about how a doctor behaves inside the court room, of the total 16 questions posed, 10 questions showed highly significant changes [$p < 0.5$ significance] in the questionnaire results. The study also showed various responses regarding the video and positively revealed that such an educational tool is needed and would definitely make a change in curriculum.

Keywords: Educational tool; Court room procedures; Knowledge; Attitude; Role play videos.

INTRODUCTION

Corresponding Author:

Dr B Suresh Kumar Shetty
Professor and Head,
Department of Forensic Medicine
Kasturba Medical College, Mangalore,
Manipal Academy of Higher Education, Manipal.
Mangaluru – 575001, Karnataka, India.
Tel: +91 9886092392
E-mail: sureshbshetty.2009@rediffmail.com;
suresh.shetty@manipal.edu

Court room procedures are complex processes to understand. The exact situation and scenario to access these courts are difficult and the access is only through hypothetical scenes portrayed in television and in movies. Most medical curriculum lack practical exposure with respect to certain medico legal issues pertaining to the concepts of courtroom procedures, which they may face in the future as experts. There is a need for an educational tool to understand the concepts pertaining to these courtroom procedures.

This project is an attempt to make the concepts easy and improve the understanding of students in handling forensic cases as an expert when they attend the courts. The study attempts to study the utility of role play using videos in improving the knowledge and attitude of students regarding courtroom procedures in an Indian court and to assess the use of role play video in improving the understanding of the legal system in court room procedure.

MATERIAL AND METHOD

Setting: Department of Forensic Medicine, KMC, Mangaluru

Target population: 2nd MBBS Students [3rd Semester].

Sample size: All students attending the classes.

Study design: Descriptive Study

IPPTeam: Forensic experts, Lawyers, Police, Professional Students, Nonteaching professionals.

Data collection: The study initially obtained a clearance from institutional ethical committee Kasturba Medical College after the study protocol was reviewed by the scientific committee. Permission from the Dean was acquired to approach the students and for collection of data from the students inside the classroom. Questionnaire based survey was done (after obtaining informed consent) from students which included following questions (Annexure)

- Pretest and Posttest questionnaire of student's self-assessment of improvement in learning.
- Student feedback on utility of video in enhancing their knowledge.

Based on feedbacks and suggestions, interventions were suggested and outcome of this study was evaluated in a better manner. The questionnaires was designed in order to have common understanding among participants. The pretest and posttest were randomized by giving a number to the students and also to avoid inter participation bias. Validation of questionnaire was then done. The video on court room procedure was done and validated with the help of forensic experts in the department and lawyer colleagues from SDM Law College, Mangaluru.

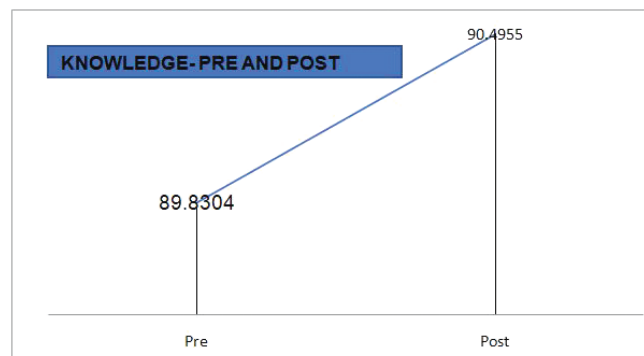
Data analysis: Statistical analysis was done on SPSS Ver. 17.0 Software. Comparison was found by applying students paired 't' test. Association was done by the chi square test and ANOVA. $P < 0.05$ was considered as significant.

RESULTS

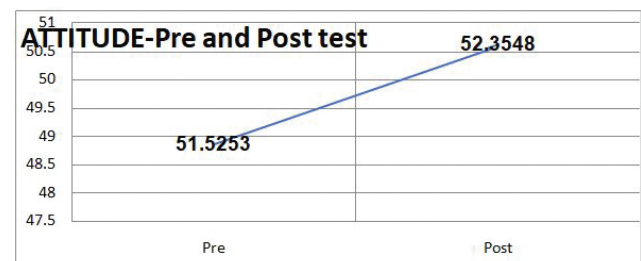
In the present study about 222 students were assessed, the study showed gender and varied age distribution between 18 to 23 years.

The study showed various aspects of knowledge and attitude. In knowledge component, some of the questions posed required a definitive positive or negative response. In the knowledge component, out of the total 28 questions posed, 22 questions showed highly significant changes [$p < 0.5$ significance] in the questionnaire results. In the remaining 6 questions [Q.9,10,13,18,19,23], no significant changes were seen in pretest and post test results. In the attitude component about how a doctor behaves inside the court room, of the total 16 questions posed, 10 questions showed highly significant changes [$p < 0.5$ significance] in the questionnaire results. The remaining 6 questions [Q.2, 6, 9, 14, 15, 16] did not show significant changes in pretest and post test results.

The comparison of mean knowledge and attitude showed significant changes as depicted in the graphs below [Graph.1,2and 3].



Graph. 1: Showing the pre and post-test comparison knowledge results regarding the court room procedures

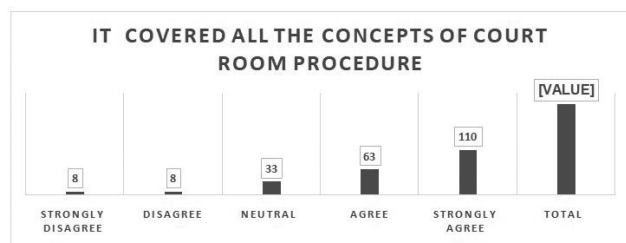


Graph. 2: Showing the pre- and post-test comparison in the attitude inside the court room

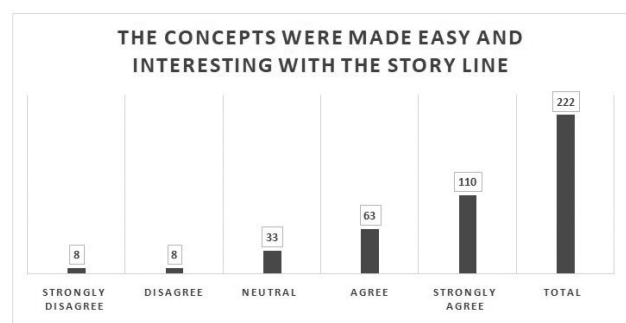
	PRE N = 224	POST N = 224	PAIRED DIFFERENCES		t	p
			MEAN	STANDARD DEVIATION		
KNOWLEDGE	89.8304	90.4955	0.6652	14.27153	0.698	<0.486
ATTITUDE	51.5253	52.3548	0.8295	11.08734	1.102	<0.272

Graph 3: Pre and Posttest Comparing knowledge and attitude among the study population

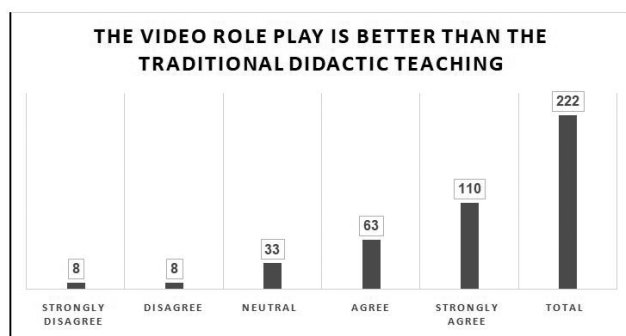
The study also analyzed the various aspects of video and its component and the uses of demonstration of video the results and depicted in the graphs [Graph.4,5,6] below.



Graph 4: Depicting response regarding video covering concepts among the study population

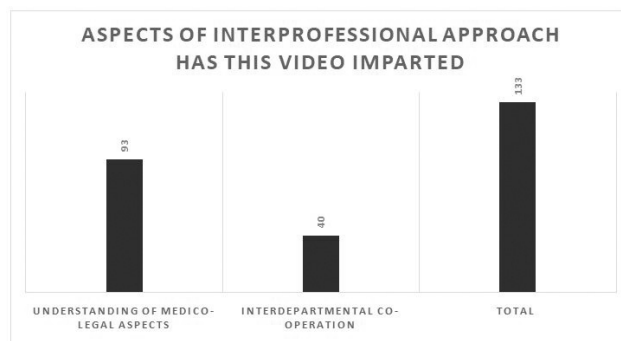


Graph 5: Depicting video response regarding made the concepts interesting with story line among the study population



Graph 6: Depicting video response regarding is better than traditional lectures

The study population were also analyzed to give their feedback about the role play video depicted in the following graphs [Graph. 7].



Graph 7: Depicting response regarding interprofessional approach in the role play video by the study group

DISCUSSION

Fadde, P et al¹ studies showed the usage of an interactive video in coaching a situation for an intellectual basis of developing teacher's self-reflection. To help trainee educators and to support the comment in the classroom regarding the teaching videos, two approach in interactive videos were designed. The first method was the trainee teachers to write their remarks when observing the short clips of video along with the experts done by video coding, based on qualitative research methods. This is compared with the remarks done by the experts before seeing and coding the succeeding video clip. Written explanations were involved by the experts in the second method of video viewing while in the first method, viewing the same video clips without writing down their interpretations were used after video coding. The written classroom report of posttest, showed the video observing group performed better than the video coding group and significantly better than a no-video control set. The above mentioned study portrayed the importance of use of video clips as an effective tool for understanding the various concepts which is at par with the results of the present study, however with the limitations

Calandra, B et al² research is concerning the effective use of improvement on teacher's reflection and also encouraging video editing of apprentice teachers' reflective practice³. The study used a qualitative study

design to observe two guided reflection activities for both the group of research trainees. The primary group were quizzed immediately with a coach after training their lesson and captured about critical things that occurred in the meeting. The subsequent group had no questioning, but to capture their programs on digital video, edit their video for two critical events, and replicate in written form using the same rubric as the earlier group. This found that students who developed video vignettes produced effective and more multidimensional reflections. The study was a significant footstep to facilitating learner teachers' development. The present study is however studied on the effectiveness of teaching concepts among the students and also on futuristic value and thereby improving their approach in some cases especially in attending courts.

Hannafin et al⁴ studied the effect of how a digital video is been used to capture and evaluate a wide range of classroom teaching practices^{5,6}. However these submissions are informal in nature and considered either risk-free or risk-neutral by teachers. The study done can be analyzed and assessed by "others" to determine the presence and/or quality of specific teaching practices. This becomes an emphasis on teacher's accountability, standards-based teaching, documentation of teacher progress, and performance evidence has spawned interest in these video related study. The present study was based on inter professional approach and based on views from all stakeholders and then delivered to students to create interest, educate and also to understand the concepts and attitude in court room procedures.

The outcomes of this study would be an improvement in understanding of concepts in dealing with court room procedures by students or creation an innovate tool of making role play education videos for departmental educational use. To make students become better experts while giving evidence in court or may be included in ethical course/curriculum in future. However there are limitations like the student and other stake holder's participation may not be active or making a video and coming up with a good story [Script] may be very difficult and then to make students to enact on the basis of script and most often funding agencies and time constraints are the major one.

CONCLUSION

This study is carried out to know an effective tool in assessing and to gauge the knowledge and attitude regarding the court room procedures amidst the second

year MBBS graduates. The existing knowledge and attitude level between students were calculated using pretest as most of these concepts were delivered in the didactic lectures. Emerging in the improvement in the delivery of medical curriculum as an innovative interesting tool i.e. role play video, was selected to make the students understand the complex concepts like court room procedures. The results were fruitful and positive as it showed that this method of delivery can definitely help in the better understanding of the concepts and approach in such complex topics. This can be also included as a regular curriculum in subjects like forensic medicine to make the subject more interesting as it helps in knowledge assimilation. This method can be strongly recommended in training such concepts in medical curriculum. Periodic updating and revision of the techniques need to be done by seminars and workshops involving all the stakeholders to make it more effective and interesting so that there is a better tool in education on forensic or any medical concepts.

Acknowledgement: The authors are indebted to all the teaching and non-teaching faculty of Department of Forensic Medicine, KMC, Mangaluru and gratitude to all colleagues and Faculty of MUFILPE for shaping and making to do this project directly and indirectly. Sincere thanks to professionals Tharanath Shetty, Principal and lawyer colleagues from SDM Law College, Police officials from Mangaluru City Commissionarate and D.K Police, for the source and time during the preparation. The research is ostensibly supported by MAHE, FAIMER Institute for Leadership in Interprofessional Education (FILLIPE) Project done as a collaborative work between institutions and professionals.

Research Funding: None

Conflict of Interest: None declared

Ethical Clearance: This study was approved by Institutional ethics committee, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, IEC KMC MLR 1-17/311, dated 18/1/2017.

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Profile of Mortalities due to Alcohol and Drug Consumption in Road and Rail Traffic Accidents in Mangaluru, a Coastal City of Karnataka, India

Subham Sarthak¹, B. Suresh Kumar Shetty², Jagadish Rao PP³, Pavanchand Shetty H³, Haniel D'Souza³, Adithi S Shetty⁴, M S Kotian⁵

¹Undergraduate Student, ²Professor and Head, ³Associate Professors, Dept. of Forensic Medicine, ⁴Associate Professor, Dept. of Obstetric and Gynecology, ⁵Selection Grade Professor, Dept. of Community Medicine, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education

ABSTRACT

Objective: Several studies have demonstrated that driving under influence of alcohol and psychoactive drugs increases the risk of fatal accidents & hence increased mortality rates. This paper presents a retrospective study of Road & Rail traffic accidents in Mangaluru.

Method: Over a six-year period (2010-2015), a total of 5226 autopsies were conducted at Govt. Wenlock Hospital, Mangaluru out of which 1261 were Vehicular accidents (1117 - Road, 144 - Rail). Various parameters were looked in these cases such as age groups, gender, type of Vehicle involved, Victim status, time of day, day of the week (weekdays/weekend), Season, type of intoxication, accident site etc.

Results: 15.85% (n = 177) of all the Road Traffic Deaths & 9.72% (n=14) of all Rail deaths occurred as a consequence of either alcohol (16.83%, n=188/191) or drug overdose (n=3). 42.93% of victims belonged to 56 and above age group. Most commonly the vehicle which were involved in accident were motorcycles (around 51.83% cases).

Conclusions: The results of this study reveals a strong positive association between the presence of alcohol and psychoactive drugs in road & rail traffic accident victims. The matter of grave concern is increasing trend of drunken driving leading to fatal accidents among adolescent age-groups especially in motorcycle vehicles.

Keywords: Road Traffic Accident, Rail traffic Accidents, Alcohol, Psychoactive drugs, Mangaluru, mortality.

INTRODUCTION

Increasing incidence of Road & Rail Traffic Accidents (RTAs) in recent decade is becoming 'hidden epidemics' across the world posing a threat to public health & national economy. It has been projected that Road Traffic Injuries will be the second most common cause of disability – adjusted life year loss in developing countries by the year 2020¹. According to the World Report on Road Traffic Injury Prevention² traffic accidents account for about 3000 daily fatalities worldwide. This requires urgent attention especially in the context of developing countries such as India, which reports highest proportion of deaths due to RTAs in South East Asia¹

Corresponding Author:

Dr B Suresh Kumar Shetty
Professor and Head,
Department of Forensic Medicine
Kasturba Medical College,
Manipal Academy of Higher Education (MAHE)
Mangaluru-575001, Karnataka, India.
Phone: +91 9886092392
Email: sureshbshetty.2009@rediffmail.com;
suresh.shetty@manipal.edu

According to official statistics, a total of 4, 45,468 'Traffic Accidents' were reported during the year 2008 in India comprising 4,15,855 'Road Accidents', 2,134 'Rail-Road Accidents' and 27,479 'Other Railway Accidents' (NCRB, 2009). In 2009, 4.22 lakh road traffic incidents and 1.27 lakh road traffic fatalities were reported³. These numbers translate into one road accident every minute and one road accident death every four minutes.

Mangaluru is very apt for the study because it's one of the largest coastal cosmopolitan city in South India with booming increase in vehicular traffic since past decade after declaration as Special Economic Zone (SEZ) in 2007. Four National Highways pass through the city which increases the burden on roads & Railways with added cargo traffic from the Mangalore Port. The city's landscape is characterized by rolling and hilly terrain along with 6 months of monsoon season which makes the roads prone to RTAs. The city has 2 major railway stations whose tracks pass through the interior of the city making it vulnerable for travelers and unattended wanderers⁴.

In spite of the high burden of RTAs in the country, there is paucity of systematic information on the statistics of most common contributory factors like alcohol intake & abuse of psychotropic drugs like benzodiazepines, barbiturates, cocaine, cannabis, opiate-like drugs such as heroin, methadone, morphine, amphetamines and other CNS stimulants. The growing trend of drunken driving leading to fatalities is clearly directed by this study that says Alcohol accounted for 11% to 60% of RTA fatalities^{5,6}.

The existing studies done on RTAs are just based on accident rate based on diffused parameters, results of which cannot be used to devise any prevention or protective guidelines to reduce mortality rates due to RTAs. The results of this proper multi-parametric study will yield appropriate intervention strategies to combat this 'Hidden epidemic'.

Several studies have demonstrated that alcohol and psychoactive drug consumption are important risk factors underlying fatal accidents. The main objective of this study was to find prevalence rates of alcohol and psychotropic drugs in fatalities of rail and road-traffic accidents in Mangaluru, a coastal district of South India.

This study was aimed to have an overall picture of the occurrence of these substances in the victims by

toxicological screenings. Through this study, analysis of different parameters which increases & decreases the frequency of mortalities & hence devise an effective strategy to reduce the mortality rates.

MATERIAL AND METHOD

Study design: A retrospective study conducted on incidences of Rail & Road traffic accidents under alcohol and drug intake leading to their deaths.

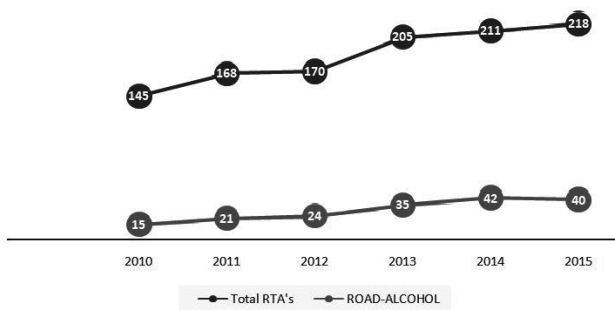
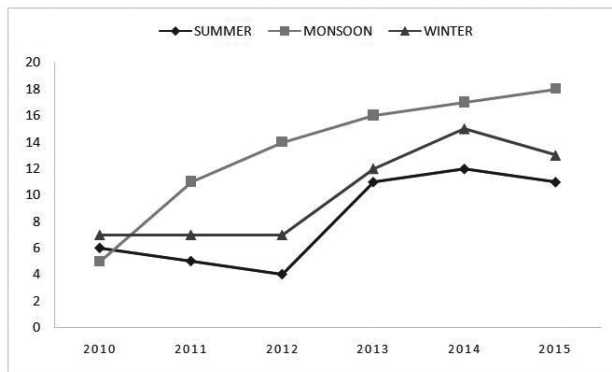
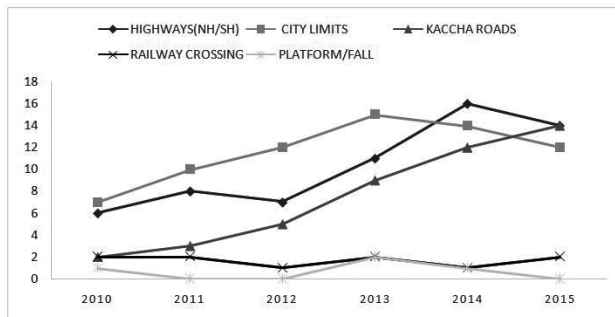
Study sample and Inclusion Criteria: The study enrolled only those cases who succumbed to death due to alcohol & drug abuse leading to Rail or Road traffic accident, as suggested in Police Intimation Letter 141(1,2). Those cases with history of natural death, poisoning, murder, firearms, drowning, electrocution, poisoning and health disorders were excluded from this study.

It was a time bound study from 2010-2015. The study was done only from the records of the dead bodies meeting the inclusion criteria among those received at District Mortuary, Government Wenlock Hospital Mortuary working in conjunction with Department of Forensic Medicine and Toxicology, KMC Mangalore.

Road Traffic Accident data records were sourced from Autopsies done by forensic experts in Department of Forensic Medicine and Toxicology, KMC Mangalore. The various parameters that were looked in the study were age groups, gender, type of Vehicle involved, Victim status, time of day, day of the week (weekdays/weekend), Season, type of intoxication, accident site etc.

A person is said to be under the influence of alcohol when blood alcohol concentration is more than 0.03% or 30 mg/100 ml of blood, according to the Road Traffic Act (1997). During Autopsy, Blood and Visceral organ sample were collected in a sterile container with preservatives and was sent by Medicolegal consultant for determination of BAC and Toxicological screening to Regional Forensic Science Laboratory (RFSL), Mangaluru for reports indicating presence of Alcohol and illegal psychoactive drugs concentration above prescribed limit.

Statistical Analysis: Data analysis was done using SPSS (Statistical package for Social Science) version 11.5. A statistical significance was considered at p-value <0.05. Multiple Regression method was used to establish the relationship between Road Traffic Accidents with various parameters and there co-relation with alcohol & psychotropic drug intake.

Total RTAs and RTA under Alcohol influence v/s Years.**Graph 1: Total RTAs & RTA under Alcohol influence v/s Years****Graph 2: Seasonal pattern of Accidents****Graph 3: Frequency of RTAs at different Accident sites v/s Years**

RESULTS

A total of 5226 autopsies were conducted during 6 year period of 2010-2015, out of which 1261 were Vehicular accidents (1117 Road & 144 were Rail Traffic Accidents). Out of these 15.85% (n = 177) of all the Road Traffic Deaths & 9.72% (n=14) of all Rail deaths occurred as a consequence of either alcohol (16.83%, n=188/191) or drug overdose (n=3, 2 cases of Cannabis and 1 Benzodiazepine drug consumption). Graph 1.

All these cases were limited to males, of which maximum i.e. 42.93% victims were of 56 and above

years of age-group closely followed by 26-55 age group which had 33.5% deaths. Such cases in Adolescents (16-25 age group) had markedly increased over the years from 3 deaths in 2010 to 13 deaths in 2015.

Vehicular pattern showed a major share of 51.83% (n = 99) motorcycles, 18.85% Light-motor Vehicles. There were 14 cases of deaths under alcohol influence involving railways.

Almost 34.55% (n = 66) of deceased were pedestrians, who after alcohol or drug abuse were wandering around on road-sides & were fatally hit by vehicles. In 26.7 % cases the vehicle driver was drunk above legal limits which led to fatal accident. 14 cases were reported either due to rail run over/fall on tracks or crush between rail & platform. In 21.47% cases the victim was a pillion rider who succumbed to death following bike accident.

About 49.74% (n = 95) incidences occurred during night time (9pm-6am) & 31.41% (n = 60) were reported during morning hours (6am -12 pm). 65.45% cases were reported during weekdays, while 34.55 % cases occurred during weekends, which have considerably grown over the years.

Monsoon season peaked the accident rates with 42.4% (n = 81) cases, moderate & summer seasons with 61 and 49 cases respectively. Graph 2.

Maximum fatal accidents occurred within the city limits i.e. 36.65% (n = 70), then 32.46% on National & State Highways, 23.56% (n = 45) along kaccha roads, while 10 along railway crossing & 4 along tracks in case of Railway Accidents during 6 year study period. Graph 3.

DISCUSSION

This 6 year retrospective study of Road & Rail traffic accidents has shown a strong positive association between use of alcohol and its culpability to high mortality rates. Of particular interest is the increasing trend of drunken driving leading to fatal accidents among adolescent age-groups. We could not find many studies on RTA mortality rate under Alcohol & Drug influence along with the parameters under our study so elaborate review of the statistics & there findings could not be compared. Few studies similar to our setup were a 1 year (2003-2004) study on 350 RTA victim was done

by Patil et al in Maharashtra which reported that out of 129 vehicle drivers, 38 (29.5%) were under influence of alcohol. A total of 129 drivers were involved out of which there were 79 (61.2%) motorized two-wheeler drivers⁷. Alcohol was found to be very important factor in mortality in studies done during 1999-2006 and 2001-2004 on pedestrians of Slovenia & South Africa was 42.4% and 58% respectively^{8,9}. A study conducted on 1,047 fatally injured victims in the UK showed the widespread use of alcohol and drugs. Alcohol was detected in 68% of all victims. Illegal drugs were detected in 85% of the cases. Cannabinoids were found to be the most commonly detected drug⁸. In Sweden, toxicological analysis of blood samples from 1,403 drivers involved in fatal accidents were analyzed for alcohol and drugs, revealed that alcohol above the legal limit for driving ($> 0.2\text{g/L}$) was detected in 22% of the drivers, while drugs were found to be present in 253 cases (19%)¹⁰. A study in Tamil Nadu by Ruma et al reported 16.5 % RTA victims who attended tertiary care hospital gave history of Alcohol consumption 6 hours prior to Accident¹¹. A similar study reported by Jha N et al had reported a similar finding (16.8%).

A new rising trend of driving under influence of alcohol in motorcycle riders as well as pillion riders is a matter of grave concern. Frequency of such accidents are expectedly maximum during night hours but early morning accidents due to hangover has been emerging rapidly. Over-drinking at weekends is gradually rising over the last few years. Statistics show that city limits and highways are most accident prone areas as they allow higher speed movements which is fatal in case of drunk victims.

Railways accidents mostly occurred due to lack of boundary all along the tracks around inhabited areas, which gives an easy access to drunk people. The above statistics only includes the accident victims who succumbed to death, there are larger number of victims who acquire various vital or non-vital injuries which can adversely affect their daily life-style and have a bad impact on their future life.

Suggestions: Stronger vigilance by traffic personnel against substance abuse by deploying Sobriety checkpoints which can allow police to briefly stop vehicles at specific locations to see if the driver is impaired using breath alcohol analyzer, if police has a reason to suspect the driver is intoxicated. Such activities

should be done especially during nights & weekends which shows higher accident rates and hence increased mortality. Special efforts should be done to educate the community especially adolescent and adult age-group by organizing awareness programs regarding hazards of drunken-driving. Safeguarding of Railway premises specially tracks and deploying protection at level crossing to ensure accident free zone. Administrative license revocation or suspension laws to be put in force to allow police to take away the license of a driver who tests at or above the legal BAC limit or who refuses testing. Mass media campaigns to spread messages about the physical dangers and legal consequences of drunk driving. They are useful to persuade people not to drink and drive and encourages them to keep other drivers from doing so.

Acknowledgement: The author acknowledges the teaching and non-teaching staffs of Department of Forensic Medicine & Toxicology, Kasturba Medical College, Mangalore for their guidance and support in carrying out the project. The authors place sincere thanks to all administrators of KMC, Mangaluru for promoting research among the students. Ethical clearance from Institutional Ethics Committee (IEC KMC MLR 07-16/145) was taken before the study.

Ethical Clearance: Institutional Ethical clearance taken

Conflict of Interest: Nil

Source of Funding: Nil

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Psychological Well-Being as a Mediator Between Psychological Contract Breach and Organisation Citizenship Behaviour

Veena Christy¹, Jayapreethi Manoharan², M. Yokesh²

¹Assistant Professor & Head of Law Division, ²Assistant Professor, Department of Science & Humanities, Saveetha School of Engineering, Saveetha Institute of Medical & Technical Sciences

ABSTRACT

This paper is an attempt to study the negative impact of Psychological Contract Breach on Organisational Citizenship Behaviour in India and to explore the mediating effect of Psychological well-being of employees. It's classic argument between the social exchange theory and the self-determination theory. A regression analysis is used to study the variables. The results confirm that positive organisational behaviours suppress the influence of psychological contract breach.

Keywords: Psychological contract breach, organisation citizenship Behaviour, Psychological Well Being, Positive organisational behaviour

INTRODUCTION

The need for retaining quality employees is highly imperative to an organisation ^[1]. Though the IT sector in India seems to be offering a competitive remuneration and a host of other benefits, employees are often seen sulking at the state of affairs. According to a survey done in 2014, at least 50% of the employees in India Inc. were found dissatisfied due to ineffective leadership (Times Jobs.com – study)

A. Psychological Contract Breach: When employees accept a job contract from any organisation, besides the written exchange of promises, both the employer and the employee tend to develop implicit obligations mutually. Primarily, the psychological contract refers such mutual expectations between the employer and the employee

^[2]. There exists an unwritten set of mutual expectations which operates at all times between every employee of an organisation and the organisation. It is a non-static and reciprocal deal which adds on over time and is often related with the social aspect of an individual ^[3] Several dimensions of an employment relationship are not formally written ^[4] The professional expectation of employees have undergone a paradigm shift ^[5] which demands them to be more adaptive and raises the problem of attracting and retaining effective workforce. A traditional career progression is no more attractive for the employees ^[6]

Psychological Contract Breaches have been estimated to be occurring in organisations ranging from 25% ^[7] to more than 90%^[8]

B. Organisational Citizenship Behaviour: The genesis of this concept dates back to 1977. According to Organ(1988) when an individual puts in more than his / her formal demands of job description and makes extra voluntary effort i.e., the effort not included in the official reward system, his / her such behaviour is termed as OCB. Accomplishment of more responsibilities which goes beyond the call of duty is OCB ^[8] it is an individual behaviour playing a dominant role in the efficiency and effectiveness of an organisation ^[9].

Corresponding Author:

Dr. Veena Christy
Assistant Professor & Head of Law Division,
Department of Science & Humanities,
Saveetha School of Engineering,
Saveetha Institute of Medical & Technical Sciences,
Mobile: 9940197661
Email: veenachristy.sse@saveetha.com

C. Psychological Contract Behaviour and Organisational Citizenship Behaviour:

When the employees find that the behaviour of the employer does not match with his expectations, naturally he is drawn towards disappointment which mounts depending on the level of his expectations. The first attitudinal change observed among such employees is job dissatisfaction^[10] Research has attributed PCB as a criteria for reduced job satisfaction^[11] On perceiving a PCB, employees are unwilling for voluntary tasks and exhibit reduced desire to remain in the organisation^[12]. Though the negative waves created by PCBs are well established over the years^[13] the aftermath created or the way in which its responses are moulded has not been thoroughly explored.

D. Psychological Well Being: Happy employees are generally healthier, have better inter personal relationships, perform better at work^[14] which benefits the organisations and the society at large. The capacity of PWB reflects in living a meaningful life. It involves perceived progressing in the face of mounting challenges of life and still following meaningful goals and establishing quality relationship with others^{[15][16][17]}

PWB is not simply experiencing more pleasure than pain; instead, it involves a striving for perfection and realisation of one's true potential^[15]. Individuals are regarded as being in a state of psychological well-being if they have a high degree of satisfaction with themselves and if they occasionally experience unpleasant emotions^[18]

Existing research advocates that positive work practises influence the Psychological well-being of an individual^{[19][20]}. The mounting literature on positive psychology and/or positive organisational behaviour^[21] also supports the finding that positive psychological state of an individual constructively effects attitudes towards the organisation.

F. Psychological Well-Being as a mediator between PCB and OCB: Perceived support of superiors can strengthen the positive relation between breach and violation, and the negative relations between breach or violation and supervisor-rated employee behaviours^[22]. Fair treatment by group members communicates symbolic messages about the relationship between the organization and the employee, and has implications for whether employees can take pride in their organizational membership.^[23]

OBJECTIVES

1. To study the influence of Psychological Contract Breach on Organisational Citizenship Behaviour
2. To investigate the mediating effect of Psychological well-being in PCB – OCB relationship.

NEED FOR THE STUDY

A majority of psychological contract studies are based in American, European or western contexts^{[24][25]} Very few psychological contract studies have been conducted in collectivist or non-western contexts^[27]^[28]. However, studies examining the role of individual variables on psychological contract breach are rather insufficient^[29]. Psychological Contract Breaches have been estimated to be occurring in organisations ranging from 25% to 90%^[30]

Conceptual Framework: The psychological contract literature has amassed a huge expanse of research about the impact of perceived psychological contract breach on outcomes of organizational concern, such as poor citizenship behaviour,^{[31][32]} Psychological contract breach relates negatively to work performance^[33].

Based on the above literature, this study proposes Hypothesis 1 as follows:

Hypothesis 1: The degree of employees' perception of breaches of psychological contracts is negatively related to organizational citizenship behaviour.

Research works in the social sciences have shown that authenticity leads to healthy psychological functioning^[34] which leads to a number of positive psychological outcomes. Studies have also exposed that deficiency of authenticity can lead to negatively affected psychological health^[35]

Extant research suggests that positive work experiences influence the psychological well-being of individuals in an organisation^{[19][20][21]}. Growing literature on positive psychology and/or positive organizational behaviour^[21] also supports the finding that positive psychological state of an individual positively influences their relative attitudes towards the organization.

Based on the above literature, this study proposes that Authentic Leadership style will have an impact on Psychological well-being of the employees and their

organizational citizenship behaviour. Hypothesis H4, and H5 are put forward accordingly.

Hypothesis 2: the level of Psychological Well-Being relates positively to the level of Organisational Citizenship Behaviour.

Hypothesis 3: the degree of psychological Contract breach is negatively related to Psychological Well-Being.

The goal of this study is to examine the mediating effect of POB in suppressing the negative effect caused by PCB on OCB. Specifically, the components of POB, the one representing the employees – Psychological well-being proposed by Carol Ryff (2002) is considered. Hence the following hypothesis.

Hypothesis 4: POB will suppress the influence of PCB on OCB.

Hypothesis 4A: PWB will reduce the influence of PCB on OCB.

PATH MODEL

The Path Model depicting the association between the latent variables:

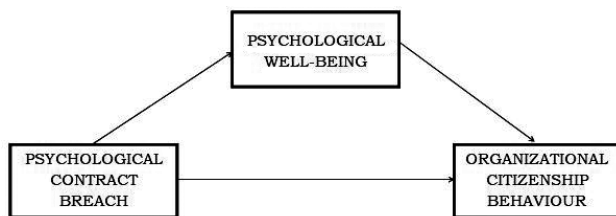


Figure 1: Path Model

RESEARCH METHODOLOGY

Nature of Data: Employees, 500 in number belonging to IT companies in Chennai were approached for Survey. The employees who responded were asked to refer their friends and colleagues in the organisation, and hence it is a Non-probability Snow-Ball sampling.. About 88% ($n = 442$) of the participants returned the questionnaires.

Research Measures:

Psychological Contract Breach (25 items) was measured using six-point scale, adapted from Robinson and Morrison. Reliability and Validity was found to be CR (Composite Reliability) = 0.748, AVE (Average Variance Extracted) = 0.499, MSV (Mean Shared Squared Variance) = 0.630, ASV (Average Shared Variance) = 0.489.

Organisational Citizenship Behaviour was measured using the twenty-item scale developed by Suzy Fox and Paul E Spector (2011). Reliability and Validity was found to be CR (Composite Reliability) = 0.812, AVE (Average Variance Extracted) = 0.468, MSV (Mean Shared Squared Variance) = 0.630, ASV (Average Shared Variance) = 0.589.

Psychological Well-Being was measured using the twenty one-item scale developed by Carol Ryff (1995). Reliability and Validity was found to be CR (Composite Reliability) = 0.831, AVE (Average Variance Extracted) = 0.621, MSV (Mean Shared Squared Variance) = 0.569, ASV (Average Shared Variance) = 0.533. In keeping with prior studies age, gender, tenure and educational level of respondents were treated as control variables.

Table 1: Model fit indices

CONSTRUCTS	χ^2	χ^2/ df	GFI	AGFI	CFI	RMSEA
PCB	373.884	2.898	0.912	0.884	0.906	0.066
OCB	393.987	2.592	0.924	0.895	0.892	0.060
PWB	530.596	3.032	0.900	0.868	0.906	0.068
	P = 0.000					

ANALYSIS & FINDINGS

Descriptive Statistics

Table 2: Correlation between Variables

	Cumulative Mean	Std. Deviation	PCB	OCB	PWB
PCB	3.16	0.29	1.00		
OCB	3.31	0.11	-.54	1.00	
PWB	4.06	0.27	-.52	.59	1.00

Hypothesis Test Results

Table 3: Regression analysis for hypothesis testing

Hypothesis	Variables	Unstandardised Coefficients		Standardised Coefficients	t	Sig	Remarks
		B	SE	B			
H1	PCB→OCB	-0.620	0.041	-0.586	-15.183	.000	Accepted
H2	PWB→OCB	0.487	0.032	0.592	15.391	.000	Accepted
H3	PCB→PWB	-0.655	0.052	-0.516	-12.608	.000	Accepted

Mediation Study

A mediator is involved in contributing for the influence of the independent variable on the dependent variable. To test the mediator Psychological Well-Being, the tests suggested by Baron & Kenny 1986 was followed and the SEM procedures were applied using the maximum likelihood estimation algorithm. It has been previously argued that in the area of mediation analysis, when conditions of CFA are met, and when models have incorporated latent variables, SEM bids a better substitute to tradition regression tests of mediation. However, here, conceptually the procedure

of testing mediation using SEM is analogous to Baron and Kenny's (1986) approach.

The relationship (total effect) pertinent between PCB and OCB has been tested to be significant (Table 4). Under ideal conditions, when all variables to the relationship between PCB and OCB are controlled, the mediating effect of the mediator is found to suppress the influence of PCB and OCB but this significant and indirect effect (Table 5) does not nullify the influence of PCB and OCB. Hence, it is concluded that the mediator PWB *partially mediates* the influence of PCB on OCB. Thereby hypothesis 4 along with 4A is accepted.

Table 4: Regression between dependant & independent variable Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	104.168	2.546		40.907	.000
PCB	-.617	.041	-.586	-15.183	.000

a. Dependent Variable: OCB

Table 5: Regression between dependant, independent & mediator variables Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1.	(Constant)	58.179	4.368		13.320	.000
	PWB	.356	.032	.438	11.249	.000
	PCB	-.389	.040	-.381	-9.772	.000

a. Dependent Variable: OCB

DISCUSSION

The often quoted theory that supports and explains the relationship between Psychological Contract Breach and Organisational outcomes is the social exchange theory^[37] and the reciprocity norm^[37]. According to the

social exchange theory, if the organisation fulfils the employee's psychological contracts, the organisation is said to have reached its goal. This reaction of taking revenge or giving back the negativity is acknowledged by the reciprocity norm^[37]. The perception of PCB is a subjective phenomenon^[36]

We build on the research of Deci & Ryan (2000) Self-determination theory is a macro theory that defines the intrinsic and varied extrinsic sources of motivation and describes the relative roles of both the motivators. Though the initial work on SDT dates back to 1970s, only the past decade witnessed mushrooming of research in this theory. SDT is an umbrella which holds six mini theories. One among them is the **Relationships Motivation Theory (RMT)**, *the sixth mini-theory*, is concerned with the development and maintenance of close personal relationships such as best friends and romantic partners as well, since belonging to groups, is one of the three basic psychological needs.

The last three mini theories namely Basic Psychological Needs theory, Goal Contents Theory and the **Relationships Motivation Theory explain the role of Psychological well-being in suppressing the negativity of Psychological contract breach.**

LIMITATIONS

One of the potential limitations of this study is that it has used only one construct of Positive Organisational Behaviour. The constructs being very sensitive, most of the respondents were coaxed to participate. Though the accuracy is ensured, the interpretation of the results could not completely rule out the possible influence of non-independence bias.

Ethical Clearance: Not Applicable

Source of Funding: Self

Conflict of Interest: NIL

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Pattern of Poisoning Cases at a Tertiary Health Care Centre— A Cross Sectional Study.

Vinay Bannur¹, Prasanna S. Jirli², Ravindra S. Honnungar³, Vishal V. Koulapur⁴, Somashekhar S. Pujar⁴

¹Assistant Professor, Department of Forensic Medicine and Toxicology, Krishna Institute of Medical Sciences, Karad; ²Professor and HOD, ³Professor, ⁴Associate Professor, Department of Forensic Medicine and Toxicology, Jawaharlal Nehru Medical College, Belagavi

ABSTRACT

Introduction and Objectives: Poisons are responsible for more than 3 million cases worldwide annually, India being among the highest contributor. Thus, this study identifies burden of poisoning cases at regional level and helps formulate preventive measures.

Materials and Method: Prospective, hospital based cross sectional study conducted at KLE's Dr Prabhakar Kore Hospital and MRC, with autopsy unit, Belagavi - for 1 year. Data collected using pretested proforma and analyzed.

Results: Total 306 poisoning cases, out of which, 35 cases (11.4%) expired. Highest being pesticide poisoning – 150 cases (49%) and 20 deaths (57.2%). Age group 21 - 30 years was most commonly involved. Male : female ratio - 1.51 : 1 for total cases and 1.69 : 1 for total deaths. Most cases and deaths were suicidal - 67.1% and 80% respectively, common cause being alleged family problems (34.1%). Majority cases were farmers (24.8%). Mortality high in cases coming within 5 hours (19.3%). Majority cases belonged to grade 1 (36.3%) Poison severity score.

Conclusion: Poison management centres should be started at rural places, proper education and mental strength should be imparted to the population to curb intentional cases.

Keywords: *Poison, Poison Severity Score, Pesticide poisoning, Belagavi.*

INTRODUCTION

Poisoning cases, both accidental and intentional (homicidal/suicidal), are a significant contributor to mortality and morbidity throughout the world¹.

Poisoning cases and deaths due to poisoning are on a rise over the years despite of the advanced knowledge and newer techniques available for management. According to WHO, more than 3 million acute poisoning cases with more than 2,20,000 deaths occur annually worldwide. Of these cases, 90% of fatal poisoning occur in developing countries particularly among agricultural workers^{1,2}.

According to an estimate, number of poisoning cases in India was 39254 in 1991 and risen to an alarming level of 60809 cases in 1995³, making our country one of the highest incidence of poisoning in the world. It is estimated that more than 50,000 die every year from toxic exposure⁴.

Mortality from poisoning varies from country to country depending upon type of poisons encountered, extent of awareness about poisoning, availability of treatment facilities and presence or absence of qualified personnel. In developed countries rate of mortality from poisoning is as low as 1–2%, but in India it varies from shocking 15–35%⁵.

In spite of such alarming levels of mortality and morbidity, no statistics are available in India regarding incidence of poisoning at home or at hospital. This may be due to lack of data at central level as most of the cases are not reported. The known cases are just as the tip of the iceberg.

Corresponding Author:

Dr. Vinay Bannur
Assistant Professor,
Department of Forensic Medicine and Toxicology,
Krishna Institute of Medical Sciences, Karad-415110
Email: vincyman.u7@gmail.com

Considering the above points, the objective of this study is to report promptly the pattern and incidence of poisoning cases at a regional level (like district level in this study) and point out the changing patterns of poisoning regarding various parameters and draw attention to various efforts which can be made to reduce the number of poisoning cases.

AIMS AND OBJECTIVES

1. To study pattern of poisoning cases coming to a tertiary health care centre.
2. To study the relation between poisoning cases and influencing factors.
3. To know the burden of poisoning cases in our tertiary care centre.

REVIEW OF LITERATURE

Poison is any substance (solid, liquid or gas), which if introduced into the living body, or brought in contact with any part thereof, will produce ill effects or death, by its constitutional or local effects or both¹.

History of poisons and poisoning dates back several thousand years and is spread through different parts of the world, including ancient Indian shastras, Egyptian Papyri, Sumerians, Babylonian, Hebrew and Greek records¹.

To determine the annual rate of poisoning-related Accident & Emergency Department visits at Sultan Qaboos University Hospital in Oman, a prospective observational study was conducted over 4 years (1996-1999). 204 poisoning-related Accident & Emergency Department visits were recorded corresponding to an average annual rate of 1.8/1000 Accident & Emergency Department visits. Therapeutic agents were most commonly involved (50% of all cases). Accidental poisoning in toddlers was most commonly caused by drugs. Intentional poisoning in adults involved mainly therapeutic agents (50%), particularly analgesics, followed by industrial and environmental agents (25%). Animal poisoning (14%) was most commonly encountered in adult males. Traditional remedies constituted 7% of all poisoning cases. A total of 148 patients (73%) were admitted for 1 to 175 days⁶.

It is a retrospective study conducted during Jan 2009-Jan 2012 in Annapoorana Medical College &

Hospitals, Salem, Tamil Nadu, to find out the Profile of poisoning cases in a Tertiary care Hospital, Tamil Nadu 150 cases of acute poisoning in adults due to drugs and chemicals were included, 148 cases were of intentional poisoning and two cases were of accidental poisoning. In all the cases the route of exposure was oral. Males (92 cases) outnumbered females (58 cases) and 101 cases were married. Peak occurrence was in the age group of 21-30 years (47 cases). Occupation wise poisoning was commonly found among male laborers (18.66%) and farmers (13.33%) followed by house wives (28%) and students (16.66%). 147 cases (98%) were Hindus. More cases were reported during summer season (36%) and day time (80%). Organophosphorus was the commonest agent (58.66%). Associated co-morbid conditions were found in 16 cases⁷.

A prospective study of poisoning cases (excluding animal bites) brought to the Civil Hospital Ahmadabad, from 1st October 2006 to 30th September 2007. Total 366 cases of acute poisoning were recorded over a period of one year. Of these 70.8% were males and 29.2% female. The majority (45.08%) cases were from age group of 21-30 years. 71.6% cases were from rural area. Commonest type of poison was pesticide in 33.9% cases, followed by household chemicals 26.8%, in 74.6% cases cause of poisoning was intentional. Fatality in pesticide poisoning was 25.8%⁸.

In a retrospective and prospective study conducted at JSS Medical College, Mysuru, Case records of poisoning cases from January 2005 till January 2008 were reviewed retrospectively and prospectively from January 2008 to September 2009, with objective of assessing the prevalence and mortality incidence rate, A total of 1045 poisoning related admissions were identified, Among them, 68.40% of cases were due to intentional poisoning and 31.60% were due to accidental poisoning. Of the poisoning related admissions, 84.4% of patients recovered, whereas in 7.6% of cases condition did not improve. Mortality rate was observed 4%. Intentional poisoning was observed more in male population (60.2%) in the age group of 18-29 years. Accidental poisoning was seen more in children in the age group of 1-3 years. Incidence of overall poisoning cases were high due to pesticides (39.5%) followed by medicines (26.1%), household products (22.1%), environmental poisoning (12.1%) and heavy metals (0.2%)⁹.

MATERIALS AND METHOD

This study is a cross sectional study, conducted at KLES's Dr Prabhakar Kore Hospital and MRC, attached with autopsy block, Belagavi, for a period of one year from January 1, 2014 to December 31, 2014. Data was collected from patients of poisoning cases visiting casualty/wards, poison detection centre reports, their medical records, laboratory reports, autopsy reports and regional Forensic science laboratory reports in fatal

cases, by universal sampling method. Informed and written consent was obtained and a preformed, pretested proforma was used to collect the required information.

FINDINGS AND RESULTS

A total of 306 poisoning cases came to the tertiary centre during the study period, out of which, 35 cases (11.4%) expired. Majority of the cases and deaths were literates - 53.3%.

Table 1: Distribution of poisoning cases and deaths on the basis of type of poison

Sl. No.	Type Of Poison	Cases		Deaths	
		Total	Percentage	Total	Percentage
1.	Pesticides	150	49%	20	57.2%
2.	Bites	73	23.9%	05	14.2%
3.	Pharmaceutical Drugs	38	12.4%	02	5.7%
4.	Alcohol + Pesticides	18	5.9%	03	8.6%
5.	Hydrocarbons	06	2%	01	2.9%
6.	Cyanides	05	1.6%	03	8.5%
7.	Unknown	05	1.6%	01	2.9%
8.	Food Poisons	04	1.3%	00	00%
9.	Alcohol	03	0.9%	00	00%
10.	Corrosive Acids	02	0.7%	00	00%
11.	Cerebral Delirants	02	0.7%	00	00%
Total		306	100%	35	100%

Maximum number of cases and deaths involved pesticide poisoning – 150 cases (49%) and 20 deaths (57.2%) respectively followed by poisoning due to animal bites – 73 cases (23.9%) and 5 deaths (14.2%).

Table 2: Age wise distribution of cases and deaths due to poisoning

Age Group (In Years)	Admitted Cases		Deaths	
	Total	Percentage	Total	Percentage
<10	16	5.2%	03	8.6%
11 – 20	61	20.1%	06	17.2%
21 – 30	117	38.2%	11	31.4%
31 – 40	45	14.7%	04	11.4%
41 – 50	31	10.1%	04	11.4%
51 – 60	25	8.2%	02	5.7%
61 – 70	07	2.3%	02	5.7%
71 – 80	04	1.3%	03	8.6%
> 80	00	00%	00	00%
Total	306	100%	35	100%

Maximum number of cases and deaths were seen in the age group between 21 - 30 years, 117 cases (38.2 %) and 11 deaths (31.4 %) respectively.

Table 3: Distribution of cases and deaths due to poisoning in relation to manner of poisoning

Maner of Poisoning	Admitted Cases		Deaths	
	Total	Percentage	Total	Percentage
Suicidal	205	67%	28	80%
Accidental	99	32.4%	16	17.1%
Homicidal	2	0.6%	01	2.9%

Most of the cases and deaths were suicidal - 67.1% and 80% respectively with maximum cases related to alleged family problems-34.1% leading to poisoning.

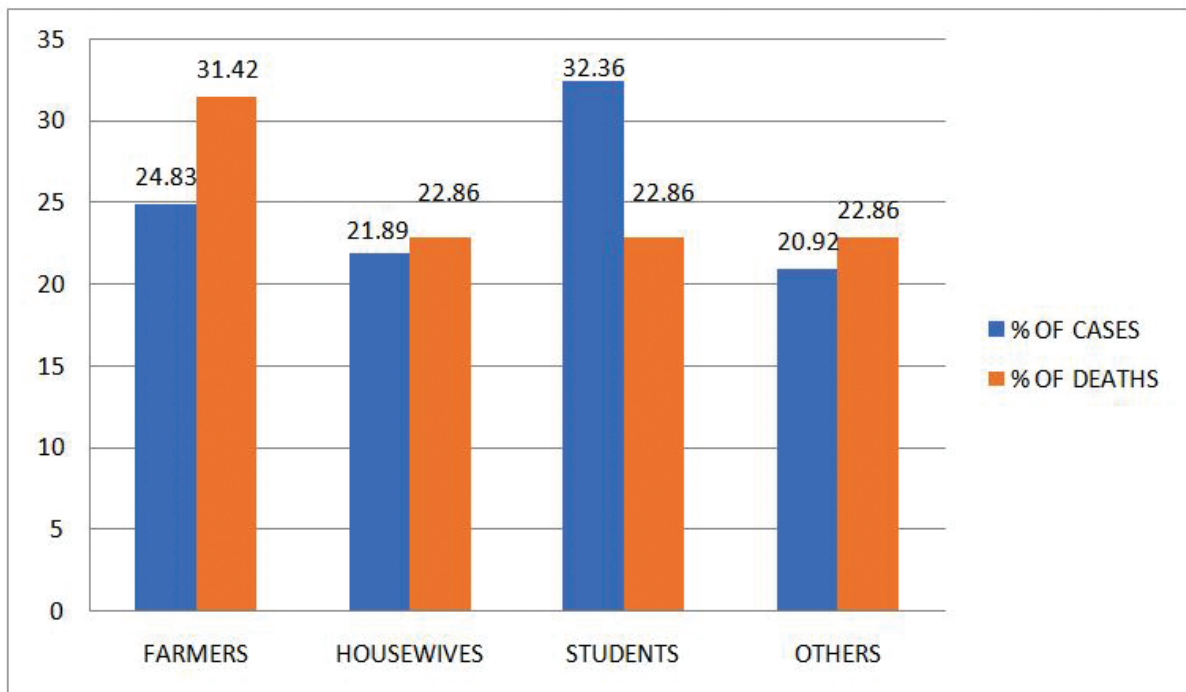
Table 4: Distribution of poisoning cases and deaths in relation to mode of poisoning

Mode of Poison	Admitted Cases		Deaths	
	Total	Percentage	Total	Percentage
Oral	22	74.2%	29	82.9%
Injection	76	24.8%	06	17.1%
Inhalation	03	1%	00	0%
Total	306		35	

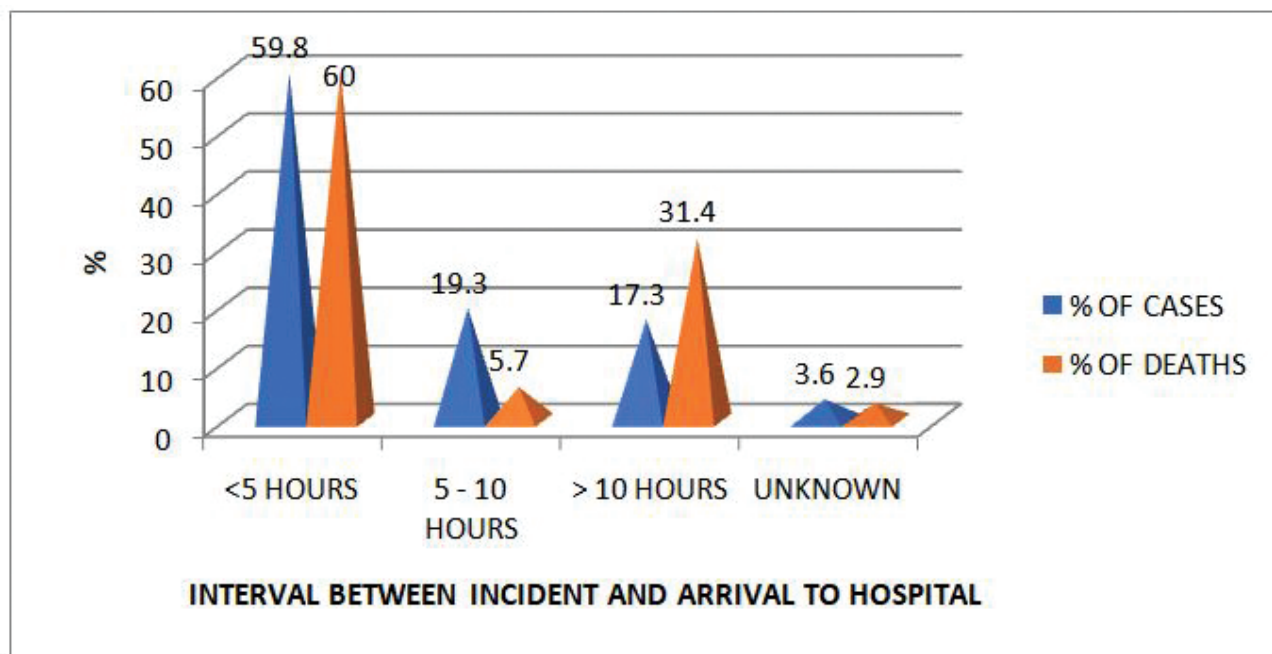
Most common mode of poisoning was oral - 74.2% of cases and 82.9% of deaths followed by injection-24.8% of cases and 17.1% of deaths.

Maximum number of cases and deaths involved males, 184 cases (60.1%) and 22 deaths (62.9%) respectively. Male : female ratio being 1.51 : 1 for total cases and 1.69 : 1 for total deaths.

Maximum cases were seen in the month of June (11.8%) and maximum deaths in January and October (14.2% each). Maximum cases and deaths were seen in winter season 34.6% and 48.6% respectively, followed by rainy season (34.3% of cases and deaths).

**Graph 1: Distribution of Cases and Deaths Related to Occupation**

Most of the cases were students (32.36%), farmers being the most common occupation involved (24.83%). Most deaths were seen in farmers (31.42%).



Graph 2: Distribution of Poisoning Cases and Deaths Based on Time Interval between Incident and Arrival to Hospital

59.8% of cases came to the tertiary centre within 5 hours of poisoning incident.

Mortality was high in cases coming within 5 hours - 19.3%, followed by cases coming after 10 hours of incident - 17.3%.

210 cases (68.6%) were referred to tertiary centre out of which 22 cases (65.67% of total deaths) expired. Rest 96 cases came directly to the tertiary centre out of which 12 cases (34.3% of total deaths) expired.

Majority of cases belonged to grade 1 - 111 cases (36.3%) of Poison severity score, followed by Grade 2 - 101 cases (33%), Grade 0 - 59 cases (19.3%) and Grade 3 - 35 cases (11.4%) respectively.

DISCUSSION

During the present study period of 1 year from January 1, 2014 to December 31, 2014, a total of 306 poisoning cases were admitted to KLES's Dr Prabhakar Kore Hospital and MRC, Belagavi. Out of these, maximum number of cases were due to pesticides - 150 cases (49%). This result is similar to the results conducted at Annapoorna Medical College and Hospitals, Salem, Tamil Nadu with 58.66%⁷, JSS Medical College, Mysuru, with 39.5%⁹. In contrast, study at Qaboos

University Hospital in Oman shows therapeutic agents were more commonly involved⁶. These differences can be attributed to a number of factors like - India being a developing country depends a lot on agriculture, making pesticides easily available at many homes.

In the present study, out of 306 cases, 35 cases expired which is an overall mortality rate of 11.4%. Studies at JSS Medical College, Mysuru⁹ shows mortality of 4% and Civil Hospital, Ahmadabad shows mortality of 25.8%⁸. Age group most commonly involved in this study was between 21 - 30 years, which is similar to study conducted at Annapoorna Medical College and Hospital, Salem, Tamil Nadu⁷, at Civil Hospital, Ahmadabad⁸, at JSS Medical college, Mysuru⁹, at Karad¹⁰ and Bengaluru¹¹. Male population is most commonly involved in this study with 60.1% cases and 62.9% deaths due to poisoning, male to female ratio being 1.51:1 for admitted cases and 1.69:1 for deaths, which was the same in other studies with varying percentages. In this study 67% of cases were suicidal, which was again similar to other studies. Triggering factors responsible for these intentional poisoning was studied upon in this study which revealed - maximum cases (34.1%) were due to family related problems. This point was not dealt with in any other study. In this study 53.3% of cases involved literate population, students were involved in 32.3% of cases. These results show that

literate male youngsters are more commonly involved with poisoning cases, which may be due to the fact that males are dominant and bread earning half of a family so is exposed to more stress causing to take such extreme steps in life.

Maximum cases in this study were seen in winter season (34.6%), this result is different in contrast to study conducted at Annapoorna Medical College and Hospital, Salem, Tamil Nadu – where maximum cases were seen in summer season (36%)⁷. In this study 59.8% of cases came to tertiary care within 5 hours of exposure and 68.6% of cases were referred from other hospitals. According to Poison Severity Score–maximum cases belonged to grade 1 (36.3%). No other studies have mentioned about these aspects. Mortality and morbidity increases as the time interval increases.

CONCLUSION

The study clearly shows pesticides are the most common means of poisoning owing to the fact that pesticides are easily available and can cause severe morbidity, leading to deaths. The most saddening fact is that most of the cases involve literate group of people, in the age group between 21–30 years, it's the youth who are committing large number of suicides due to various triggering factors. This shows that poisoning is more of a mental issue to manage and preventive strategies should be formulated accordingly.

The long standing problems of farmers still continues, as they continue to commit suicide due to financial problems and weather problems, which is a tough burden to resolve and requires combined efforts from the government and doctors to reduce this burden. Accidental cases in fields due to animal and insect bites are also increasing due to improper protective measures and lack of proper knowledge which has to be curbed. Industrial poisoning incidents are low compared to other causes. Homicidal cases are rare with only two cases being reported in the whole year.

The study also shows that many cases are being referred from other smaller health centers and hospitals, which are leading to delays in early diagnosis and adequate management. With the introduction of poison detection centre it is helpful to diagnose the poison early and give proper care. Such centers should be increased so that proper care is given over a larger area and delays are reduced.

Conflict of Interest: No

Source of Funding: Self

Ethical Clearance: The ethical clearance was obtained by JNMC Institutional Ethics Committee on Human Subjects Research – Jawaharlal Nehru Medical College, Belagavi.

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An Analysis of Pattern of Fatal Head Injuries in Road Traffic Accidents

Shobhana S S¹, RaviRaj K G¹, Yadav Abhishek², Lohith Kumar R³

¹Assistant Professor, Dept of Forensic Medicine & Toxicology, Vydehi Institute of Medical Sciences & Research Centre, Bangalore; ²Assistant Professor, Department of Forensic Medicine and Toxicology, All India Institute of Medical Sciences (AIIMS), Ansari Nagar, New Delhi, India; ³Assistant Professor, Department of Forensic Medicine & Toxicology, Shimoga Institute of Medical Sciences, Shivamogga, Karnataka

ABSTRACT

One of the common regional injuries an individual can sustain in Road Traffic Accidents is head injury. Head and face is the region which is more susceptible and requires an immediate care and treatment. The fatality rate is high even with intense treatment. Law making agencies has been continuously trying to enforce the rules of wearing helmets both in riders and pillion in two wheelers. Considering the same, this study was done in eastern part of Bangalore, an IT hub and a rapidly developing area with increase in vehicular movements. The study concluded that incidence was common among age group of 21-30 years with male predominance and among two wheel riders. Laceration is most common external injury followed by abrasion. Fissure fractures are most common type of Fracture, and sub dural haemorrhage is seen in majority of cases.

Keywords: Road Traffic Accidents, Head Injuries, Fatality, Subdural Hemorrhage.

INTRODUCTION

Traumatic brain injury (TBI) is a significant public health problem leading to mortality, morbidity, and socioeconomic losses in India. The majority (60%) of TBI cases are a result of road traffic accidents (RTA).¹ Head injury is a morbid state where there are gross or subtle structural changes in scalp vault and or the content of the skull. The application of blunt force may result in injury to the skull and its contents.² As per History head trauma did not take long to be realized by human, the head has always been seen by both assailant and defender as a region of particular vulnerability, where an incapacitating blow might most effectively be

landed. This is well attested by the creation of protective helmet (iron hat) worn by the warriors far back in the antiquity and now as well, at war and at peace, while at work and in variety of sport- connected activities. It is learnt from heroic poems of Greek and Roman literature that the cranial wounds of antiquity did not differ a great deal in their lethal or disabling effects from the cranial wounds of our times; the change that had been seen over ages is method of injury both accidental and intentional assault, basic reason for change is continuous upgrading of “force”.³

AIMS AND OBJECTIVES OF THE STUDY

1. To know the pattern of fatal head injuries in relation to age, sex, type of road user, place of death.
2. To know the pattern of fatal head injuries in relation to cause of head injury.

MATERIALS AND METHODOLOGY

Data was collected from the medico legal autopsy reports and from inquest forms of fatal head injuries

Corresponding Author:

RaviRaj K G,
Assistant Professor,
Dept. of Forensic Medicine & Toxicology,
Vydehi Institute of Medical Sciences & Research Centre,
Whitefield, Bangalore-66
Email: ravirajkganapathy@gmail.com

related to road traffic accident for a period of 5 years from September 2006 to August 2011 which were autopsied in Vydehi Hospital Mortuary. A proforma was prepared accordingly to collect the data based on the deceased's particulars, with complete external and internal examination of those involved in fatal head injuries of RTA cases. The particulars of deceased in the form of age, sex, type of road user, types of injuries, types of Fracture, Haemorrhages and cause of Death, were studied based on autopsy reports, inquest forms, information from relatives. Those cases that are not included in this study are

1. Decomposed cases with fatal head injuries, where the interpretation of injuries is not possible due to extensive decomposition.
2. Unknown cases where, the history and details are not available.
3. Intracranial hemorrhages, infarctions, lesions as a result of natural diseases.
4. Extensive burns involving head, where there is difficulty in interpretation of injuries.

OBSERVATIONS AND RESULTS

Data was collected in 184 cases with various objectives. Among 184 cases of head injuries 123 cases were those of RTA. Age of incidence broadly grouped into ten years range and Youngest case noted was that of 1½ years and oldest noted was 78years. Highest incidence of 42% cases was noticed in age group of 21 to 30 years (Table-1). On considering sex profile 11% cases were those of females and 89% was that of male (Table-2). In road traffic accidents when data was analyzed among the type of road users, two wheeler motor vehicle occupants were maximum, which accounted for 58% cases, 37% were pedestrians, 3 % were four wheeler and 2% were other types of road users like bicycle riders (Table-3). The incidents indicate four wheeler occupants were well protected compared to other type of road users.

123 cases that is 67% of cases external injuries were noticed in all the cases involving scalp and face. Most common injuries that was noticed was laceration in 51% cases followed by abrasion in 33% cases (Table-5). On considering types of fracture sustained to skull most common being fissured in 50% cases followed by comminuted fracture in 34% cases (Table-6).

On considering the bones involved facial bone is commonly involved in 11% cases in 13% cases there was involvement of facial and all vault bones (Table-7). Base of skull commonly involved middle cranial fossa fracture is involved in 17% cases, anterior cranial fossa in 10% cases combination of all fossa in 1 case (Table-8). Meningeal involvement commonly is subdural haemorrhage that is in 63% cases, subarachnoid haemorrhage is seen in 57% cases (Table-9). On considering injuries to brain contusion was commonly noticed in 20% cases, followed by laceration and contusion (Table-10). Parietal lobe of brain is commonly involved followed by frontal bone (Table-11). Cause of death was shock and haemorrhage is most cases followed by coma, then there are other causes which includes instantaneous, respiratory failure, cerebral oedema, infection, brain stem dysfunction (Table-12).

Table 1: Age Distribution

Age of incidence	Number of cases %
1-10years	3
11-20years	11
21-30years	43
31-40years	13
41-50years	12
51-60years	08
61-70years	07
71-80years	3

Table 2: Sex Distribution

Sex profile	Number of cases %
Male	89
Female	11

Table 3: Type of Road Users

Type of road users	Number of cases %
Two wheelers	58
Pedestrians	37
Four wheeler	03
others	02

Table 4: Place of Death

Place of death	Number of cases %
Spot death	63
On the way to hospital	13
In hospital	23

Table 5: Type of Injury

Scalp and face	Number of cases %
abrasion	33
contusion	04
laceration	51
Crush injury to head	04
Healing wound	02
Suture wound	06

Table 6: Type of Skull Fractures

Type of fracture	Number of cases %
comminuted	34
Fissure	50
Depressed	11
Diastitic	02
Hinge	02
Fissure + Depressed	01

Table 7: Skull Bones Involved

Bones involved	Number of cases %
Facial	11.4
Temporal	8.1
Parietal	8.1
Frontal	8.9
Occipital	7.3
All the above bones	13

Table 8: Involvement of Base of Skull

Base of skull involvement	Number of cases %
Anterior cranial fossa(ACF)	9.7
Middle cranial fossa(MCF)	17
Posterior cranial fossa(PCF)	7
ACF + MCF	7
PCF + ACF	7
MCF + PCF	1.6
ACF + MCF + PCF	0.8

Table 9: Meningeal Involvement

Meningeal involvement	Number of cases %
Extra dural	9.7
Subdural	63.4
Subarachnoid	57.7
Intra ventricular	0.8

Table 10: Internal Brain Injury

Injury to brain	Number of cases %
Contusion	19.5
Laceration	17.8
Oedema	17.8
Drained out	10.5

Table 11: Areas of Brain Involved

Areas of brain involved	Number of cases %
Frontal	13
Temporal	12.1
Parietal	14.6
Occipital	5.7
Diffuse	8.9

Table 12: Cause of Death

Cause of death	Number of cases %
Shock and haemorrhage	54.4
Coma	22.7
others	22.7

DISCUSSION

This study was done to analyse the head injuries and it was found that the Road Traffic Accidents were the most common manner for sustenance of head injuries followed by others like homicidal and suicidal. Incidences of Head injuries due to RTA constitute about 67% which can be compared to a study which had also shown maximum of RTA cases where it constitute 40% of cases.⁴ Incidences were common in two wheelers (57%), followed by pedestrians(36%) and then four wheelers (2.4%) and others (2.4%) which are similar with the study of Jawaharlal Nehru Medical college and hospital, but in contrast with other where the incidence of pedestrian are common followed by two wheeler and others.^{5,6} The male predominance in current study and also age of occurrence of RTA being common in 20 to 30 years is consistent with the other studies⁴⁻⁷. The study can also be compared with another study done in Indore where incidences are common in male in third decade.⁸ Among the injuries to face and the head, similar results were drawn in a study where scalp laceration was noticed as the most common injury.⁷ In the present study on

considering skull fracture of the vault, it had showed the linear/ fissure fracture were the commonest accounting for 50% of cases followed by comminuted fracture in 33% of cases, this can be compared with a study done in Jaipur where they concluded linear fracture is common followed by basilar fracture and then comminuted fracture.⁹

On considering the anatomical location of the skull fracture present study had showed involvement of all bones in majority of cases followed by involvement of facial bones which is then followed by frontal involvement, in contrast to Chandigarh based study which had showed parietotemporal area being common followed by parietal area.⁷ The common meningeal haemorrhage in current study is subdural followed by subarachnoid haemorrhage, this is consistent with a previous study where the subdural haemorrhage is commonest followed by subarachnoid haemorrhage.¹⁰ Aligarh based study had showed that cerebral oedema is common followed by contusion, in contrast current study had showed the contusion is common followed by cerebral oedema and then laceration, few cases also showed complete expulsion of brain matter. The present study has also showed the parietal lobe involvement of brain common followed by frontal lobe involvement. Common cause of death that had been given in most of cases is shock and haemorrhage, followed by coma as a result of injury sustained.

CONCLUSION

Four wheeler involvements were very less which shows that it is a much safer mode of transportation. Most of cases are of spot death without receiving any treatment which will shows the importance of immediate and preliminary treatment.

Ethical Clearance: Institute Ethics Committee.

Conflict of Interests: Nil

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Antibody Detection (IgG, IgM) of both HSV-1 and VZV in Serum and Saliva of Bell's Palsy Patients Recovered by Low Level Laser Therapy

Ali Mihsen Hussein Alyassiri¹, Taghreed Fadil Zaidan¹

¹Department of oral diagnosis, College of Dentistry, University of Baghdad, Baghdad city, Iraq

ABSTRACT

Bell's palsy (BP) is the commonest form of facial palsy. It often starts with pain behind the ear, with impairment of taste sensation. One-hundred and twenty (120) subjects were participated in this study; they were divided into two groups: Group one: Eighty (80) Bell's palsy patients included in this study. These patients were treated by LLLT. Diagnosis of patients with Bell's palsy based on House- Brachmann Scale (HBS, 1996); this diagnosis was done by neuromedicine / neurosurgery specialists, and group two: Forty (40) healthy control subjects (volunteers) with no signs and symptoms of any systemic diseases, with matched ages and genders with BP patients. There was a highly significant reduction in serum HSV-1 IgG level after LLLT ($p < 0.001$). No significant differences were observed before and after LLLT regarding salivary HSV-1 IgG level, serum HSV-1 IgM level and salivary HSV-1 IgM level. A highly significant decline in serum VZV IgG level was observed after LLLT ($p < 0.001$). No significant differences were observed before and after LLLT regarding salivary VZV IgG level, serum VZV IgM level and salivary VZV IgM level.

Keywords: Bell's palsy, HHV-6, PCR.

INTRODUCTION

Idiopathic facial palsy or Bell's palsy (BP) is peripheral facial paralysis with unknown occurrence; affecting the facial nerve, which supplies all facial muscles also supplied the salivary and lacrimal glands, as well as limited sensory fibers in the anterior 2/3 of the tongue for taste function fibers in the anterior 2/3 of the tongue for taste function ¹. Hato *et al.*, 2007 ² showed BP is happen in unilateral side of the face, also is no sexual predilection. It has been described in the patients of all ages groups, with peak incidence showed in the 40 years old of age ³. It is likely happens between the ages of fifteen and forty- five years. At the same time BP showed wide spread in women of the adolescence stage and in their twenties age ranges. The prevalence occurs similar in both genders of their thirties, with increasing incidence after the age of forty years ⁴. Elliott, (2006) ⁵ concluded that the Bell palsy

was the lower motor neuron lesion or disease, happen as a complicated disorder in the neuromuscular facial part with unknown etiology which affects the facial nerve or seventh cranial nerve, causing ipsilateral facial paralysis or paresis in the facial expression muscles. The paralysis in the Bell's palsy will resemble the facial paralysis happens in head injury. The pathophysiology can be explained as an inflammatory condition affecting the facial nerve that leading to axonal demyelination and disturbance of the blood supply to the facial nerve, the pathological process of bell's palsy including the muscles of the facial appearance, salivary glands as well as sensory fibers that supply taste sensation and it will occur in the lacrimal glands leading to excessive lacrimation (excessive tearing) or dryness (excessive dry mouth). Roob *et al.*, (1999) ⁶ showed both etiology and pathogenic mechanism of idiopathic facial palsy have not yet been understood despite extensive research. Immunological reactions, viral infections, genetic and ischemia theories have been postulated. Tomishima *et al.*, (2001) ⁷ showed that the viral reactivation happens through a reduction of the immune activity which could be triggered by metabolic alterations surgical or dental

Corresponding Author:

Ali Mihsen Hussein Alyassiri
Department of Oral Diagnosis, College of Dentistry,
University of Baghdad, Baghdad city, Iraq

procedures immune suppression, or event under stress. Light amplification by stimulated emission of radiation (laser) is one of the most important treatment modalities. Diode or low-level laser therapy (LLLT) is suggested to have bio- stimulating and analgesic effects through direct irradiation without causing thermal response.

MATERIALS AND METHOD

One-hundred and twenty (120) subjects were participated in this study; they were divided into two groups:

Group one: Eighty (80) Bell's palsy patients included in this study. These patients were treated by LLLT. Diagnosis of patients with Bell's palsy based on House-Brachmann Scale (HBS, 1996); this diagnosis was done by neuromedicine / neurosurgery specialists.

Group two: Forty (40) healthy control subjects (volunteers) with no signs and symptoms of any systemic diseases, with matched ages and genders with BP patients. All samples collection was done in Babylon Health Directorate; specifically Merjan Medical City, Babylon Center of Physical Therapy and Rehabilitation and Al-Hilla Teaching Hospital during the period from May 2017 to March 2018, while the laboratory work was done in the College of Sciences Laboratories / Babylon University / Consultation office . The age ranges of those patients were (20- 70) years old. All subjects were examined clinically (extra and intra - orally). Each subject fulfilled a case sheet and approved consent was taken from each subject to participation in this study. The HSB were assessed for all patients in the 1st visit before the treatment as well as after (6 – 7) weeks after of the treatment ⁸.

Samples collection: Blood and saliva were collected from each subject at a fixed daily time i.e. 8-11 a.m. These samples were collected at early diagnosis and after treatment.

Blood sample: About 6 ml of venous blood sample was aspirated from antecubital vein from each individual, using disposable syringes with 21 gauge stainless steel needle. The whole blood transferred into sterile polyethylene tubes. Samples were allowed to clot for 30 minutes before centrifugation at 3000 rpm for 10 minutes then the supernatant serum was aspirated and transferred into an Eppendorf tubes and frozen at – 20 °C for subsequent analysis. Hemolyzed samples were discarded.

Saliva sample: About 3- 4 ml of unstimulated (resting) whole saliva was collected. An individual was asked to rinse his / her mouth thoroughly with water to allow removal of debris. The first mouth – full of saliva was discarded to allow clearance of water, and then the patients were asked to spit all the saliva into a plastic polyethylene tube. The collected saliva was centrifuged at 3000 rpm for 10 minutes; the clear supernatants was aspirated and frozen at - 20°C until assayed. The ELISA kit with Competitive- ELISA technique was applied. Diluted patient serum and saliva were added to wells coated with purified antigen.HSV-1 or VZV (IgG / IgM) specific antibody, it was bind to the antigen. All unbound materials were washed away and the enzyme conjugate was added to bind to antigen- antibody complex. Excess enzyme conjugate was washed off and substrate was added. The plate was incubated to allow the hydrolysis of the substrate by the enzyme. The color intensity generated was proportional to the amount of IgG specific antibody in the sample.

Table 1: List of materials used in analysis of patient's samples with Bell's palsy

Name of Material	Batch number	Place of production
HSV 1/IgG ELISA kit	H1029G	Calbiotech (U.S.A)
HSV 1/IgM ELISA kit	H1030M	Calbiotech (U.S.A)
VZV/IgG ELISA kit	VZ081G	Calbiotech (U.S.A)
VZV/IgM ELISA kit	VZ082M	Calbiotech (U.S.A)

Table 2: Ages and genders distribution between BP patients and healthy control subjects

Age/Year	Bell's palsy Patients (No. 80)	Control Subjects (No. 40)	p-value
Range	20 - 70	20 - 70	1.0
Mean ± S.D	43.6 ± 15.6	45.4 ± 15.9	0.5 ^{NS}
Female	34 (42%)	16 (40%)	0.7
Males	46 (57%)	24 (60%)	
Males/females ratio	1:3	1:5	0.4 ^{NS}

Table 3: Distribution of serum and salivary (HSV-1, IgG,IgM / VZV, IgG, IgM) measures of BP patients before and after LLLT

Variable	Before mean $\pm$ SD	After mean $\pm$ SD	Paired t-test	P- value
HSV-1 IgG serum $\mu\text{g}/\mu\text{l}$	2.5 $\pm$ 0.8	0.9 $\pm$ 0.7	8.1	<0.001 ^s
HSV-1 IgG saliva $\mu\text{g}/\mu\text{l}$	0.5 $\pm$ 0.4	0.6 $\pm$ 0.3	0.8	0.4 ^{NS}
HSV-1 IgM serum $\mu\text{g}/\mu\text{l}$	0.8 $\pm$ 0.3	0.7 $\pm$ 0.2	1.03	0.3 ^{NS}
HSV-1 IgM saliva $\mu\text{g}/\mu\text{l}$	0.5 $\pm$ 0.4	0.7 $\pm$ 1.4	0.7	0.4 ^{NS}
VZV IgG serum $\mu\text{g}/\mu\text{l}$	2.5 $\pm$ 0.9	0.8 $\pm$ 0.7	9.1	<0.001 ^s
VZV IgG saliva $\mu\text{g}/\mu\text{l}$	0.4 $\pm$ 0.3	0.3 $\pm$ 0.1	1.4	0.1 ^{NS}
VZV IgM serum $\mu\text{g}/\mu\text{l}$	0.2 $\pm$ 0.09	0.2 $\pm$ 0.1	0.9	0.3 ^{NS}
VZV IgM saliva $\mu\text{g}/\mu\text{l}$	0.08 $\pm$ 0.08	0.06 $\pm$ 0.02	1.2	0.2 ^{NS}

RESULTS AND DISCUSSION

The age range of patients with Bell's palsy was (20- 70) years, the mean $\pm$ S.D for patients with Bell's palsy were (43.6 $\pm$ 15.6). For the healthy control subjects the age range was (20 -70) years with mean $\pm$ S.D was (45.4 $\pm$ 15.9). Statistical analysis using t – test showed no significant differences between the age of patients and control subjects as shown in table 1. There was a highly significant reduction in serum HSV-1 IgG level after LLLT ($p < 0.001$). No significant differences were observed before and after LLLT regarding salivary HSV-1 IgG level, serum HSV-1 IgM level and salivary HSV-1 IgM level. A highly significant decline in serum VZV IgG level was observed after LLLT ($p < 0.001$). No significant differences were observed before and after LLLT regarding salivary VZV IgG level, serum VZV IgM level and salivary VZV IgM level. All these findings as shown in tables 2. The results in this study noted no significant differences were observed before and after LLLT regarding serum HSV-1 IgM level and salivary HSV-1 IgM level, as shown in table 3. A highly significant decline in serum VZV IgG level was observed after LLLT ($p < 0.001$). No significant differences were observed before and after LLLT regarding salivary VZV IgG level ($P < 0.1$), as shown in table 3. No significant differences were observed before and after LLLT regarding serum VZV IgM level was (0.3) and salivary VZV IgM level was (0.2), as shown in table 3. The ideas of this study as fallow the results of ⁹; they showed that Bell's palsy is a disease without gender or seasonal predilection. It's equally affected men and women regarding age distribution. The highest occurrence of Bell's palsy is reported to be between 15- 45 years of age. This disease is less common in patients under the age of 15 and above the age of 60. Eviston *et al.*, (2015) ¹⁰ agreed with this study; they also showed that patients with Bell's palsy

are not interested in age, gender and seasonal variations. Peitersen, 2002 and Greco *et al.*, 2012 ^{11, 12} stated that the precise etiology of BP remains unclear, although autoimmunity, viral infection and ischemic mechanisms are considered to play an important aspect in this disease. BP has occurrence in pregnant women, diabetic patients, patients with a recent extraction of tooth, those with influenza, also with cold and other respiratory illness more than other groups of population Peitersen , (2002) ¹¹ has showed a poor prognosis in third trimester of pregnancy and in puerperium and diabetics. Shmorgun *et al.*, 2002 concluded that etiology of Bell's palsy remains unknown, but the diabetes mellitus, hypertension, pregnancy, pre-eclampsia, viral infections, hereditary factors, vascular ischemia and autoimmunity reported as probable causes of Bell's palsy. More specific, HSV-1, VZV reactivation, with subsequent inflammation with entrapment of the facial nerve in the narrow labyrinthine segment, proposed to explain nerve injury mechanism ¹³. An increasing the antibody detection levels; could be associated with an early collection of Bell's palsy samples ¹⁴, these considerations were not matched with Kawaguchi *et al.*, 2007 ¹⁵ that showed herpes simplex-type 1 viruses shedding in both serum and saliva were delayed in some sample of patients, probably due to host immunity. Herpes simplex type -1 reactivation is not always accompanied by an antibody response, the lack of IgM and the presence of IgG in patients with Bell's palsy shedding HSV-1 in both serum and saliva may still pointer of HSV-1 reactivation ¹⁵. Finally, HSV-1 may be the most accepted explanation of Bell's palsy occurrence. The presence of IgG and lack of IgM in patients shedding HSV-1 in saliva, serum may still indicate a reactivation of HSV-1; these ideas near the present study. Mitchell *et al.*, (2003) ¹⁶ Rouse and Kaistha, 2006, stated the latency and reactivation of viruses has occurred more rapidly firstly HSV-1 and secondly VZV. Santos *et al.*, 2010

¹⁷ showed the reactivation of VZV which was observed without cutaneous vesicles, in serum and saliva of Bell's palsy samples. These results were not matched with ¹⁸ in which IgG / VZV was lower than these above findings. More specific, HSV-1, VZV reactivation, with subsequent inflammation with entrapment of the facial nerve in the narrow labyrinthine segment, proposed to explain nerve injury mechanism ¹⁸. To the best of our knowledge, this was first study revealed IgM / VZV in serum and saliva of patients with Bell's palsy, so there are no other references to compared with.

CONCLUSION

Both α - herpes viruses (HSV-1 & VZV) are associated with common, self-resolving diseases of the skin or mucosa, and occasionally establish a persistent latent infection of neuronal nuclei in the sensory ganglia innervating the peripheral site of infection, and these viruses may reactivate and recurrent disease will result in the face of existing immunity.

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Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the Department of oral diagnosis, College of Dentistry, University of Baghdad, Baghdad city, Iraq and all experiments were carried out in accordance with approved guidelines.

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Demographic Profile of Pattern of Railway Injuries in Warangal Municipal Limits, A. P.

D. Vijaya Raghavendra¹, K. Ravimuni², K. Usha Rani³

¹Assistant Professor, ²Associate Professor, Department of Forensic Medicine & Toxicology, Karpaga Vinayaga Institute of Medical Sciences & Research Centre, Chinnakolambakkam, Kanchipuram, Tamilnadu;

³Assistant Professor, Department of English, K.L.University, Vaddeswaram, Guntur District, Andhra Pradesh

ABSTRACT

Accident is an unexpected, unplanned occurrence which may involve injury or it may be defined as an unpremeditated event resulting in recognizable damage. Railway related injuries are not those uncommon occurrences in forensic practice. Among the varied presentation of injuries, superficial injuries along with fractures were commonly observed. Over the last 15 years many railway accidents have happened in Andhra Pradesh and in India. Following these train accidents, there has been a large amount of public debate about safety management on the Indian railways. These accidents have raised issues regarding the effectiveness of the safety management of the railway system. This paper presents a summary of the results of a preliminary systemic analysis of several rail accidents in and around Warangal City. The present study was conducted in the Department of Forensic Medicine, Warangal Medical College, Warangal, from January 2013 to June 2014 i.e., 18 months, during which the total postmortem cases were 74 occurred in the jurisdiction of the Govt. Railway Police Station, Warangal. The factors taken to enumerate the study are the incidence of deaths month wise, age and sex, marital status, scene of offence and habitat during railway accidents.

Keywords: analysis, damage, factors, management, preliminary

INTRODUCTION

Evolution is never ending process. Mankind has evolved from primates' eras back. The same Human is trying to develop over the yesteryears by inventing things, which have mechanical advantages. One of them are the Locomotives. Every comfort has some impending dangers within them. Similarly, the moving trains are also proving fatal.¹

The structure and designing of the train is made so safe that it is not easily possible to sustain injuries by the train, unless there is gross negligence or willful act is made to have such injuries. The areas of the movement of train are also made safe by providing

several protective measures but still deaths are occurring on the railway tracks. Several commissions are made by the Governments to look in to these factors which are unsafe for public use. In spite the people living near and around the tracks are so negligent and erratic in using the track, it is always unsafe for these people.²

The train tracks are used for open air defecation. They are used for disposing the waste. It becomes a playground for the children. Agriculture is done in between the tracks. Animal grazing done on the tracks. The most unfortunate part is the train tracks are used by the male prostitutes especially near the railway stations. All these activities increase the movement of the people near the track. It is always dangerous irrespective the amount of safety precautions that are adopted to prevent accidents on the track. People living near to the train tracks, find railway line as their destination when they take a decision to commit suicide. This is because of the accessibility, assured death and lonely places present on the tracks. Railway tracks becomes the place for disposing the dead bodies of the homicidal victims. This type of acts are done to conceal the crime.

Corresponding Author:

Dr. K. Ravimuni

Associate Professor

Department of Forensic Medicine & Toxicology

Katuri Medical College, Katuri Nagar, Guntur District

Email: dr_rvmuni@yahoo.co.in

MATERIALS AND METHOD

This study has been carried out from January 2013 to June 2014 from the ethical committee of Kakatiya Medical College, Warangal, Andhra Pradesh.

The present study was conducted in the Department of Forensic Medicine, Warangal Medical College, Warangal from January 2013 to June 2014 i.e., 18 months, during which the total postmortem cases were 74 occurred in the jurisdiction of the Govt. Railway Police Station, Warangal, Andhra Pradesh.

The records maintained for each case in this department are post mortem requisition given by Investigating Officer in their inquests, treatment records from hospital if treated, history from blood relatives and friends, observation of the circumstances at the scene by visiting the scene of offence, photographs taken from the scene of offence and findings in the Post mortem Examination certificates.

The materials used are inquest Reports, inpatient Case sheets, per usual of police papers, data from district crime records bureau (DCRB), Warangal. Records from Medical Record Section of Kakatiya Medical College, Warangal, Andhra Pradesh. Post mortem Reports of all cases, Information collected from the Investigation Officer, Relatives and friends of the deceased accompanying dead bodies.

OBSERVATIONS AND RESULTS

Warangal is one city which is well connected to all parts of the country by railway line. Kazipet is one of the biggest Railway Junctions. Govt. Railway Police Station is situated in Warangal Railway station and the outpost of this Police Station is located in Kazipet. The number of accidents in the jurisdiction of these stations is also increasing day by day. The same amount of load will be reflected on to the mortuary staff working in this jurisdiction.

There are 74 deaths occurred in the jurisdiction of the Govt. Railway Police Station, Warangal. All of them are subjected to Post mortem examination in the mortuary of Kakatiya Medical College, Warangal from January 2013 to June 2014.

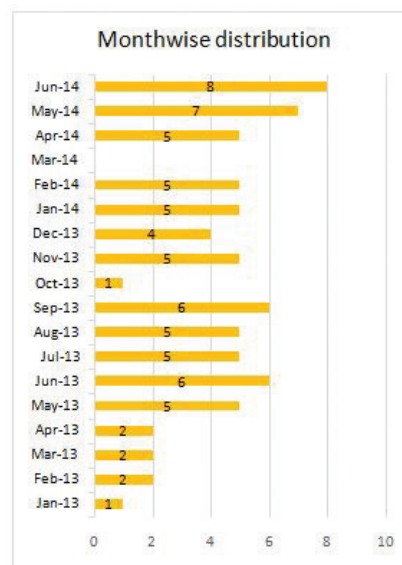


Figure 1: Month wise distribution of Railway related deaths

In this study from Figure No. 1 it can be cleared that there are 8 deaths in the month of June 2014, 7 deaths in May 2014, 6 deaths in the months of June and September 2013, 5 deaths in the months of May, July, August and November 2013, also 5 deaths in the months of January, February and April 2014. 4 deaths occurred in December 2013. 2 deaths occurred in the months of February, March and April of 2013. One death occurred in the months of January 2013 and October 2013. There are no deaths reported in the month of March 2014. The frequency of occurrence of deaths due to railway related injuries over these 18 months is not following any pattern. There are no seasonal variations observed in this period. However, the months of January to April are showing less incidence of deaths and relatively a greater number of deaths are occurring in the months May and June.

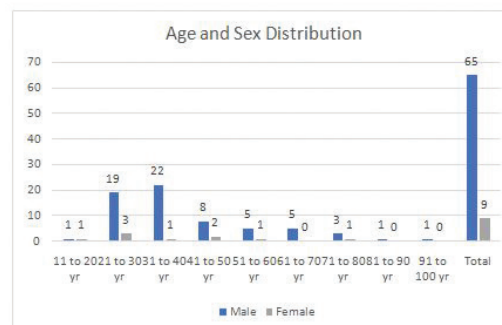


Figure 2: Age and Sex distribution

In this study on perusal of Figure No. 2, The age groups in which a greater number of deaths occurred are 21 years to 40 years, where 45 (60.81%) lives are taken by the railway. The next vulnerable age group is

41 years to 50 years where 10 (13.51%) deaths occurred. This is followed by 51 years to 60 years age group, in which 6 (8.11%) deaths occurred. In 61 years to 70 years age group 5 (6.75%) deaths, in 71 years to 80 years age group 4 (5.41%) deaths, in 11 years to 20 years age group 2 (2.70%) deaths occurred. There are one (1.35%) death in the age groups of 81 years to 90 years and 91 years to 100 years. There are no railway related deaths seen in children less than 10 years of age. Among these people males are 65 and females are 9 giving a ratio of males to females as 7.22: 1.

Table 1: Marital status of the deceased

Marital status of the deceased	Sex		Total n (%)
	Male	Female	
Unmarried	10	2	12 (16.22)

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Married	29	1	30 (40.54)
Widowed	2	0	2 (2.70)
Unknown	24	6	30 (40.54)
Total n (%)	65 (87.84)	9 (12.16)	74 (100)

Table No.1 shows that, out of 74 deaths, 30(40.54%) of the deceased are married, 12(16.22%) are unmarried and two (2.70%) are widowed. The marital status of 30 (40.54%) persons is not known as they are bought as unknown when they are subjected to Post mortem examination.

In this study, 14 (18.92%) of the total deceased there are illiterates. 16 (21.62%) of them have primary education, 9 (12.16%) have secondary education, 4 (5.41%) of them are graduates and one person (1.35%) is an Engineer in irrigation department. Remaining 30 (40.54%) persons' educational status is not available.

Table 2: Time of occurrence and Scene of Offence

Time of Occurrence	Scene of offence				Total n (%)
	On the Platform	Near Railway Station	Near Village/Town	Deserted area	
Early morning	0	0	0	1	1 (1.35)
Morning	1	1	0	15	17 (23.0)
Afternoon	0	0	0	9	9 (12.2)
Evening	0	2	1	8	11 (14.85)
Night	2	2	3	29	36 (48.6)
Total	3 (4.05)	5 (6.75)	4 (5.4)	62 (83.8)	74 (100)

Table No. 2 indicates, one-person (1.35%) fell down from the moving train in the early morning hours i.e. between 4 am and 7am. 17 (23.0%) people died in the morning hours i.e. from 7 am to 12 noon. 9 (12.2%) persons died in the afternoon i.e. between 12 noon and 4 pm. 11 (14.85%) persons died in the evening hours i.e. from 4 pm to 7 pm. 36 (48.6%) persons are died in the night hours i.e. from 7 pm to 4 am.

Table 3: Habitat of the deceased

First seen dead by	Habitat				Total n (%)
	Rural	Sub-Urban	Urban	Unknown	
Known person	2	1	0	0	3 (4.05)
Unknown person	0	0	0	0	0
Railway employee	24	9	8	30	71 (95.95%)
Total	26 (35.14%)	10 (13.51%)	8 (10.81%)	30 (40.54%)	74 (100%)

Table No. 3 indicates, 3 (4.05%) of them died near the platform of the railway station. 5 (6.75%) died in the vicinity of the railway station. 4 (5.40%) are found died on the track near to the village / town. Remaining 62 (83.8%) persons are found to die in the lonely and deserted places on the railway tracks.

DISCUSSION AND SUGGESTIONS

Death is one inevitable event the human life, can result from natural or unnatural means. It can be result of injuries sustained. Injuries caused by a fast-moving object can result in death. Especially trivial injuries produced by fast moving trains can result in fatality.

According to Bernoulli's Principle, when an object moves a greater velocity, it produces a low pressure in its path. Trains moving greater speed also produce a low pressure in their path and suck the objects towards them because they are placed in high pressure area and result in fatal injuries.⁹ That is why a red painted area is made on the margins of the platform of Railway stations, so that people should not enter in to it when a train comes on to the platform.

In spite of the precautions and the preventive measures adopted by the Railway authorities, still many deaths are occurring on the track because of the railway related injuries.

The evidence is clearly shown in the present study by getting 74 deaths in whom railways (Trains) Produced injuries resulting in the death of persons. The annual incidence of railway related deaths is coming to 2.65% (44 deaths in the year 2013 to the total of 1661 Post mortem Examinations done), this is almost equal to the study made in Germany and much less in comparison to the rest of south east Asian countries.^{3,4,5} This is because the magnitude of railway related accidents may be same throughout the world, if the track is accessible to the people, but in Warangal geographical area, the suicidal methods adopted differ from rest the habitat. In this area people are committing suicides by poisoning more than other methods.

There is no seasonal variation observed in the present study, a little increase in the incidence during summer may because people use railways more in the vacation time i.e. summer. More number of deaths is occurring in young aged persons i.e. from 21 to 40 years of age, with the mean age 34.5 year. This is less than the age group observed in America which is 39 years.⁶ This shows the economic loss to the nation because of the person losing their lives in their productive age group.

The male to female ratio is 7.22. This is much higher in comparison to western countries where it ranging from 2.54 to 2.70.^{7,8} This can be due to selection of the method

by the gender as it amounts violent deaths. Marital status cannot be taken as a parameter to read the impact of railway deaths. However, the maximum numbers of person are from married age group and many of them are married. However, many dead bodies came as unknown, hence marital status is not known at the time of autopsy.

Low socio-economic status and the illiteracy have their effects by showing increased incidence in the combination these factors, which took 14 (31.8%) lives among the 44 identified. 26 persons of the total 44 identified deceased are from rural areas. This needs a special concern that, the track needs fencing in the rural areas. 62 persons died in deserted areas, and 36 persons died in the night, which shows that, the railway track needs a vigilance to reduce these deaths.

As many as 71 dead bodies are first seen by the railway employees. This is because the deaths are witnessed by the drivers, are the gang-men or key-men making rounds on the track. Suicides are common in younger age groups and accidents are common in elderly people. More suicides occurred in the age group of 21 to 50 years and more accidents occurred in 51 to 90 years of age groups.

Suggestions:

1. All railway related deaths are invariably fatal in nature and are preventable by strict vigilance of railway staff on the track.
2. There should be proper vigilance on the railway tracks about the suspiciously moving persons on the track, by the gang men.
3. Impatient driving of the vehicle across the track should be watched out by CCTVs footages and corrected time to time

Trespassing should be penalized with heavy penalties, to discourage the movements on the track

1. Proper fencing should be made in the areas of movement of people
2. Grazing domestic animals on the railway tracks should be discouraged
3. suicidal spots on the track should identified and properly protected
4. Infrared beams should be provided to identify the movement of the people on the railway track

5. Platforms should be provided with proper height to boarding and alighting.

CONCLUSION

Most of the railway fatalities were accidental in nature and in the bread earning age group particularly among the males. The increasing number of population, overcrowding in the trains, reckless and careless behavior of the passengers, pedestrians and the train drivers towards safety norms are the constant causes of railway fatalities. The high levels of the railway fatalities make a strong case for the necessary accident control interventions. Public as well as the railway authorities must take some measures to bring down these fatalities. People must follow some easy set of laws like do not travel on footboard, do not enter or get down from running trains, do not try to cross the level crossing gate when it is closed, be alert and reduce your speed while approaching railway unmanned level crossing, never guess the speed of the train and adhere to the set norms of railway safety to curb this menace. By comparing the data of the present study of 2013 with that of the previous studies, the incidence of railway accident cases are gradually increasing in number day by day.

1. Male predominates the females, Male to female ratio is 7.22 : 1
2. The frequently involved age groups are 21 years to 40 years
3. Less incidence is seen in extremes of age groups, no death in the age group of less than 10 years
4. 30 (40.54%) of total dead bodies are unidentified at the time of conducting inquest and autopsy. 12 of them are identified in the due course of time
5. Married persons (30-40.54%) are victimized more than unmarried (12-16.22%).
6. People from low socio-economic strata, rural background are involved more in number
7. Literacy did not play significant role causation of deaths due to railway injuries
8. Night time deaths (36-48.6%) are more, followed by deaths occurring in the morning (17-23%), evening (11-14.85%) and afternoon (9-12.2%). Early morning death is only one (1.35%).
9. Very few cases of death are witnessed by the known people. Most of the dead bodies are first seen by railway employees.

10. No person in the present study is intoxicated with alcohol or drugs

Accidents (23-31.08%) are reported to be more than suicides (51-68.92%)

Ethical Clearance: This study has been carried out in the year 2013, after from the ethical committee of Kakatiya Medical College/General Hospital, Warangal.

Source of Funding: Self

Conflict of Interest: Nil

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Retrospective Study of Autopsied Firearm Fatalities Over Period of Five Years

Kiran Patil¹, Gyanendra Kumar¹, Ashesh Wankhede², Pawan Tekade³, Shashikant Kaulaskar⁴

¹Assistant Professor, ²Professor, Department of Forensic Medicine, Late Baliram Kashyap Memorial Government Medical College, Jagdalpur, Chattisgarh; ³Professor, Department of Forensic Medicine, Dr. Punjabrao Deshmukh Memorial Medical College, Amravati, Maharashtra; ⁴Associate Professor, Department of Forensic Medicine, Maharashtra Institute of Medical Sciences & Research, Latur, Maharashtra

ABSTRACT

Present retrospective study is undertaken to observe the pattern of firearm injuries in relation with the wound characteristics, manner of death and type of firearms with their range of infliction. The study sample included seventy firearm fatalities presented to the Department of Forensic Medicine and Toxicology of Government Medical College, Jagdalpur during January 2013 to December 2017. The autopsy reports were analyzed using descriptive statistics. Maximum affected male individuals were belonged to the age group of 21-30 years. The most common site for the infliction of gunshot injury was found to be the thorax followed by the upper and lower extremities. Rifled firearm weapon was used with the distant range of fire in majority of the cases. Considering the number of injuries and their location, we interpreted the homicidal nature of death in 94.29% of all cases ($n = 66$).

Keywords: *Bastar, Firearm injuries, Homicide, Descriptive statistics.*

INTRODUCTION

According to the recent survey, 3.85 people died per 1,00,000 population due to gun violence during the year 2016 in the USA while India rated 0.88 during that period¹. Increasing inter-personal conflicts, unemployment, political rivalry, religious affairs and the naxal based terrorism are contributing to it undoubtedly amongst both urban and rural Indian population. The unlicensed firearms have out-numbered the licensed ones in terms of their homicidal mode of usage².

The Southern region of Chattisgarh state is frequently involved in the encounter related incidences between the defense personnel and the extremists. It was

reported that, 255 individuals of the various defense agencies of the state and central government have died over the period of year 2013 to 2017, in such counter fight incidences across the state³. Gunshot wounds have been extensively studied in forensic and other literature, with articles focusing on the types of injuries, wound locations, weapons used, weapon range, and so on⁴. Similarly, the Indian studies have demonstrated that there is variation in the epidemiological data related to the firearm deaths, which differs from place to place, across the country⁵⁻⁸.

Our aim is to analyze the pattern of firearm injury cases subjected for autopsies with the intent to search for any possible measures needed to be undertaken to limit such occurrences.

Corresponding Author:

Dr. Kiran Patil
Assistant Professor
Department of Forensic Medicine & Toxicology
Late Baliram Kashyap Memorial Government
Medical College & Hospital,
Dimarapal, Jagdalpur-494001 (Chattisgarh)
Email: drforensic10@gmail.com

MATERIAL AND METHOD

The present study is conducted at the department of Forensic Medicine and Toxicology of Late Baliram Kashyap Memorial Government Medical College, Jagdalpur. The sample comprised of seventy known firearm related death cases amongst the total of 1971 medico-legal autopsies conducted during the period

of January 2013 to December 2017. The particulars of the cases were recorded from the autopsy reports and analyzed using descriptive statistical method.

RESULTS

Table 1: Year-wise distribution of number of deaths and victims

Year	Defense personnel	Extremists	Civilian
2013	07	02	12
2014	16	00	02

Table 2: Site, Type and number of injury

Site	Entry wound (Percentage)	Exit wound (Percentage)	Glancing injury	Projectiles recovered
Head & Neck	21 (12.65%)	12 (10%)	0	0
Thorax	74 (44.58%)	47 (39.17%)	1	2
Abdomen	12 (7.23 %)	11 (9.17%)	2	1
Upper limbs	35 (21.08%)	29 (24.17%)	2	1
Lower limbs	24 (14.46%)	21 (17.5%)	4	1
Genitals	0	0	0	0

Table 3: Distribution of entry wound with regions involved

Site Victims (n)	Head & Neck (%)	Thorax (%)	Abdomen (%)	Upper limbs (%)	Lower limbs (%)	Genitals (%)
Defense personnel (43)	13 (61.90%)	44 (58.67%)	05 (35.71%)	20 (54.05%)	14 (50%)	0
Extremists (11)	05 (23.81%)	19 (25.33%)	08 (57.14%)	12 (32.43%)	12 (42.85%)	0
Civilians (16)	03 (14.29%)	12 (16%)	01 (7.14%)	05 (13.51%)	02 (7.14%)	0
Total	21	75	14	37	28	0

Thorax was the most common site for the infliction of firearm wounds with the subsequent regions included upper and lower limbs (Table-2). Major target for injury was Thorax, followed by Upper limbs, lower limbs and head-neck among the defense personnel ($n=43$), while for the extremists ($n=11$), it was Thorax followed by upper, lower limbs and abdomen. The civilians ($n=16$) suffered over Thorax followed by upper limbs, Head-neck and lower limbs (Table-3).

Table 4: Range of Firearm injury

Range	Number of cases	Percentage
Contact	02	2.86 %
Close	04	5.71 %
Distant	63	90.00 %
Unknown	01	1.43 %
Total	70	100 %

Conted...

2015	13	02	00
2016	05	07	01
2017	02	00	01
Total	43	11	16

Highest number of victims belonged to the age group of 21-30 years comprised of ($male = 30$; $female = 03$) followed by 31-40 years ($male = 19$; $female = 02$). Forty three victims were found to be from the different defense agencies, eleven from the extremists and sixteen civilians (Table-1).

Rifled firearm injuries were observed in the majority of the cases ($n=68$) while shot gun injuries were observed in two cases. The distant range of weapon was estimated in sixty three cases (90 %). The contact shot in two and close shot within four cases (Table-4).

Table 5: Cause of death

Causes	Number of cases	Percentage
Injury to vital organs	45	64.29 %
Shock & Hemorrhage	25	35.71 %
Coma	00	0 %
Secondary infection	00	0 %
Total	70	100 %

Sixty eight individuals had survived for less than six hours after the injuries sustained. Firearm Injury to the vital organs ($n=45$) was the leading cause of death

followed by shock and hemorrhage associated with the firearm injuries ($n=25$) to the major blood vessels, long bones and soft tissues of the thorax, upper limbs, lower limbs and abdomen (Table-5).

Based on the number, sites of injury and the circumstantial records, 90 % of all cases were the victims of encounter incidences, 4.49 % were of homicidal circumstances and 2.86 % each of the suicidal and undetermined circumstances. It was observed from the analyzed data, that the group fight was the predominant motive of crime in 63 cases while 3 homicidal cases aroused out of familial or personal conflicts (Table-6).

Table 6: Manner of death and motive of crime

Manner	Motive	Number of cases	Percentage
Encounter related	Group fight	63	90 %
Homicidal	Familial/ Enemy	03	4.29 %
	Property disputes	0	0 %
	Theft/Dacoit	0	0 %
Suicidal	Familial/ Personal	02	1.43 %
	Love affairs	0	0 %
	Money/Debt	0	0 %
	Other	0	0 %
Un-determined	Unknown	02	2.86 %

DISCUSSION

Firearm injuries to the humans have always caused significant morbidity and mortality. The incidences of gunshot wounds in civilian trauma have increased in many parts of the world, sometimes reached an epidemic level⁹. Social problems and the easy access of the non-licensed guns have contributed to it as in our country².

Younger male population are the most vulnerable to the mortality arising out of different propositions and circumstances such as the Northern east region, Metropolitan region or the places where, the defense agencies are deployed to limit the internal extremists violence^{5-8,10,11}. Present study results are consistent with the most of the published literature in account of the

constant male victims of the age group belonging to the third decade of life.

We found that the thorax (41.01%) was the most common site for gunshot injury followed by upper limbs (22.37%), lower limbs (16.61%) and head-neck (11.19%). Our study results are consistent with the findings by Thube et al⁶ (Metropolitan) and Tekade et al⁸ (Extremists prone region) as the thorax being the most frequently injured site in 36.9% and 32 % of the cases respectively. However, Sachan R et al⁵ in their metropolitan based study, reported that the abdomen (48.4%) was the common site, followed by head-neck (27.2%), extremities (24.2%) and the thorax (18%).

Further to note that, the Thorax was the most common target for firearm injury followed by upper limbs, lower limbs and head-neck amongst the defense personnel ($n=43$). The thorax was the most common target for firearm injury followed by upper limbs, lower limbs and abdomen amongst the extremists ($n=11$) while the civilians ($n=14$) which were present at the encounter sites suffered most over thorax then followed by upper limbs, head-neck and lower limbs. It can be attributable to the fact that immediate or rapid incapacitation is being sought to destabilize or possibly to cause death of the victim by targeting such regions of the body which involve vital organs¹².

Based on the wound characteristics and clothes examination findings, we observed rifled firearm injuries in 97.14% ($n=68$) of victims with the distant range of fire in 93% ($n=63$). The rifled firearm injuries were inflicted from the distant range in forty one defense personnel, eleven extremists and eleven civilians at the encounter sites. Unlike these results, the researchers found, smooth bored firearm injuries in 53.3 % ($n=80$) and rifled firearm injuries in 30% ($n=45$) cases amongst their total of 150 victims⁸. Though, the earlier study by Tekade et al⁸ was carried out at the same centre, it can be attributed to the fact that there was the difference in study period of both studies and there was significant decline in number of fatalities when compared to the past and present study.

It is the well known fact that the rifled weapons have more lethality in their action and the distance doesn't pose any difficulty when fired at the specific sites over the body. Therefore, the wounds over thorax, head or abdomen are more lethal as they involve vital organs and the sufferers cannot survive long without any

immediate medical attention. We found that the Injury to the vital organs such as lungs, heart, brain, liver, spleen and intestines was the leading cause of death (64.29%) followed by the shock and hemorrhage (35.71%) due to the injuries over major blood vessels, long bones and soft tissues.

Correspondingly, we could interpreted the encounter related manner of death in 94.29% ($n = 63$) of the cases as per the number of injuries, their location and police history. Three cases represented the homicidal while the two were from the suicidal circumstances. This finding was not consistent with the study by Tekade P et al⁸, where they reported 33.6% ($n = 50$) of cases belonged to homicidal nature aroused out of property disputes and subsequent 23.3% ($n = 35$) of cases out of group fights.

In concordance with the Police history and the post mortem findings, majority of the victims (97.14%) could not survived for more than 6 hours after the violent injuries. It becomes very difficult to provide immediate medical services to the survivors of violent firearm injuries. However, every possible resuscitative procedure and immediate hospitalization should be attempted.

CONCLUSION

It can be concluded from the present study that, most of the deaths from firearm injuries in the Bastar region of Chattisgarh state are the results of the encounters between the defense personnel and the extremists. The appropriate safety measures can be adopted by the defense personnel to protect the Chest, abdomen and extremities from the rifled firearm injuries in an order to limit the morbidity and the mortality. It is noticed that the number of fatalities due to firearm injuries occurring in these circumstances are declined to some extent over a period.

Conflicts of Interest: Nil

Sources of Funding: Nil

Ethical Clearance: The study adhered to the ethical guidelines.

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The Development of a Web Portal for an Assisted Reproduction Center in South India and an Analysis of its Efficacy

Rahul Munikrishna¹, Kavitha T. C.², Venkataramanaiah³, Somu G.⁴, Rajesh Kamath⁵, Brayal D'Souza⁵, Sagarika Kamath⁶

¹Final Year Postgraduate Trainee, Master in Hospital Administration Program, Prasanna School of Public Health, ²Associate Professor, School of Management; ³Manager-IT, Kasturba Hospital, Manipal, Karnataka; ⁴Professor, Department of Hospital Administration, Kasturba Medical College; ⁵Assistant Professor, Prasanna School of Public Health; ⁶Assistant Professor, School of Management, Manipal Academy of Higher Education, Manipal, Karnataka

ABSTRACT

Introduction: Telemedicine is the need of the hour to keep pace with developments in the healthcare industry. Easy and better access to facilities facilitates customer retention. Online consultations facilitate hassle free patient–doctor communication, in sharp contrast with the common sight of long waiting queues for doctors. Objective: To develop and analyse the efficacy of a web portal for an assisted reproduction center at a tertiary care hospital in South India.

Method: This study was conducted between November 2017 and April 2018. An initial study was conducted to analyse the need for online consultations at this center. Based on this study and considering the future requirements of e consultation in Kasturba hospital, a web portal was developed. Upon the completion and implementation of the web portal, patients who registered for the web portal services were administered a feedback questionnaire on the efficacy of the web portal. This questionnaire had to be filled out by the patients when they logged out of their web portal account. The questionnaire responses were analysed to assess the acceptance level of patients to online consultation and the working efficiency of the web portal.

Results: Patients who registered with the web portal found it user friendly. They found it easy to access all information on the portal. The positive feedback and suggestions from patients suggest that the patient portal was wilfully accepted by them.

Keywords: Telemedicine, Online consultation, E-health, E-consultation, patient portal, web portal.

INTRODUCTION

Telemedicine is the need of the hour to keep pace with developments in the healthcare industry. Easy and better access to facilities facilitates customer retention. Online consultations facilitate hassle free patient–doctor communication, in sharp contrast with the common sight of long waiting queues for doctors. In an era of consumer driven healthcare, where patients browse

healthcare information on the Internet, graphically appealing, informative and patient centred websites can attract their attention.¹

Patients seek better communication with their physicians. A fully functional website with patient portal solutions will not only facilitate enhanced patient-to-provider relationships but also enable hassle free patient- physician communication.¹ The patient portal is a secure, interactive, web based communication solution that provides a platform for online interaction between doctors and patients. The availability of a patient portal can influence the patient's choice of healthcare provider.¹

A recent trend in eHealth is delivering health care services online. Online health services like E-consultations have become increasingly popular.

Corresponding Author:

Dr. Kavitha T. C.

Associate Professor, School of Management,
Manipal Academy of Higher Education, Karnataka-576104
Mobile: 7204123298
Email: kavitha.tc@manipal.edu

These online health services can reduce both waiting time and travel expenditure. Online consultations can improve the operational efficiency and effectiveness of and equitable access to medical resources. They can reduce medical costs and improve customer satisfaction.² With increasing awareness and newer technology, the demand for assisted reproduction services is growing. The IVF market in India is growing at a Compounded Annual Growth Rate(CAGR) of 28% and is expected to be a Rs.500 crore market in India by 2022.³ With growing internet penetration, internet users in India are expected to increase at a CAGR of 15.6 per cent from 450 million at the end of 2017 to 700 million by 2020.⁴

OBJECTIVES

1. To develop a patient friendly web portal for an Assisted Reproduction Center(ARC).
- 2.To assess the efficacy of the web portal.

METHODOLOGY

This study was conducted in an Assisted Reproduction Center (ARC) at a tertiary care hospital in South India between November 2017 and April 2018. An initial assessment was done of the requirement of online consultation in this department. The number of email exchanges between doctors and patients was counted. The need for features like report uploads and appointment scheduling was assessed. It was seen that 30-40 email exchanges per month were happening between doctors and patients. No consultation fee was being charged for the e mail consultations. There were several instances of overseas patients wanting to consult a doctor in the assisted reproduction center but not being able to do so because of the lack of a patient portal for online consultations. In order to cater to all these requirements, a patient portal with the following features was developed for the assisted reproduction center.

1. Patient Registration:

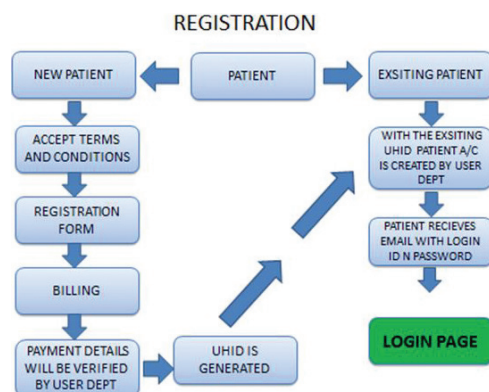


Figure 1: Registration process for a new patient

2. User Interphase: The portal has 3 kinds of users: Patients, doctors and administrators. Each one will have access to a different view. 3 different views were created:

a. Patient view (Figure 2) : This is accessible only to patients. It has the following features : Option to get an online consultation through message; Option for the patient to upload his reports to get the doctors' opinion; Option to view the date and time of the scheduled appointment. Every patient who needs an online consultation with a doctor is directed to the payment gateway for payment of the consultation fee. The patient can contact the doctor only after the payment is completed. Every message sent by the patient to the doctor is considered a consultation and is charged. The patient can upload her reports on the portal. The file size limit for each file is 5 MB. The acceptable file types are pdf and jpeg.

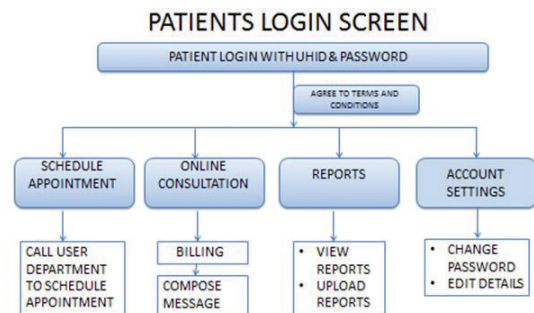


Figure 2: User interphase : Patient view

b. Doctors' view (Figure 3): This view is accessible only to doctors. It has the following features: IVF module; Exchange of messages with patients; Viewing of reports uploaded by patients; Appointment list of patients with date and time. The IVF module contains details of patients who are undergoing treatment at the ARC. This can be accessed only through a password which is unique for each doctor.

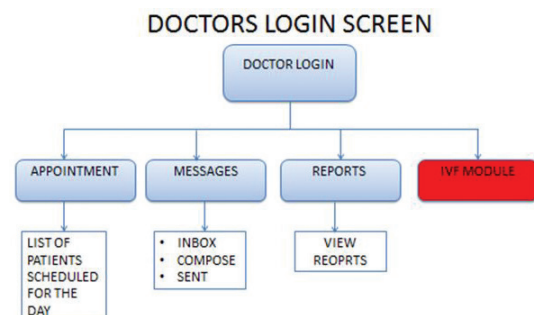


Figure 3: User interphase : Doctors' view

c. Administrators' view (Figure 4): This is accessible only to the front office staff. It has the following features: The registration of patients for accessing the patient portal. Every patient can be registered only through a valid email ID and valid Hospital number given to the patient at the time of registration; Scheduling of appointments; The message exchanges between the patient and the doctor.

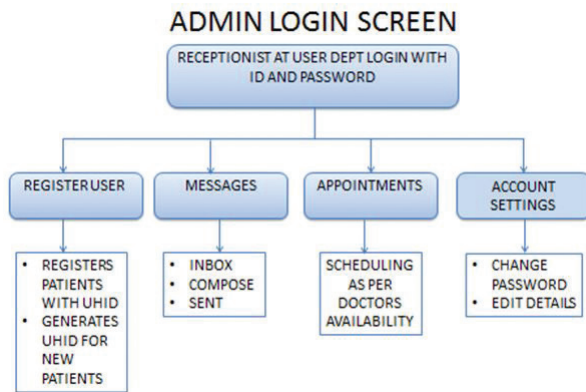


Figure 4: User interphase: Administrators' view

Assessment of the efficacy of the web portal: The web portal efficacy assessment was done by analysing the patient feedback, which was taken from patients with the help of a structured questionnaire. A sample size of 10 was considered for the analysis. Every patient who was registered in the portal had to give feed back at the time of logging out. The structured questionnaire consisted of 10 questions, out of which 8 were multiple choice questions and the remaining 2 questions were open ended, where the respondents had to fill in their comments.

RESULTS

Question 1: How easy was the login process ?

The answer options were Very Easy, Easy, Neither easy nor difficult, Difficult and Very difficult. 2(20%) respondents answered Easy. 8(80%) respondents answered Very Easy.

Question 2: Were you able to view all information after logging in successfully?

The answer options were "Yes" and "No". All 10 respondents were able to view all information after logging in.

Question 3: Did you find any issues in sending or viewing messages ?

The answer options were "Yes" and "No". All 10 respondents had no problems in sending or viewing messages.

Question 4: Was it easy to upload a report? The answer options were "Yes", "No" and Not Applicable. Of the 10 respondents, 5(50%) who actually uploaded a report found it easy to do so. The remaining 50% did not upload any reports.

Question 5: Were you able to update your password easily ?

The answer options were "Yes", "No" and Not Applicable. All 10 respondents were able to update their passwords easily.

Question 6: How would you rate the web portal?

The answer options were "Excellent", "Good", "Average", "Bad" and "Very bad". Of the 10 respondents, 6(60%) rated the web portal Excellent whereas 4(40%) rated it Good.

Question 7: Overall, how well does our website meet your need?

The answer options were "Extremely well", "Very well", "Somewhat", "Not so well", "Not well at all". Of the 10 respondents, 5(50%) responded that the website met their need extremely well, while 5(50%) responded that the website met their need very well.

Question 8: How easy is it navigate our web portal ?

The answer options were "Extremely easy", "Very easy", "Somewhat easy", "Not so easy" and "Not easy at all". Of the 10 respondents, 6(60%) responded that the web portal was extremely easy to navigate. The remaining 4(40%) responded that the web portal was very easy to navigate.

DISCUSSION

cherpbier-de Haan et al in an initial implementation of a web based consultation process for patients with chronic kidney disease observed that In the absence of telenephrology, 43 patients (35.3%) would have been referred by their family physicians, whereas the nephrologist considered referral necessary in only 17 patients (13.9%) ($P < .001$). The family physician would have treated 79 patients in primary care. The nephrologist

deemed referral necessary for 10 of these patients. Time investment per consultation amounted to less than 10 minutes.⁵ Edwards et al in the evaluation of a pilot observational study on the use of a primary care online consultation system in 36 general practices in South West England observed that the use of e-consultations was very low, particularly on weekends. Unless this can be improved, any impact on staff workload and patient waiting times is likely to be negligible. It is possible that use of e-consultations increases primary care workload and costs. Online consultation systems could be developed to improve efficiency both for staff and patients. These findings have implications for software developers as well as primary care services and policy-makers who are considering investing in online consultation systems.⁶

Biermann et al in their study on using the internet to enhance physician-patient communication, observed that the rise in internet use by patients with musculoskeletal problems has put orthopaedic surgeons under increased pressure to provide Web-based resources. Patients are researching musculoskeletal conditions online, and many want to communicate electronically with their physicians. Online medical information may be a useful adjunct to traditional physician-patient interaction because it is readily available, is wide in scope, and can provide the patient with basic knowledge on a given topic. A clinical encounter may then be efficiently spent refining information and answering specific questions. Orthopaedic surgeons should be aware of the advantages of using Internet resources as part of their practice as well as the potential legal and confidentiality pitfalls in electronic communication. Some patient concerns may be easily satisfied and communication enhanced through the use of e-mail. Physicians planning to incorporate electronic communication with their patients must be prepared to manage unsolicited e-mail, maintain patient confidentiality, and adopt practices that maximize the use of online resources to enhance patient education.⁷

Hjelm et al, while wiring a medical school and teaching hospital for telemedicine, observed that little attention has been paid to the use of audio-visual communication within a smaller setting such as a hospital. They demonstrated that there are many applications of audio-visual communication in such an environment. They state that Audio-visual communication between patients and health professionals, and between health professionals themselves, should improve the quality

of health and of undergraduate and postgraduate teaching to all categories of health professionals. They observed that the costs for a hospital-based audio-visual LAN are surprisingly low compared with overall costs for patient care. Therefore, they concluded that telemedicine in a hospital environment could well be the main application of this form of information technology in the longer term.⁸ Baldwin et al in their study on the pitfalls, promises and learnings from patient portals and health apps observe that the widespread use of health information technology (IT) could potentially increase patients' access to their health information and facilitate future goals of advancing patient-centered care. Despite having increased access to their health data, patients do not always understand this information or its implications, and digital health data can be difficult to navigate when displayed in a small-format, complex interface. The authors discuss two forms of patient-facing health IT tools—patient portals and applications (apps)—and highlight how, despite several limitations of each, combining high-yield features of mobile health (mHealth) apps with portals could increase patient engagement and self-management and be more effective than either of them alone. Patient portal adoption is variable, and due to design and interface limitations and health literacy issues, many people find the portal difficult to use. Conversely, apps have experienced rapid adoption and traditionally have more consumer-friendly features with easy log-in access, real-time tracking, and simplified data display. These features make the applications more intuitive and easy-to-use than patient portals. While apps have their own limitations and might serve different purposes, patient portals could adopt some high-yield features and functions of apps that lead to engagement success with patients. The authors thus suggest that to improve user experience with future portals, developers could look towards mHealth apps in design, function, and user interface. Adding new features to portals may improve their use and empower patients to track their overall health and disease states. The authors conclude by saying that both these health IT tools should be subjected to rigorous evaluation to ensure they meet their potential in improving patient outcomes.⁹

CONCLUSION

The ARC patient portal was wilfully accepted by patients, as evidenced by the positive feedback and suggestions given by them. This could be considered a stepping stone for the acceptance of E-health and for the

further adoption of a patient portal in the departments of the hospital based on the hospital requirements.

Ethical Clearance: Taken from Institutional ethics committee

Source of Funding: Self

Conflict of Interest: Nil

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Knowledge and Practice on Dietary Management among Patients with Gallbladder Diseases

Sahil George Lal

M.Sc. Nursing 2nd Year Student, Teerthanker Mahaveer College of Nursing, TMU, Moradabad, U.P

ABSTRACT

Background: The word “Diet” means the food and drink that we habitually consume did not appear in English until thirteen century, but it also had another sense, meaning “a way of life”. The second meaning is more in line with the word’s origins, as it comes from the Greek “diaita via diaitan”. Diaita was a noun that meant a way of living, and also had a more specific meaning, signifying a way of living as advised by a physician, which could include a “food” diet and other daily habits. The literature is increasing on the dietary management for common gallbladder disease issues. Inappropriate knowledge leads to inappropriate practice of diet which increases the problems in gallbladder disease conditions.

Objective: The main objective of the study was to assess the knowledge and practice on dietary management among gallbladder disease patients.

Method: A quantitative study based on descriptive research design. Patients were recruited from hospital. 124 patients affected with gallbladder disease were included in the study. Knowledge and practice were assessed by using self structured knowledge questionnaires and practice checklist. Data was analyzed by using a thematic analysis.

Results: Poor knowledge and practice were present among the patients regarding dietary management of gallbladder diseases.

Conclusion: Patients were having low knowledge regarding dietary management for gallbladder diseases which leads them to poor practice. Although they were aware that proper diets give them proper health but they are unaware with the appropriate diet used during gallbladder disease conditions.

Keywords: Knowledge, practice, dietary management, patients, gallbladder diseases.

INTRODUCTION

“Eat for the body you want not for the body you have.”

-WHO

“Your diet is a bank account, good food choices are good investments.”

-Bethenny Frankel

The gallbladder is small organ found fixed to the underside of the liver the job of which is to store and concentrate bile. Bile is produced in the liver and is responsible particularly for the efficient digestion of dietary fats. Bile is squirted in to the duodenum under the control of a hormone released into the blood stream as fats are detected in the stomach. As food leaves the stomach it passes to the duodenum and mixes with bile that has passed down through the biliary duct system.

Disease associated with the gallbladder is very common. In western society this is usually due to the development of gallstones in the gallbladder and the following conditions may often result from inflammation, infection or blockage of the gallbladder and duct system that drains it.

OBJECTIVE

To assess the knowledge regarding dietary management of patients affected with gallbladder diseases in “Sir Sunder Lal Hospital, BHU at Varanasi, U.P”

To assess the practice regarding dietary management of patients affected with gallbladder diseases in “Sir Sunder Lal Hospital, BHU at Varanasi, U.P”

To find the correlation between the knowledge and practice of patients affected with gallbladder diseases in “Sir Sunder Lal Hospital, BHU at Varanasi, U.P”

To find the association between the demographic characteristic with their knowledge of dietary management of patients affected with gallbladder diseases in “Sir Sunder Lal Hospital, BHU at Varanasi, U.P”

To find the association between the demographic characteristic with their practice of dietary management of patients affected with gallbladder diseases in “Sir Sunder Lal Hospital, BHU at Varanasi, U.P”

REVIEW OF LITERATURE

Lindseth N. Gelenda and Denny L. Dawn, (2014), together conducted a study on “Patients” Experiences with Cholecystitis and a Cholecystectomy.” A phenomenological approach was used & was conducted at a 250 bedded hospital & purposive sampling technique was used for the selection of samples and interview was conducted with pre-operatively patient experiencing a indication of cholecystitis and post-operatively with those patients who had undergone cholecystectomy procedure. The study concluded the five out of six cases. They continued to describe their ongoing pain and patients also appear to describe the feeling of inadequacy in caring for their family.¹⁰

Hussain Muhmood Saad, (2013), conducted a study on “Quantitative analysis of chemical composition of gallbladder stones among cholecystectomy of Iraq patients.” Prospective study was used in this study in which 40 patients (8 males and 32 females) were studied. The results showed that majority of cases had mixed gallstones that involved five and four of inorganic chemicals of calcium, magnesium, uric acid and phosphate. The highest incidence was 13 gallstones in age group 40-49 years old.¹³

Misciagna Giovanni, et.al, (1998), together conducted a study on “Diet, physical activity, and gallstones-a population based, case-control study in Southern Italy.” In this study case-control method was used in which 100 patients with newly diagnosed gallstones and 290 randomly selected control subjects without gallstones were enrolled in the study. The results showed that a inactive life-style and a diet rich in animal fats and refined

sugars and poor in vegetable fats and fibers are remarkable risk factor for gallstone formation.¹¹

Kuwabara Kazuaki, et.al, (2011), together conducted a study on “Relationship of age, cholecystectomy approach and timing outcomes of elderly patients with cholecystitis.” In this, cohort study was used with total 2552 patients. The results showed that octogenarians were likely to have open cholecystectomy and functional decline. Since open cholecystectomy was a prediction of resource use and complications, procedures to complete earlier laparoscopic cholecystectomy and prevent complications are required for octogenarians.¹⁵

Haq Mujibal, et.al, (2015), conducted a study on “Effect of cholecystectomy on lipid profile in Bangladeshi patients with cholecystectomy.” The study was quantitative study in which 44 adult patients were studied. The results showed that alterations in lipid profile in which cholelithiasis were significant but complex and cholecystectomy had extreme effect suggesting a critical role of gallbladder.¹⁶

METHODOLOGY

A quantitative research approach was used in the present study and descriptive survey research design was adopted to assess the knowledge and practice regarding dietary management of patients affected with gallbladder diseases due to the nature of the study.

Non-probability sampling technique- purposive sampling technique was used for selecting the sample in this study because this study was adopted with the specific purpose in mind. In this study, sample size was 124 gallbladder disease patients and the data was collected with the help of structured questionnaires for the knowledge and checklist for the practice from the Government hospital.

FINDINGS OF THE STUDY

The present study was reported on knowledge and practice of patients regarding dietary management of patients affected with common gallbladder diseases. The main purpose of this study is to identify the knowledge and practice of patients regarding dietary management of patients affected with common gallbladder diseases. Total 124 patients were involved in this study. In the present study, majority 28 (23%) of the patients belongs to the age group of 40-50 years, majority 86 (69%)

of the patients were female, majority 74 (60%) of the patients belongs to hindu religion, majority 59 (48%) of the patients were having only primary education, majority 75 (61%) of the patients were unemployed, majority 74 (60%) of the patients were having income of Rs <5000, majority 81 (65%) of the patients belongs to joint family, majority 66 (53%) of the patients were vegetarian, majority 88 (71%) of the patients got the information from health personnel. The findings of the present study were based on objectives and theoretical based literature. Most of the studies revealed that having a good knowledge and practice regarding the dietary management will reduce the gallbladder disease and also in prevention of reoccurrence of the gallbladder diseases again in future.

DISCUSSION

Present Study: The present study revealed that level of knowledge score of gallbladder disease patients regarding dietary management was poor, i.e. 66% and practice score was also poor, i.e. 52%. Overall, correlation between knowledge and practice 0.49 after calculating mean and standard deviation. For knowledge mean was 5.14 and SD was 2.57 & for practice mean was 3.73 and SD was 2.04. Hence, there was poor knowledge and practice regarding dietary management among gallbladder disease patients.

Comparative Study: Sachdeva Sandeep, et.al (2011), conducted a study on "Lifestyle and gallstones disease: scope for primary prevention", with the aim quantifying the socio-demographic and lifestyle risk factors for gallstones diseases among age- and sex-matched cases and controls. The study revealed that the difference in the prevalence of gallstones among the two sexes was statistically significant ($P < 0.01$). **Large proportions of cases were asymptomatic (47%) or remained largely subclinical as chronic cholecystitis or early malignancy with nonspecific symptoms (29%).** Interestingly, intake of less protein in diet was significantly associated with cholelithiasis. A higher prevalence of cholelithiasis among females, observed in the present study. Low fiber intake and high refined sugars were similarly associated with tendency to gallstones.⁸

CONCLUSION

In the present study the patients had poor knowledge regarding the dietary management for gallbladder disease

conditions. There was a significant association between the level of knowledge with educational status, occupational status, income per month and dietary pattern.

Ethical Consideration: This study is ethically considered by the panel of Teerthanker Mahaveer College of Nursing, Teerthanker Mahaveer University after discussing with each and every point of this study.

Source of Funding: Self

Conflict of Interest: Nil

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The Prevalence of Work-Related Musculoskeletal Disorders among the Nurses in Dubai: Occupational Health Study

Amina Naushad¹, Zenah Alsaraeji¹, Yvonne Ruhumbika¹, Edidong Ubong Isong¹, Yassen Alfoteih¹

¹Canadian University of Dubai, Environment health Department

ABSTRACT

The purpose of this research is to explore the risk factors and prevalence of musculoskeletal disorders (MSDs) among nurses in Dubai. The research was done among nurses in Dubai's two famous hospitals – Iranian Hospital and Burjeel Hospital for Advanced Surgery. After approvals were obtained, questionnaires with attached consent forms were randomly distributed among nurses from different wards according to their availability. In this study, a total of 100 responses from nurses working in Dubai were analyzed using validated questionnaire forms. Questions focused on the percentage of nurses suffering from MSDs, risk factors perceived by nurses, and whether medical attention was sought following the development of MSDs. The results of our study showed that female nurses were more affected than male nurses. Most nurses were young (between 28 and 35 years of age) with few years of work experience. Positive responses of having developed MSDs were largely from nurses in the surgical ward. The body sites most affected were found to be the back (~44%), feet (~18%), neck and shoulder (~18%). In addition, the majority of nurses reported physical ergonomic factors as the main cause for their MSDs. These findings are especially important in the region, as very few studies have been published in this field. They also give a new perspective to the work handled by nurses and help 'voice' their problems as a call for action to nurses, hospitals, and the government itself.

Keywords: MSDs, nurse's health, hospitals, Occupational Health

INTRODUCTION

Musculoskeletal disorders refer to injuries or disorders of the musculoskeletal system that occur as a result of excessive exposure to hazards and/or risk factor in the work environment ⁽¹⁾. However, MSDs can be defined in a variety of ways based on duration, frequency and intensity of pain ⁽²⁾ or the existence of pain that affects daily normal functioning⁽³⁾.

Although studies regarding the subject have increased dramatically, the relation between MSDs and occupations remains debatable. In a survey done by Baldwin *et al* (2004), he found that work-related

MSDs are the leading cause of absenteeism and low productivity ⁽⁴⁾.

According to the Bureau of Labor Statistic (BLS), nurses and attendants had the highest rates of MSDs in 2007, which led to a high absenteeism rate, which resulted from the nature of their jobs. It is worthy to mention that nurses are indispensable in healthcare environment, so that the ergonomic risk they are exposed should not be not negligible ⁽⁵⁾⁽⁶⁾.

Shortage of staff is another risk factor contributing to the high rates of MSDs among nurses. Due to this, nurses often have to do strenuous work alone and over long periods. Lack of advanced nursing equipment also adds to this issue. Long working hours were reported in areas with staff shortage. This resulted in increased exposure to physical demands and therefore, limited recovery time between work shifts, which in turn led to increased rates of injuries ⁽⁷⁾. A recent qualitative study of Canadian critical care nurses highlights the effects of overtime and increasingly heavier patients on

Corresponding Author:

Dr. Yassen Alfoteih
Canadian University of Dubai
P.O. Box 117781 Dubai. UAE
Email: alfoteih@gmail.com

nurses – leading to exhaustion, poor body mechanics and subsequent injury ⁽⁸⁾. MSDs in nurses is an issue that is frequently overlooked not only the UAE, but in many parts of the world⁽⁹⁾. Therefore, our study was conducted in two of Dubai's well-recognized hospitals. This study focuses on the association of tasks involved in the nursing profession to the prevalence of MSDs among nurses. It also assesses the relationship between the current nursing ergonomics and MSDs in nurses, particularly in the UAE. Results derived will be relevant for planning, developing and implementing an ergonomic program to improve the health of nurses. Through the concept of ergonomics in workplaces can be remodeled or redesigned to suit human features and capabilities.

MATERIALS AND METHOD

The nursing population at two licensed hospitals in Dubai – the Iranian Hospital (IHD) and Burjeel Hospital of Advanced Surgery (BHAS) – was taken as the target population for the current occupational health study.

A cross sectional study was conducted in the period between February 07, 2018 to March 26, 2018 in which a sample of 120 nurses was taken at a single point in time that consisted of 57 nurses from IHD and 63 nurses from BHAS. The questionnaire was prepared by Mugga and then adopted and customized to our needs and requirements⁽¹⁰⁾. The number of questionnaires distributed differed between the two hospitals as per availability of nurses. Results were collected based on questionnaires to assess them against a set of standards provided by the OSHA. Qualitative (such as the type of MSDs in nurses, factors contributing to these MSDs) as well as quantitative data (including, percentage of nurses suffering from MSDs etc.) were also gathered and analyzed. The study focused on analyzing the MSDs in the nurses at the chosen hospitals as a sample with respect to the entire population of nurses in Dubai.

DATA ANALYSIS

The data collected was analyzed and categorized according to the questions asked, using both quantitative and qualitative methods. Risk factors were identified following the responses of the nurses. These risk factors were then categorized by frequencies. The study also looked into the relationship between demographic

and employment characteristics with the prevalence of MSDs in the nurses. The information obtained was illustrated using descriptive statistics. The presence of pain and its duration was recorded according to nurses' declaration of pain. These were then compared to their effect on work, and whether they took leave or sought medical attention. Nurses were asked about body sites that were frequently injured and possible causes.

FINDINGS

MSDs were more prevalent among females than males for two reasons. Firstly, females dominated the nursing profession and therefore were more exposed to the risks of MSDs than males. Secondly, males have more physical strength than females making it easier for them to handle heavy tasks as compared to females.

Nurses in the surgical ward were the most affected by MSDs (Refer to table 3). Body sites most frequently affected were the back, feet, neck and shoulders which can be attributed to lifting and supporting partially or non-weight bearing patients, especially after their surgeries. (Refer to table 5 and 6)

Only a few nurses sought any kind of medical attention for the pain they suffered (refer to table 4) and even fewer nurses took sick leaves for the same. From the response rates (83.3%) attained from various treatment sites studied, nevertheless, most reported 'physical ergonomic factors' as the main risk contributor to their development of MSDs. (Refer to Table 3). This includes the tasks handles by nurses, equipment used, position of materials used, and so on.

The response rates obtained from different treatment sites, as shown in table 3 indicate that the surgical department was the highest among female (26.98 %) and male (47.4 %) nurses followed closely by ICU/NICU and other departments (which includes OBG, physiotherapy & clinics collectively). On the other hand, due to the very high influx of patients, it was very difficult to get the busy nurses to complete the surveys, which is also why the ambulatory department scored the lowest (0% response rate).

The demographic and employment characteristics of the nurses indicate that the majority of respondents were between the ages of 28 and 35 years old (49%), and 18-27 years old (33%) (Refer to table 1). This shows that

most nurses are quite young. Finally, the majority of the nurses' height lies between 5'1" to 5'5", (57%), (Refer to table 1). Weight 55-64kg (36%), (Refer to table 1). and the majority of participants (82%) had between 3-12 years of clinical experience which can also be concluded from their age range. (Refer to table 2). The lesser work experience and therefore, may be less familiar with the best possible way of handling Patients that is 'safest' for the nurses would be a reason for MSD's.

Overall, the values are quite different for workplaces between male and female nurses, as can be seen in table 3. Surgical unit the most among male and female nurses, 47.4% and 26.9% respectively. Pediatrics units had the least for female (1.59%) MSDs followed by emergency and ICU/NICU. For males, ICU/NICU had the least MSDs while emergency was among the highest. There were more affected male nurses in the emergency department than females (Refer to table 5 and 6).

As a result of our data analysis, we inferred the following

Table 1: Relationship between MSDs with age, Height and Weight amongst female and male nurses

Female Nurse Data	Age bracket (yrs)	Female Nurse Response Rate %	Height range (ft)	Female Nurse Response Rate %	Weight (Kg)	Female Response rate (%)
	18-27	20.6%	< 4.5	1.59%	45-54	31.7%
	28-35	68.2%	4.6-5.0	15.9%	55-64	38.0%
	36-44	7.93%	5.1-5.5	73.0%	65-74	23.8%
	45-50	3.17%	5.6-6.0	9.52%	75-84	4.76%
	51 and above	0%	6.1 and above	0%	85 and above	1.58%
Male Nurse Data	Age bracket (yrs)	Male Response rate (%)	Height range (ft)	Male Response rate (%)	Weight (Kg)	Male Response rate (%)
	18-27	21.0%	< 4.5	0%	45-54	0%
	28-35	63.1%	4.6-5.0	0%	55-64	26.3%
	36-44	10.5%	5.1-5.5	26.3%	65-74	26.3%
	45-50	0%	5.6-6.0	68.4%	75-90	31.6%
	51 and above	5.26%	6.1 and above	5.26%	90 and above	15.8%

Table 2: Relationship between work experience and MSDs in female and male nurses

Experience (yrs)	Female Nurse Response rate (%)	Male nurse Response rate (%)
3-12	88.8%	84.2%
13-22	9.52%	10.5%
23-32	1.59%	5.56%
33 and above	0%	0%
Total	100%	100%

Table 3: Relationship between the workplace and MSDs in female and male nurses

Workplace	Female nurse response rate (%)	Male nurse response rate (%)
Medical	12.7%	0%
Surgical	26.98%	47.4%
Pediatrics	1.59%	0%
Emergency	4.76%	31.6%

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ICU/NICU	7.93%	15.8%
Others (clinics, physio therapy, OBG)	34.92%	5.26%
OR/OT	11.1%	0%

Table 4: Nurses with MSDs that sought medical attention

Nurses	No. respondents	Response rate (%)
Sought medical attention	32	34.4%
No medical attention	61	65.6%

Table 5: Nurses' response rate about suffering from MSDs based on various body parts

Injured body parts	No. of respondents	Response rate
Back	65	43.6%
Neck and shoulder	26	17.4%
Feet	27	18.1%
Knees	15	10.0%
Head	8	5.36%
Hands	7	4.69%
Total	149	100%

Table 6: Percentage of nurses on body parts affected by MSDs in comparison to age, sex, department and work experience

Category	head	Neck and shoulders	Hands	Back	Knees	Feet
Age						
18-27	0	4	2	13	3	6
28-35	7	22	5	44	10	17
36-44	0	3	0	6	2	1
45-50	1	0	0	1	0	1
51 and above	0	0	0	1	0	0
Gender						
Male	1	4	0	17	1	4
Female	7	25	7	48	14	21
Workplace						
Medical	2	3	1	8	3	4
Surgical	2	11	1	19	3	5
Pediatrics	0	1	0	1	0	0
Emergency	1	5	1	7	0	3
ICU	1	0	0	5	2	4
OR/OT	0	1	0	4	1	3
Others (OBG, physiotherapy)	1	8	5	21	6	6
Experience						
3-12	7	26	7	56	13	23
13-22	1	3	0	7	2	2
23-32	0	0	0	2	0	0
33 and above	0	0	0	0	0	0

CONCLUSIONS

Cumulative evidence refers to the continuous problems related to MSDs in healthcare sector^(2, 11, 12). In the UAE, nurses are struggling to correct the nursing shortage while working hard and maintaining standards in the absence of adequate personnel. The challenge has taken a physical toll, causing nurses to develop chronic back pain⁽¹³⁾. Our results clearly prove that there is an issue that is receiving insufficient attention from hospital management and nurses alike. Nursing is a very important profession, yet a demanding one as well. It requires physical, as well as mental strength to perform it well without risking the health of the nurses. Most nurses in Dubai hail from selected (younger) demographics⁽⁹⁾ and are usually smaller in height, weight, and physical strength as compared to the patients they receive. This increases their risk of developing MSDs over long-term work exposure. Additionally, these nurses are young with low work experience due to which their knowledge on proper patient handling and other nursing tasks may be less than more experienced staff. Owing to their experience, older nurses may be more adept at recognizing their need for time off to recuperate, and knowing their own physical limits⁽⁸⁾. Therefore, proper training of novice nurses, working shifts and ergonomic factors, should all be considered and implemented in a way that aids the nurses in their daily activities, reducing the chances of developing MSDs, and thus, enabling them to perform their tasks in a healthy manner.

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Ethical Clearance: There was no physical or biological sampling or any intervention, Questionnaires forms were sent to both hospitals and approvals were granted.

Source of Funding: Self funded research

Conflict of Interest: Nil

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A Postmortem Study of Blunt Cardiac Injuries

Konduru Laxman

Assistant Professor, Department of Forensic Medicine, Osmania Medical College, Hyderabad

ABSTRACT

Introduction: Blunt cardiac injury (BCI) refers to injury sustained due to blunt trauma to the heart. The manifestations of such range from clinically silent, transient arrhythmias to deadly cardiac wall rupture.

Objectives: To study the blunt cardiac trauma following vehicular accidents brought for autopsy to the morgue of Osmania Medical College, Hyderabad have been studied.

Method: 55 cases of blunt cardiac trauma following vehicular accidents brought for autopsy to the Department of Forensic Medicine, Osmania Medical College, Hyderabad have been studied to find out types of cardiac injuries, their association with sternal and rib fractures, mechanism of causation, risk factors, etc.

Results: It was observed that 60 % of the cases with blunt cardiac trauma had associated sternal and rib fractures. Maximum number (58%) of the cardiac rupture was seen in run-over cases. The right ventricle of the heart was involved in 23 (41%) cases. All the injuries were located on the anterior surface of the heart.

Conclusion: In assessing blunt cardiac trauma victims in vehicular accidents, knowledge about the commonest sites, types and degrees of injuries have been highlighted in the present study, which will help in a timely intervention.

Keywords: *Vehicular accident, rib fracture, sternal fracture, blunt cardiac trauma.*

INTRODUCTION

Nonpenetrating chest trauma with injury to the heart and aorta has become increasingly common, particularly as a result of rapid deceleration in high-speed vehicular accidents, over the past 2–3 decades. Airplane crashes, falls from height, and other severe crushing injuries of the thorax and the lower body may also lead to the nonpenetrating cardiac injuries¹⁻⁷. Because blunt cardiac injury is the most clinically underdiagnosed traumatic injury in the adult and pediatric population⁸, these kind of injuries significantly increase morbidity in polytrauma patients, and in many cases lead to death⁹. The incidence of cardiac injury is presented 20% after blunt chest trauma in postmortem studies¹⁰. In the pediatric age group, the

incidence is slightly lower and previous studies suggested that cardiac injury was found in 15–20% of the pediatric patients examined⁷⁻¹¹. The incidence might be as low as 0.5–0.8% in clinical for all age groups. Therefore, there is always a possibility of fatal cardiac injuries to be unnoticed leading to a fatal outcome.

METHOD

55 cases of blunt cardiac trauma following vehicular accidents brought for autopsy to the morgue of the Department of Forensic Medicine, Osmania Medical College, Hyderabad have been considered for this study. The cases were studied to analyze the types of cardiac injuries, their association with sternal and rib fractures, mechanism of causation, risk factors, etc.

RESULTS

All the victims were males within the range age of 21–40 years, and all of them were involved in vehicular accidents. Out of these 55 cases of blunt cardiac trauma, 33 cases (60%) had associated sternal and rib fractures.

Correspondence Author:

Dr.Konduru Laxman
Assistant Professor
Department of Forensic Medicine
Osmania Medical College, Hyderabad
Email: laxmankonduru@gmail.com

27% of the cases had only associated rib injuries. Only five cases (10%) had no associated sternal or rib fractures (Table-1).

Table 1: Incidence of Cardiac Injuries and Association with sternal and rib fractures

	Cardiac injuries	Number	Percentage
1.	With sternal fracture	2	3%
2.	With rib fracture	15	27%
3.	With both sternal and rib fractures	33	60%
4.	Without sternal or rib fractures	5	10%

The right ventricle of the heart was involved in 23 (41%) cases. It was lacerated in 20 (86.5%) of these 23 cases, while the remaining three (13.2%) had contusion. The right atrium was lacerated in five (9.09%) cases. Both atria were lacerated in four (7.2%) cases, while both the ventricles were lacerated in five (9.09%) cases. The right ventricle and right atrium combined were lacerated in 10 (18.14%) cases. Extensive lacerations of the heart involving both the ventricles and both the atria were seen in five (9.07%) of the cases. The left ventricle and the left ventricle and left atrium combined were contused in two (3.6%) case each. In one (1.8%) case, laceration of the right atrium without any external injury of the chest region was seen and it was observed in a motorcyclist knocked down by a truck.

DISCUSSION

Waele J.J.D. et al.,¹² noticed that blunt cardiac injury was common after sternal trauma and the severity of the fracture was an indicator of possible myo or pericardial damage. This holds true in the present study as cardiac injuries were associated with sternal and rib fractures in 48.57% of the cases. In the run-over cases, the mechanism of injury could be attributed to compression of the heart between the sternum and vertebral bodies or penetration by a fractured rib or sternum. A direct blow to the anterior chest or penetration by a fractured rib or sternum could be the cause in the remaining cases. Bright E.F and Beck C.S.,¹³ and Parmley L.F. et al¹⁴, observed that while all the four chambers of the heart are susceptible to rupture in non-penetrating trauma, ventricular ruptures are preponderant. This is

in concurrence with the present study. The findings of the present study were also comparable to the findings observed by Brathwaite C.E. et al¹⁵ except for the fact that they observed a higher right atrial involvement (40.6%). The common sites of traumatic cardiac rupture in order of diminishing frequency are: right auricle, right ventricle, left ventricle, left auricle, ventricular septum and valves¹³. The preponderance of right ventricular injury over the left in blunt trauma can be explained by the fact that the sternocostal surface of the heart is mainly formed by the right ventricle, so the major brunt of the trauma is borne by the right ventricle ultimately leading its rupture. In one (2.86%) case, laceration of the right atrium without any external injury of the chest region was seen in the present study. The laceration of the right atrium without any external injuries of the chest region signifies that serious cardiac injuries may be present in absence of any visible external injuries.

CONCLUSION

In assessing blunt cardiac trauma victims in vehicular accidents, knowledge about the commonest sites, types and degrees of injuries sustained by them is often required. Patients with cardiac rupture who reach the hospital alive can often be saved by prompt diagnosis and immediate surgical treatment. Interestingly, survival is more common with right-sided injuries, especially right atrial lacerations^{16,17}. Moreover, as most of the cardiac injuries have associated rib and sternal fractures, proper monitoring of the victims with rib and sternal fractures is desired in blunt thoracic trauma cases. The presence of fatal cardiac trauma in head on collision cases emphasizes the utility of safety belts while driving.

Ethical Clearance: Taken from the Institutional Ethical committee

Source of Funding: Self

Conflict of Interest: NIL

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A Study of Determination of Stature in Hyderabad Population from External Ear Morphometry

Konduru Laxman

Assistant Professor, Department of Forensic Medicine, Osmania Medical College, Hyderabad

ABSTRACT

Introduction: Many studies have been conducted on the estimation of stature from different body parts like hands, trunk, vertebrae, extremities and foot. Since, all these parts of the body and also bones are not always available for forensic examination. It becomes now necessary to make use of other parts of the body like head & face region. Determination of stature is considered an important parameter in medico-legal and forensic examinations. Objective: this study was carried out to investigate the possibility of estimating stature from external ear morphometry in a sample of Hyderabad population.

Method: This study was carried out on 300 persons (180 males and 120 females). Besides stature, eight measurements were obtained from both ears of each participant using manual vernier caliper. Data were analyzed by SPSS version 16.

Results: There was a strong significant positive correlation between all measurements and stature. A linear equation model for prediction of stature from given external ear dimension was generated. By simple linear regression analysis, the most accurate predictable variable of stature from both ears in males was ear length ($R^2 = 0.728$ in right ear and $R^2 = 0.815$ in left ear). While in females; right ear width ($R^2 = 0.655$) and left conchal width ($R^2 = 0.791$) are the most accurate variables that can predict stature.

Conclusion: it is concluded that external ear morphometry can be used as an additional tool in the estimation of stature in Hyderabad population.

Keywords: *Ear morphometry; Hyderabad; Linear Regression*

INTRODUCTION

Personal identification means determination of individuality of a person. It is an important aspect in forensic science. In living subjects, identification was based on certain morphological criteria unique to that individual. In case of skeletal remains, identification is more complicated and requires accurate examinations of these remains ¹.

Anthropometric data are believed to be objective and they allow the forensic anthropologist go beyond subjective assessments such as “similar” or “different” ². Establishment of alternative methodologies for personal stature estimation is very important for a number of reasons. An estimate must be then made on the known relationship of the remains to stature ³. However, a number of common diseases or deformities of the vertebral column make it difficult to accurately measure stature in standing position in many patients.

Many studies have been conducted on the estimation of stature from different body parts like hands, trunk, vertebrae, extremities and foot. Since, all these parts of the body and also bones are not always available for forensic examination. It becomes now necessary to make use of other parts of the body like head & face region ^{4,5}.

Ears in humans are the defining feature of the face and its structure shows the signs of age and sex. The human ear is divided into external, middle and internal parts. Pinna and external acoustic meatus form the external ear. The lateral surface of the pinna is irregularly concave, faces slightly forward and displays numerous eminences and depressions ⁶. So the objective of this study was to estimate stature by using external ear measurements and derive an equation of linear regression that are specific for identification of stature in of Hyderabad population

METHOD

This study was carried out on 300 persons (180 males and 120 females), with age ranges from 18-25 years. Subjects were randomly selected from the Osmania Medical College, Hyderabad. A written informed consent was taken from each participant. Any participant with physical deformity, tumors, congenital anomalies and previous surgeries of external ears were excluded from this study.

Eight measurements beside individual stature were taken from both ears of each participant. According to Krishan ⁷, stature was measured as a vertical distance from the vertex to the floor using a standard anthropometric Frankfurt plane. Stature was taken by making the subject stand on a horizontal resisting plane, with foot bared and heels together and they must not leave the ground.

Beside stature, standardized measurements of the external ear were taken according to the landmarked points defined by De Carlo et al ⁸ and the methodology was adopted from McKinney et al ⁹. The parameters were measured in the sitting positing with the head in the Frankfurt horizontal plane by manual vernier caliper. They include Ear length (EL), Ear width (EW), Conchal length (CL), Conchal width (CW), Lobule length (LL), Lobule width (LW), Tragus length (TL) and Tragus width (TW). All ear measurements were taken in millimeters.

For each subject, the measurements were carried out twice to ascertain accuracy and the arithmetical mean of the two measurements was used for each dimension. Secondly, all measurements were carried out by the same investigator in order to minimize bias and error of identification of the parts of the external ear involved in the measurements.

The data were analyzed using SPSS version 20. Mean and standard deviations were obtained for stature and all measurements of both ears in males and females. Correlation between stature and different measurements was tested using Pearson's correlation. Student-t-test was done to establish that a significant sexual difference was present. Linear regression analysis was performed to derive an equation to predict stature in Hyderabad region.

RESULTS

In this study, there was a significant sexual difference in stature and insignificant sexual difference in all ear

measurements except right and left EL, left EW, left LL and right TW. There was a statistically significant difference in all measurements of both ears except EL in males and EL, LL and CW in females.

There was a significant strong positive correlation between all measured parameters of right and left ears and stature in both sexes. Linear regression analysis was done in this study to predict the stature of both sexes from external ears measurements.

By linear regression analysis, stature can be estimated from this equation:

Person's stature = constant + (slopping of unstandardized coefficient x ear measurement). By simple linear regression analysis, the most predictable variable in estimation of stature in males from right ear measurements was EL ($R=0.963$ & $R^2=0.928$) followed by CL ($R=0.945$ & $R^2=0.944$) and finally EW ($R=0.930$ & $R^2=0.865$). While, in left ear, the most accurate variable that can predict stature was EL ($R=0.956$ & $R^2=0.915$) followed by CW ($R=0.955$ & $R^2=0.913$) and finally CL ($R=0.945$ & $R^2=0.893$).

In females, the most predictable variables of stature from right ear parameters were EW ($R=0.925$ & $R^2=0.855$), followed by EL ($R=0.898$ & $R^2=0.806$) and lastly LW ($R=0.893$ & $R^2=0.797$). While, in left ear, the most accurate variable that can predict stature was CW ($R=0.878$ & $R^2=0.771$) followed by EL ($R=0.863$ & $R^2=0.745$) and finally CL ($R=0.862$ & $R^2=0.744$).

By multiple linear regression analysis, combination of all measurements in both ears was occurred. In the right ear in males, $R=0.997$ and $R^2=0.994$. While, in the left ear, $R=0.994$ and $R^2=0.987$. In females, $R=0.996$ and $R^2=0.991$ in the right ear, in the left ear, $R=0.991$ and $R^2=0.982$.

By stepwise linear regression analysis, 6 models can be used to predict stature in males from right ear measurements. The most predictable model in stature estimation was that contained combination of (CL, EL, TW, LW, LL and EW) ($R=0.997$ and $R^2=0.993$). While, in the left ear of males, 7 models can be used and the model that can estimate stature accurately was that contained combination of (EL, TW, EW, CW, LL, LW and CL) ($R=0.994$ and $R^2=0.986$).

Three models were used to predict stature from right ear measurements by stepwise linear regression

analysis in females. The model that can highly predict stature accurately was that contained combination of (EW, LL and EL) ($R = 0.993$ and $R^2 = 0.986$). While, in left ear five models were used. The model that contained combination of (EL, LW, TL and TW) was the most predictable model in stature estimation ($R = 0.990$ and $R^2 = 0.981$).

DISCUSSION

Human identification is of a great importance in many anthropological cases and traumatic events. Within the medicolegal field, the objective of the forensic anthropologist when working with recovered skeletal remains is the determination of sex, stature, age and race. Estimation of stature is an important tool in forensic examination especially in unknown highly decomposed, fragmentary and mutilated human remains⁷.

Stature is being one of the criteria of personal identification that helps in narrowing down the investigation process and thus provides useful clues to the investigation agencies. It becomes very difficult for a forensic anthropologist when isolated remains of head, face, or skull are brought for forensic examination, as the standards available in this direction are scanty. Therefore, facial measurements (e.g. nose, mouth and ear measurements) act as a useful tool in the absence of the other evidences for stature estimation¹¹.

There are many functions of external ear. It receives sound waves for hearing and supporting eye glasses. Also, it is an important aesthetic defining feature of the human face. Overall, facial beauty arises from symmetric and harmonious proportions of its defining features¹².

There are many benefits of using the ear dimensions as a data source for individual identification. The ear has characteristic ear parts; the location of these parts, their directions, angles; their size and relation within the ear are distinct and unique to humans. So, ear measurements can be used as a modality for personal identification¹³.

Studies of external ear morphometry have been significantly used in many purposes like plastic surgery¹⁴⁻¹⁷, determination of racial variation¹⁸ and designing of ear related products¹⁹. The use of external ear measurements in stature estimation is limited. Therefore, the objective of this study was to estimate stature in Hyderabad population using external ear morphometry and derive a linear regression equation to predict stature.

The results of this present study demonstrated that there was a statistically insignificant sexual difference in all ear measurements except right and left EL, left EW, left LL and right TW. Coinciding with these results, Cagatay and Erol¹⁷ concluded that there was a significant sexual difference in right and left EL, EW, LW and LL.

Deopa et al² conducted a study included anthropometric measurements of external ear of medical students in Uttarakhand region. Their study revealed the presence of insignificant sexual difference in all measured parameters of both ears. Their study is not in agreement of our study. In the study of Oludiran and Omotoso²⁰, there was a significant sexual difference in EL, EW and lobule parameters of both ears and this is not in concordance with our findings except in EL of both ears, left EW and left LL which are significantly sexually different.

This study revealed that there was a strong significant positive correlation between all measurements of both ears and stature in both sexes. These results agree with the results of Magaji et al²¹. Their study revealed that there was a statistically significant correlation between EL and EW of both ears and stature. Also, our results are in concordance with the results of Lynn et al^{22,23}. Their study on ear print revealed that there was a possible correlation between some auricle dimensions and stature.

Prediction of stature from external ear measurements in this study was done by the use of linear regression analysis. By simple linear regression analysis, the highly predictable variables of stature from right ear measurements in males were EL, CL and EW. While, from left ears measurements, the variables were EL, CW and CL. In females, the most highly predictable variables of right ear were EW, EL and LW. On the other hand, the highly predictable variables of left ear were CW, EL and CL.

In stepwise linear regression analysis, the model that can highly statistically significantly predict stature in males from right ear measurements was the combination of (CL, EL, TW, LW, LL and EW). While, in left ear the model was the combination of the following parameters (EL, TW, EW, CW, LL, LW and CL). In females, the most predictable model of stature from right ear measurements was combination of (EW, LL and EL). In left ear, the model was that contained combination of (EL, LW, TW and TL).

This study revealed that left EW ($R^2= 0.086$) was the most predictable variable to estimate stature, this is followed by right EL ($R^2= 0.082$) and finally left EL ($R^2= 0.074$) and their results are not in concordance with this study¹⁷.

When comparison of this study with those of others, this study found that there is a difference in the values of ear measurements and these differences could be a result of many factors such as race, age, genetic variables, individual constitution, environmental factors, and human error in both ear measurements and stature estimation.

CONCLUSION

In conclusion, this study has demonstrated that the ear morphometry is an additional important tool in the estimation of stature by using simple statistical method. The regression equations generated from external ear measurements can be a supplementary approach for the estimation of stature when extremities are not available. Also, the regression formulae derived in this study will be of potential use in clinical, medicolegal and anthropological studies.

Ethical Clearance: Taken from the Institutional Ethical committee

Source of Funding: Self

Conflict of Interest: NIL

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Comparable Study between Panic Disorder Patients (with or without) Mitral Prolapse in Nassiria City/Iraq

Kadum Mohan Manil¹, Hussain Hlail Wda'a Al-Sayyad²

¹Board (Med.), ²Board (Psych.), College of Medicine, Thi-Qar University, Iraq

ABSTRACT

Background: There are considerable hypothesis about possible relationship between panic disorder (pd) and mitral valve prolapse (MVP), panic disorder usually consider as impact factor on patient with (MVP) either in exaggeration of symptoms or complications of (MVP) like angina, chest pain, chronicity of course of (pd). (MVP) is myxomatous disconfiguration of valve due thickening and dislocation of valve leaflet into left atrium through systole.

Patients and Method: Cross sectional study of (52) patients with panic disorder with MVP (31) or without (21) through the period (March- October 2018) in private clinics of (physician, psychiatrist, Echocardiographic specialist), all study sample were submitted to (DSMIV) criteria to document panic disorder diagnosis by psychiatrist and physical assessment.

Results: All study sample (52) patients were documented as (pd), (31) patients (59.6%) were with negative (MVP), 21 patients (40.4%) were with positive, < 20 year age group were the major with positive MVP, >60 year were the major negative (MVP) their percentage were (66.7%,100.%) successively, most common count of positive (MVP) who were unemployed were (44.4%) in comparism with (55. 6%) with negative (MVP), (41. 2%) of MVP were from rural area, (60. 0%) were with negative MVP,(50. 0%) of positive Mitral valve were from moderate social class, which is equal to negative (MVP) (46. 2%),

Keywords: *Panic disorder, Mitral valve Prolapse, comparable study, DSMIV Criteria, Nassiriya, Iraq.*

INTRODUCTION

Panic disorder (pd) is repetitive and sever psychiatric disorder characterized by frequent panic attack (PA) which is the main syndrome of panic disorder, it is expressed as sever fear or unpleasant feeling comorbid physical and mental symptoms in presence or absence of phobic stimulus (ICD 10, W H O) ^[1]. Panic attack usually sudden onset often takes (5- 15 minute), or rarely extend for hours with anxiety, tremor, palpitation ^[2],panicky patients preoccupied with integrity of their main vital organs like their heart, respiratory system these symptoms are suggested to be psychological in

nature and still masked those organs diseases like; chest pain, dysphagia, and certainly mitral valve disease (MVP). All theories suggest a basic of disturbance of autonomic system and easily diagnosed with irregular heart pulse and chest pain might developed clear cut panic attack, which concerned with group of motions disturbance which perceived as phobia^[3].

Mitral valve Prolapse (MVP) or (floppy mitral valve syndrome), which shows thickening of mitral valve leaflet into left atrium at systolic phase ^[4] , Leaflet has three layers of tissues: the atrialis, fibrosa and spongiosa, huge connection tissue lead to thickening of spongiosa layer which isolate collagen bundle in the fibrosa, which lead to prolongation of chorda tindinea that may result in damage of posterior leaflet in inversion and dislocation of Left atrium^[5].

No, obvious clinical evidence for relation between excessive co-existence of panic disorder and mitral valve prolapse^[6].

Corresponding Author:

Kadum Mohan Manil
Board (Med.), College of Medicine,
Thi-Qar University, Iraq
Email : Kaddimmohan@yahoo.com

PATIENTS AND METHOD

Setting and sample- DSM-IV Symptoms of panic attack in Arabic& English version (Appendix 1) was applied to diagnose the panic disorder. Through the period (March- October, 2018). Patients should have at least {4} attacks per month followed by other one in same or other month and meeting full criteria in (Appendix 1), which mean positive symptoms of panic disorder and exclusive criteria involve (substance abuse, thyrotoxicosis or Lung disease) other exclusive criteria involve (anxiety, specific phobia, OCD, PTSD,

dissociative disorder) (Appendix)(1). Such diagnosis of criteria should be submitted for expert psychiatrist and physician, other visit to document the diagnosis.

Fifty two patient were giving oral consent, examined by cross-sectional study in private clinic of (physician, psychiatrist) and Modern clinic of echo cardio graphic machine to elicit even the complicated case of MVP which are interviewed by physician through auscultation, physician also diagnosed comorbid medical disorder(χ^2 , P value, Fisher exact test, Pearson Chi-Square) were not find significant result between study sample (pd) with or without MVP.

RESULTS

Table 1: Distribution of age in study* sample (panic disorder patients (pd) with or without mitral valve prolapse)

Specimens		**(pd) with ***MVP			Fisher's Test****
		Negative	Positive	Total	P value*****
Age	<20 y	Count	1	2	3.858
		% within age	33.3%	66.7%	0.263
	20y-	Count	19	9	
		% within age	67.9%	32.1%	
	40y-	Count	9	10	
		% within age	47.4%	52.6%	
	>60 yr	Count	2	0	
		% within age	100.0%	0.0%	
Total		Count	31	21	
		% within age	59.6%	40.4%	

*Study sample means panic disorder patient with or without mitral valve disease.

** (pd) means panic disorder.

*** (MVP) means mitral valve prolapse.

**** Fisher exact test is not significant (NS)

***** P value is not significant (NS)

Table 2: Shows Distribution of occupation in study sample

Specimens		**(pd) with ***MVP				Chi-Square*
			Negative	Positive	Total	value
Occupation	Unemployed	Count	16	9	25	.384 ^a
		% within occupation	64.0%	36.0%	100.0%	0.535
	Employed	Count	15	12	27	
		% within occupation	55.6%	44.4%	100.0%	
Total		Count	31	21	52	
		% within age	59.6%	40.4%	100.0%	

Table 3: Distribution of address in study sample

			(pd) with (MVP)		Total	X ² *
			Negative	Positive		P value **
adress	Urban	Count	21	14	35	.007, 0.935
		% within adress	60.0%	40.0%	100.0%	
	Rural	Count	10	7	17	
		% within adress	58.8%	41.2%	100.0%	
Total		Count	31	21	52	
		% within adress	59.6%	40.4%	100.0%	

Table 4: Distribution of social class in study sample

			(pd) with (MVP)		Total	X2 *
			Negative	Positive		P **
***SC	Low	Count	12	5	17	1.846 ^a
		% within SC	70.6%	29.4%	100.0%	0.397
	Moderate	Count	12	12	24	
		% within SC	50.0%	50.0%	100.0%	
	High	Count	7	4	11	
		% within SC	63.6%	36.4%	100.0%	
Total		Count	31	21	52	
		% within SC	59.6%	40.4%	100.0%	

Table 5: Distribution of heart and comorbid disease in study sample

		(pd) with (MVP)		Total	X ² *				X ²				
		Negative	Positive			Negative	Positive	Total					
D.H.**	Negative	Count	25	14	39	1.305 ^a	Comorbid disease	Negative	Count	23	12	35	1.654 ^a
		% within HxofH.D	64.1%	35.9%	100.0%	% within comorbid disease			65.7%	35.3%	100.0%		
	Positive	Count	6	7	13	.135	Positive	Count	8	9	17	0.198	
		% within HxofH.D	46.2%	53.8%	100.0%	% within comorbid disease		47.1%	52.9	100.0%			
Total	Count	31	21	52		Total	Count	31	21	52			
	% within HxofH.D	59.6%	40.4%	100.0%	% within comorbid disease		59.6%	40.4%	100.0%				

Table 6: Distribution of comorbid psychiatric diseases in study sample

	(pd) with (MVP)		Total	X ² *
	Negative	Positive		
Comorbid psychiatric diseases	Count	17	40	.322 ^a
	***% within com-psy-dis	42.5%	100.0%	0.741
Positive	Count	4	12	
	% within com-psy-dis	33.3%	100.0%	
Total	Count	21	52	
	% within Post psychiatric dis	40.4%	100.0%	

DISCUSSION

Study exposed for (52) patients with panic disorder, (31) of them were with normal mitral valve, (21) were presented with valve prolapse, study was achieved in private clinics of psychiatrist, physician as outpatient in Nassiriya city.

Majority of patients (66. 7%) with (MVP) were < 20 year. Because of development of diagnostic tools and alertness of patients and physicians about the risk of disorder last twenty years, one study revealed (38%) of health teenager age have the same disorder^[7], which means increase (MVP) in panic disorder in comparison with healthy teenager, other study goes with this study that use the diagnosis before age of (40) years^[8].

Least incidence was (0. 00%) at age of (60) years, which is due to exclusive criteria of other valve involvement and probably the age of patients with complicated (MVP) does not prolong survive of patients above (60) year for self-ignorance of general health to such group, or due to their tolerance for panic attack symptoms, which reduce older age consultation of physician.

(MVP) mainly range between (20- 40) years, it is related for proper use of antibiotics to prevent rheumatic fever which cause valvular heart diseases, similar study mention that majority of (MVP) under 30 years age^[9].

Most employed patients with negative (MVP) (55. 6%) was higher than those with positive (MVP) (44. 4%), this is mostly revealed to crippling effect of (MVP) like fatigability or heart failure, intolerance with physical activity, in addition to factors that panic

symptoms severely affect socio- occupational life, same conclusion was settled that symptoms of (pd) with (MVP) like (tacky cardia) and palpitation, syncope, fatigue, excessive intolerance, chest pain dyspnea^[10].

(40%), (41%), of study sample have equal count of urban and rural area with (MVP), this is probably related to presence of panic disorder fearful symptoms that enhance early consultation of physicians or psychiatrists.

(60%), (58%) of study sample with negative (MVP) are equal in both urban and residence count, also it is related to co-existence with a good leading symptoms of (pd) in spite of different address.

A availability of diagnostic tools of diagnosis of (MVP) like modern echo graphic machine and well trained resident doctors in rural area, the ratio of negative: positive mitral value state was equal to 3:2, results goes with normal distribution of study sample of patient with or without (MVP).

Comprehensive training in all place, systemic investigation, appropriate medical centers, feedback physicians information will be more in industrialized area that met suitable personal skills with strong communication abilities, all these facilities will result in more accurate diagnosis^[11].

Regarding social class in study sample among patients with moderate class count as the highest percentage (50%), high social class with positive (MVP) was (36. 4%), low social class was (29.4%), high count among high social class are goes with economic normal distribution of Iraqi population, due to improvement of income that facilitate early consultation of professional physicians, low social class with (MVP) has least count for financial obstacles to afford the payments of medical care in city center, marked fatigue, hyperventilation, chest pain are more prevalent in civilian life as well, (MVP) and other medical illness that comorbid (pd), these conclusions are contradictory with our study of highest count of (pd) with (MVP) in high social class^[12], study sample with (pd) with (MVP) with low social class are the highest (76. 6%) in comparison with high social class, this result might be accidental, which goes with other study which mentioned (pd) and its comorbidities are more prevalent in low social class due to poor somatic status^[13].

Distribution of heart diseases in this study sample in patients with (MVP) was (53. 8%), which is higher than study sample with negative (MVP) (46. 2%), most common complications of (MVP) are mitral valve regurgitation, endocarditis and destruction of chordal, some patients experience chest pain, dyspnea^[14]. So we can conclude that Patients with panic disorder express more cardiovascular diseases and (MVP).

Positive count percentage within study sample with (MVP) was (52. 9%) in comparison with study sample without MVP (47. 1%), the case related to synergistic effect of (pd) with (MVP), longitudinal evaluation of (pd) referred to increased distribution of physical diseases likes hypertension, migraine, peptic ulceration,

endocrine disturbance as comorbid physical disease ^[15], approximately half (52%) of all patients present with at least one physical health condition, the relation of medical comorbidity in (pd) highly concerned to bad health perceived compare to those without, (p- value is < 0. 5) ^[16], significant value cannot be found out in our study due to small size study sample.

Non psychiatric medical comorbidity, health perception and treatment out common in patients with panic disorder suggested correlation of (pd) and (MVP), with low in frequency (0- 8%) other higher ^[17], which goes with this study finding of comorbid diseases.

Comorbid psychiatric diseases in study sample with positive (MVP) was (33%), (pd) with negative (MVP) was (66%) higher percentage among negative (MVP) than positive refers to negative correlation with other mental effect, the case that concerned with denial approach of patients for their mental symptoms is due to social stigma or it is type of chance effect. Some studies mentioned that (MVP) is disorder which occurs more probably with emotional disorder and fear of serious heart diseases likes palpitation and chest pain which suggest angina pectoris, cardiac arrhythmia, phobia are usually comorbid panic disorder and anxiety disorder ^[18], patients with MVP and (pd) are frequently have major depressive disorder ^[19], the case which was not observable during mental state examination in this study; which is probably due to time restriction or Long term use of chronic (pd) patient of selective serotonin Reuptake inhibitors (SSRI) which control both panic and depressive disorder in (60%) of cases. (36) out of (100) patients with (MVP) are presented with uncontrolled anger- rage symptoms ^[20].

Concerning distribution of duration of (pd) with positive (MVP) in study sample were relatively equal in the following periods (1 month, 1 year, 6- 10 years) were the duration relatively in (63%), these results referred to the chronicity of (pd) with MVP, however (1 month) duration was the most common (66. 7%), but this is mainly related to younger age <20years old.

High percentage of long duration among study sample with (MVP) (1year), (6- 10 years) probably referred to ignorance the symptoms of panic disorders, because of short time of episode of (pd) (few minutes- hour), or poor medical training for diagnosis and differentiating (pd) among many practitioners, other causes related

to similarity of (pd) to generalized anxiety, exertional arrhythmia, mid (MVP) usually a symptomatic although its prevalence is (24- 35%) definite (MVP) with (pd) ^[21].

Duration of (pd) with negative (MVP) were lower than positive (MVP) in most durations course of (pd) mostly in (1 month, 6 month, 1 year, 6-10 year), this is related to impact effect of panic disorder on study sample of comorbid diseases, mitral valve regurge, ischemic heart disease.

(MVP) patients with (pd) who did not seek professional care would be low and similar to patients with negative (MVP) ^[22].

CONCLUSION

There was obvious different in percentage of various socio- demographic or medical variables of study sample with MVP or without, despite presence of controversial some results that was interpreted through this study.

Conflict of Interest: The author has no disclosures to report.

Source of Funding: Self.

Ethical Clearance: All patients and their relative were giving oral and written consent to carry out all investigations and interviews.

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A Study to Assess the Knowledge and Compliance of Critical Care Nurses Regarding Ventilator Care Bundle in Prevention of Ventilator Associated Pneumonia

Dipali U Dumbre

Nursing Tutor, Symbiosis College Nursing, Symbiosis International (Deemed University), Pune, India

ABSTRACT

Mechanical ventilation is one of the major supportive modalities in the intensive care unit but it carries a lot of risks and complications, the most common one being VAP. VAP is a problem in intensive care units worldwide and dramatically increases morbidity and mortality rates on mechanically ventilated patients. It is the most common infectious complication among patients admitted to intensive care unit^[1]. Knowledge of nurses on ventilator care bundle for the prevention of VAP and adherence to them would reduce the risk of occurrence of VAP and decrease morbidity and mortality of mechanically ventilated patients in the ICU. Nursing care is growing rapidly in conjunction with technology and it is catching up with developed countries guidelines and standards of care. Nursing shortage, however, is a burden and intensive care nurses are in huge demand. The few intensive care nurses still practicing need to constantly update themselves with current knowledge and scientific evidence on many issues existent in the ICU, including VAP^[2]. The four primary recommended practices includes: elevating the head of the bed to 30 degrees, sedation vacations, oral care with chlorohexidine (CHG) and subglottic suctioning endotracheal tubes. Ventilator “bundles” usually include other elements such as deep venous thrombosis (DVT) prophylaxis, peptic ulcer prophylaxis. The nurse are expected to care for these patients in a setting of intensive care unit. The nurses should have thorough knowledge of the modes of ventilation, assessment, and trouble shooting of ventilators and assessment and care of the patients requiring mechanical ventilation.^[3,4]

The result shows that more than half (56.7%) of the staff nurses had excellent knowledge regarding ventilator care bundle and 43.3% of them had good knowledge regarding ventilator care bundle. It shows that knowledge and compliance of staff nurses regarding ventilator care bundle were found to have significant association.

Keywords: *Compliance, Critical care nurse, Ventilator-associated pneumonia (VAP), Ventilator care Bundle,*

INTRODUCTION

The lungs are usually amongst the major organs involved in multiple organ failure and thus the challenge of delivering appropriate ventilation with as little complications as possible is extremely important. Nosocomial pneumonia is a leading cause of death from hospital-acquired infections, with an associated crude

mortality rate of approximately 30 percent. Ventilator-associated pneumonia (VAP) refers specifically to nosocomial bacterial pneumonia that has developed in patients who are receiving mechanical ventilation. To ensure the highest standards of nursing care, nursing practice must be based on a strong body of scientific knowledge. This can be achieved through adherence to the evidence based guidelines for prevention of VAP, ultimately improving patients' outcomes. Improved outcomes will shorten patient's ICU length of stay, hospitalization as well as benefit the patient financially with decreased hospital costs. Hospitals also gain benefits as they are continually faced with the challenge of providing cost effective services to patients and communities.^[1]

Corresponding Author:

Mrs Dipali U Dumbre

Nursing Tutor, Symbiosis College Nursing,

Symbiosis International (Deemed University), Pune, India

Mobile: 9921938445

Email: dipalidumbre@scon.edu.in

PURPOSES

To assess the knowledge, compliance of staff nurses regarding ventilator care bundle.

NEED OF THE STUDY

Intubation and mechanical ventilation both increase the risk of bacterial pulmonary infection because the invasive endotracheal tube allows direct entry of bacteria into the lower respiratory tract since the tube is located in the trachea. Bacterial colonization in the respiratory tract is further facilitated by the absence of the cough reflex and excessive mucus secretion in the mechanically ventilated patients.^[5] Nosocomial pneumonia is a leading cause of death from hospital-acquired infections, with an associated crude mortality rate of approximately 30 percent. Ventilator-associated pneumonia (VAP) refers specifically to nosocomial bacterial pneumonia that has developed in patients who are receiving mechanical ventilation. Ventilator-associated pneumonia that occurs within 48 to 72 hours after intubation is usually termed early-onset pneumonia; it often results from aspiration, which complicates the intubation process. Ventilator-associated pneumonia that occurs after this period is considered late-onset pneumonia.

Between 5-15% of hospital in-patients develop infection during admission to intensive care unit (ICU). ICU patients are 5-10 times more likely to acquire nosocomial infections than patients in the wards and approximately 86% of hospital associated pneumonia is linked with mechanical ventilation. The prevention of Ventilator Assisted Pneumonia (VAP), a hospital acquired infection, among intensive care patients is a major clinical challenge. It is a condition that is associated with high rates of morbidity, mortality, length of stay and hospital costs.^[6]

Conceptual Framework: The conceptual framework is developed by the investigator herself based on the critical thinking of nursing practice Health Belief Model (HBM) developed in the 1950s by social psychologists Hochbaum, Rosenstock and Kegels working in the U.S. aims to assess the knowledge and compliance of critical care nurses regarding ventilator care bundle in prevention of ventilator associated pneumonia.

RESEARCH METHODOLOGY

Design: Exploratory survey research design

Sample: 60 nurses.

Tool: Demographic data, structured questionnaire, Observation checklist

Validity: Validation of the tool was done by experts and modifications were made accordingly.

Reliability: The reliability of the tool was calculated to be 0.9538 for knowledge aspects and 0.8072 for practice aspects. Split half method, Inter rater method was used to find out the reliability for knowledge and compliance aspects which was analysed using Karl Pearson coefficient correlation.

DATA COLLECTION

Data was collected from 60 subjects working in critical care unit.

DATA ANALYSIS

The data collected was analysed using descriptive and inferential statistics.

Major Findings of the Study:

- Majority of 71.7% of the staff nurses had age 21-25 years, 25% of them had age 26-30 years, and remaining 3.3% of them had age above 35 years.
- Majority of 75% of them were females and 25% of them were males.
- Majority, 95% of them had B.Sc. Nursing, 1.7% of them had GNM and 3.3% of them had Post B.Sc.
- Majority shows 81.7% of them had 1-3 years of total experience and 18.3% of them had more than 3 years of experience
- Majority shows, 58.3% of them had less than one year of ICU experience, 33.3% of them had 1-3 years of experience and 8.3% of them had more than 3 years of experience.
- Majority shows, 33.3% of them were working in CCU, 33.3% of them were working in ICU and 33.3% of them were working in NTU.
- Majority, 51.7% of them were in Evening shift, 23.3% of them were in morning shift and 25% of them were working in night shift.
- Majority shows, 51.7% were in the evening shift followed by 25% in night and 23.3% in morning.

Findings related to knowledge of staff nurses regarding ventilator care bundle: It shows that more than half (56.7%) of the staff nurses had excellent knowledge regarding ventilator care bundle and 43.3% of them had good knowledge regarding ventilator care bundle.

Findings related to compliance of staff nurses regarding ventilator care bundle: It shows that knowledge and compliance of staff nurses regarding ventilator care bundle were found to have significant association. More the knowledge, better is the compliance, as the p-value is less than 0.05.

Findings related to association between knowledge regarding ventilator care bundle and selected demographic variables of staff nurses: It shows that shift was found to have significant association with the knowledge of the staff nurses regarding ventilator care bundle, as the p-value corresponding to shift was small, the null hypothesis is rejected.

Findings related to association between compliance regarding ventilator care bundle and selected demographic variables of staff nurses: It shows that area of work and Shift were found to have significant association with the compliances of the staff nurses regarding ventilator care bundle, as the p-values corresponding to area of work and shift was small, the null hypothesis is rejected.

CONCLUSION

The Findings of the study show that there is a highly significant association between knowledge and compliance scores of the group.. There is significant association of knowledge score with shift and compliance scores with area of work and shift as 'p' value <0.001.

This study could help in increasing the knowledge and compliance of staff nurses regarding ventilator care bundle in prevention of VAP.

DISCUSSION

In the present study 43 (71.7%) of the subjects were from the age group of 21-25 years whereas 15 (25%) of them were in the age group of 26-30 years. Majority 45 (75.%) of subjects were females and only 15 (25%) were males. Maximum 57 (95%) did their B.Sc. nursing, whereas 2 (3.3%) did their PBSc nursing where as G.N.M 1 (1.7%). Most 49 (81.7%) of the subjects had 1-3 years of experience remaining 11(18.3%) of the subjects had

> 3 years of total experience. Most 35 (58.3%) of the subjects had less than 1 year remaining 20 (33.3%) of the subjects had 1-3 years of experience remaining 5(8.3%) of the subjects had > 3 years of total ICU experience. There was equal representation 20 (33.3%) of subjects had CCU, ICU, NTU experience. Majority 31(51.7%) of the staff nurses were in evening shift while around 23 - 25% morning shift & night shift respectively. More than half (56.7%) of the staff nurses had excellent knowledge regarding ventilator care bundle and 43.3% of them had good knowledge regarding ventilator care bundle. Majority (71.7%) of the staff nurses had good compliance regarding ventilator care bundle, 18.3% of them had satisfactory compliance and 10% of them had excellent compliance regarding ventilator care bundle. It shows that knowledge and compliance of staff nurses regarding ventilator care bundle were found to have significant association. More the knowledge, better is the compliance, as the p-value is less than 0.05.

Source of Funding: Self

Ethical Clearance: Taken from RAC

Conflict of Interest: Nil

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Determinants of Levels of Cardiac Troponin I in Post-Mortem Blood Sample in Sudden Cardiac Death—An Autopsy Based Study

Sharifa S¹, Sarathkumar A², Sasikala K³

¹Associate Professor of Forensic Medicine, ²Additional Professor of Pathology, ³Associate Professor of Forensic Medicine, Medical College, Thiruvananthapuram, Kerala, India

ABSTRACT

Cardiac Troponin I (cTnI) is a very sensitive biochemical marker for the diagnosis of myocardial infarction (MI) in Sudden Cardiac Death (SCD). cTnI has nearly absolute myocardial tissue specificity, thereby reflecting even microscopic zones of myocardial necrosis. The aim of this study is to find out the gross and microscopic changes in heart and determinants of elevated levels of cTnI in cases of SCD. This cross sectional study was conducted in 50 cases of SCD brought for medicolegal autopsy at Government Medical College, Thiruvananthapuram. Heart was examined for gross and microscopic changes and blood level of cTnI. The mean value of cTnI was 3.4 (sd – 7.8) ng/dl. Age (>50 years), male sex, BMI (>25), previous history of CAD, family history, diabetes mellitus and hypertension were the determinants of level of cTnI in the postmortem blood. Common morphological findings observed in heart were haemorrhage, hypereosinophilia and oedema. From this study it can be concluded that cTnI assay can be used as a valuable supportive measure for postmortem diagnosis of SCD.

Keywords: Sudden Cardiac Death (SCD); Cardiac Troponin I (cTnI); myocardial infarction (MI); determinants; postmortem diagnosis

INTRODUCTION

According to Hurst, sudden cardiac death (SCD) in a person is the unexpected natural death in a person, due to cardiac causes, within a short period of time from the onset of symptoms without any prior fatal disease¹. Acute myocardial ischaemia due to Coronary Artery Disease (CAD) accounts for 45 to 90% of all sudden natural deaths according to various authors². Post-mortem demonstration of ischaemic heart disease is based on conventional gross and histological changes. Gross changes occur 8 hours after coronary occlusion. No macroscopic changes will be evident by classical method for at least 8 hours or much longer³. Cardiac Troponin I (cTnI) is a very sensitive biochemical

marker for the diagnosis of myocardial infarction (MI). Cardiac troponin I has nearly absolute myocardial tissue specificity, thereby reflecting even microscopic zones of myocardial necrosis⁴. cTn I was found to be power aid in diagnosis of myocardial damage⁵.

The main aim of this study is to find out the gross and microscopic changes in heart and determinants of elevated levels of cardiac troponin I in cases of sudden cardiac death

MATERIAL AND METHOD

This cross sectional study was conducted in the Department of Forensic Medicine, Government Medical College Thiruvananthapuram for a period of one year after getting Institutional Ethics Committee Clearance. A sample size of 50 cases of SCD due to CAD was studied. Unknown cases, decomposed bodies and those with other causes of death were excluded from the study. Cases were selected after scrutinizing the inquest reports. Informed written consent was obtained from the available near relative. Preliminary details were collected from the available relative and the police. During autopsy,

Corresponding Author:

Dr. Sarathkumar A
Additional Professor of Pathology
Medical College, Thiruvananthapuram
Kerala, India. Pin 695011
Mobile: 8547393074

a sample of 5ml of blood collected from neck veins for analysis of level of cTn I. All organs including heart were examined in detail for gross pathological changes. Bits of tissues from heart were subjected to hisopathological examination using haematoxylin and eosin staining. cTnI was analysed by High Sensitivity assay at Advanced Research Laboratory (ACR Lab), Government Medical College Thiruvananthapuram. All data were entered in proforma and MS Excel Spread sheet.

Statistical analysis was done using soft ware, Statistical Package for Social Sciences (SPSS) Version 16.0. The descriptive data was represented; qualitative variables as frequencies and percentage and continuous variables as mean and standard deviation (sd). Categorical variables were made into binary variables and comparison was done using 't' test. Correlation between variables was done by Pearson correlation.

OBSERVATIONS

Results are as follows

Table 1: showing characteristics of the study population (N = 50)

Variable	Mean	sd	Min.	Max.	25th percentile	Median	75th percentile
Age	52.2	12.8	23.0	83.0	44.5	53.5	61.0
Body Mass Index (BMI)	24.0	3.6	16.4	36.3	21.5	24.5	26.1
PM interval	14.8	5.6	4.0	23.0	10.0	16.5	18.5
Trop I	3.4	7.8	0.8	56.6	1.5	2.1	3.2

Table 2: showing Microscopic appearance of heart (N = 50)

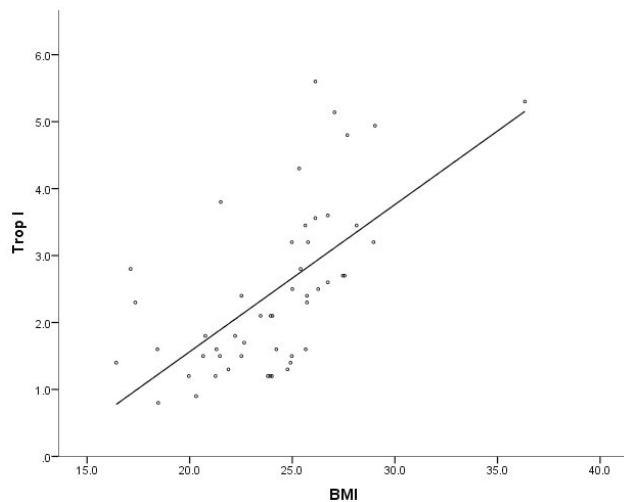
Characteristics	Frequency	Percentage
Wavyness of fibres	27	54
hyper eosinophilia	43	86
haemorrhage	44	88
oedema	42	84
Necrosis	19	38
Vascular proliferation	12	24
Inflammatory cell infiltration	22	44
Fibrosis	32	64

Table 3: Showing correlation of Trop I level with independent variables (N = 50)

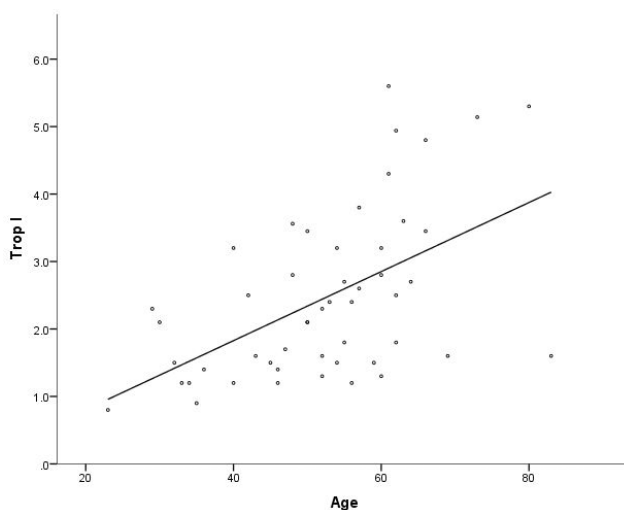
Variable		N	Troponin I		t	p
			mean	sd		
Age	<50	18	1.78	0.79	-.126	0.003
	≥50	32	2.83	1.29		
BMI	Normal	30	1.75	0.67	6.845	<0.001
	Abnormal	20	3.51	1.14		
Gender	Male	30	2.74	1.23	2.064	0.044
	Female	20	2.02	1.14		
Previous h/o CAD	No	22	1.95	0.70	2.679	0.010
	Yes	28	2.84	1.43		

Conted...

Family history	No	39	2.24	1.01	2.451	0.018
	Yes	11	3.22	1.67		
Smoking	No	25	2.54	1.34	0.504	0.617
	Yes	25	2.36	1.15		
Alcoholism	No	17	2.66	1.39	0.852	0.398
	Yes	33	2.35	1.16		
Diabetes Mellitus	No	29	2.05	1.10	2.924	0.005
	Yes	21	3.01	1.21		
Hypertension	No	25	1.98	0.87	2.899	0.006
	Yes	25	2.93	1.38		



Pearson correlation- $r = 0.633$ $p < 0.001$
Figure 1: Showing the relationship of Troponin I with BMI



Pearson correlation- $r = 0.53$, $p = 0.001$
Figure 2: Showing the relationship of Troponin I with Age

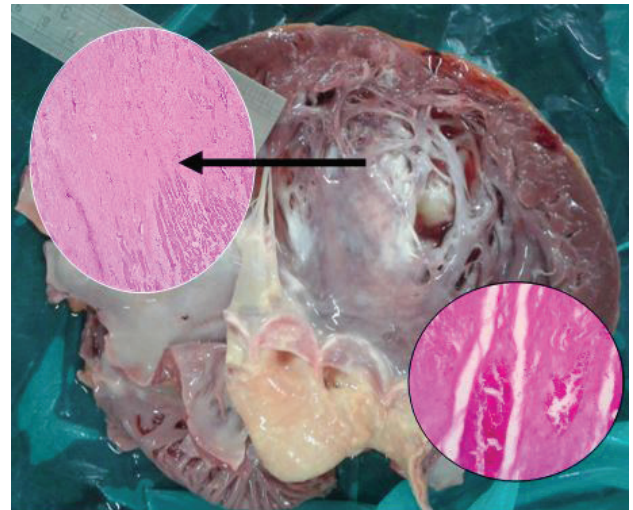


Figure 3: Showing gross appearance of fibrosis and its microscopic appearance (insight upper left H&E100 x and haemorrhage (insight lower right H&E 400x))

DISCUSSION

In the present study the mean age at death of SCD was 52.2 years (sd- 12.8) which is in agreement with previous study showing mean age 47 years (sd - 13)⁶. There is male predominance similar to many other studies^{6,7}. The average postmortem interval was 14.8 hours (sd - 5.6); so that decomposition changes has not started and so no changes in level of troponin could have occurred due to decomposition. The average Body Mass Index (BMI) was 24.0 (sd- 3.6). It indicates that majority of persons died of SCD is having BMI within normal limits.

Microscopic findings: Common microscopic findings in heart in SCD were similar to observation made by Fishbein and slightly higher from observations of Martinez. The findings were haemorrhage (88%), hyper

eosinophilia (86%), oedema (84%) and waviness of fibres (54%). In the study by Fishbein et al³ the findings were haemorrhage (71%), hyper eosinophilia (10%), oedema (10%) and waviness of fibres (94%) and Martinez et al⁸ observed haemorrhage (18%) and oedema (78%). The most common observation in Fishbein et al³ study was vascular proliferation (100%) whereas in our study that observation was 24%. Fibrosis was observed as indicator of old Myocardial Infarction and observation varies from 40% to 80% in different studies^{9,10}. In the present study it was 32 (64%)

Level of Troponin I: The mean level of Trop I was found to be 3.4 ng/dl (sd – 7.8) in the present study. This value is diagnostic of Myocardial Infarction. This finding is in well agreement with various other postmortem studies. Because cardiac Troponin I is not normally found in blood, any detectable amount is considered as indicative of MI. In the meta analysis by Sethi A et al¹¹, the researchers found out a pooled cut off value of High sensitivity Trop I as 0.867 (95% CI: 0.845 – 0.887, $\chi^2 = 43.46$, $p < 0.001$). In a study Patel PR et al¹² concluded that cardiac Trop I level > 0.04 ng/ml was considered as positive test and 93.75% cases of SCD gave positive test and none of cases of Noncardiac death gave positive test. Whereas Martinez et al⁸ in his study observed serum mean value of Trop I 11.8 ng/ml (sd – 23.6). Many authors also suggested Cardiac Trop I assay in postmortem blood as a diagnostic tool of SCD^{5,13,14}. Sharma et al¹⁴ observed in his study, trop I value indicative of myocardial damage ranges from 0.1 to 2 μ g/ml. In another study by Bossard et al¹⁵ observed a median value of 0.68 (interquartile range 0.43 to 1.18) ng/ml. A similar observation was made in the present study with a median value of 2.1 (interquartile range 1.5 to 3.2) ng/ml

Determinants of Postmortem blood level of Trop I: Univariate analysis of various independent variables upon the level of Trop I could identify certain determinants of the level of Trop I in postmortem blood sample. Among general factors Age (> 50 years), Male sex, BMI (> 25), Previous history of CAD, Family history, Diabetes Mellitus and hypertension are found to be the determinants and causes elevated levels of trop I in post mortem blood sample. Various studies had observed male gender, age as determinants¹⁵⁻¹⁷. BMI and age showed positive correlation with the level of Trop I with high significance ($p < 0.001$) as shown in charts.

CONCLUSION

Cardiac Troponin I assay can be used as a valuable supportive measure for postmortem diagnosis of SCD. Common morphological findings observed in heart were haemorrhage, hypereosinophilia and oedema. The mean tropinin I value in postmortem blood sample was found to be 3.4 (sd- 7.8) ng/dl. Age (> 50 years), male sex, BMI (> 25), previous history of CAD, family history, diabetes mellitus and hypertension were the determinants of level of Troponin I in the postmortem blood. The smaller sample size and the difficulty to get previous history and personal habits are the limits of this study.

Conflict of Interest: None to declare

Source of Funding: Study is part of a project funded by State Board of Medical Research (SBMR) Government Medical College, Thiruvananthapuram.

Ethical Clearance: The study started only after receipt of Institutional Ethics Committee, Government Medical College, Thiruvananthapuram.

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Effect of Group Education (Simulation Model) on Information Disclosure and HIV/AIDS Transmission Prevention for HIV/AIDS Risk Groups

Ngesti W Utami¹

¹Department of Nursing, Health Polytechnic of Malang, Indonesia

ABSTRACT

WHO calls the case of HIV/AIDS as an iceberg phenomenon, especially in countries that have not yet carried out HIV testing evenly, including Indonesia. The Ministry of Health of the Republic of Indonesia reports that the rate of increase in new cases of HIV/AIDS is accelerating, especially in the last 3 years. This study aims to analyze the effect of group education (simulation model) on information disclosure and efforts to prevent HIV/AIDS transmission for HIV/AIDS risk groups in Malang, Indonesia, using pre-test and post-test group design. The population of this study was all people at risk of HIV/AIDS, who had a special group and had names in the community: *IGAMA* (Malang gay bond), *IWAMA* (Malang Transgender Association), *Penasun* (syringe users), *Sadar Hati* (narcotics users), *Paramita* (commercial sex vendor) in Malang City, with 140 people. The sample of this study was the risk group with HIV/AIDS in the working area of Arjuno Health Center and Dinoyo Health Center, Malang, with a sample size of 30 from *IGAMA*, *Penasun*, and *Sadar Hati*. The results showed that: 1) information disclosure before and after group education was > 90% quite disclosure; 2) prevention of transmission before intervention was 56% good, and after intervention increased to 83%. The results of the paired sample t-test showed that: 1) there was difference in information disclosure between before and after the intervention (p-value = 0.001); 2) there was difference in HIV/AIDS transmission prevention between before and after administration of intervention (p-value = 0.002).

Keywords: *HIV/AIDS, Group education, Information disclosure, Prevention of transmission*

INTRODUCTION

HIV/AIDS is a deadly disease that until now there is no vaccine and cure. WHO calls HIV/AIDS an iceberg phenomenon, especially in countries that have not even carried out HIV testing, including Indonesia.⁽¹⁾ Many programs have been implemented by the Indonesian government to tackle HIV/AIDS, but their reach is still limited. Ministry of Health of Republic of Indonesia reports the increasing rate of new cases of HIV/AIDS, especially in the last 3 years. Data from January 1987 to June 2014 showed that 142,950 Indonesians had contracted HIV and 55,623 people had been diagnosed

with AIDS. The known risk factors are heterosexual (34187), homo-bisexual (1298), *Penasun* (8451), blood transfusion (129), perinatal transmission (1499) and unknown (9532). Until June 2014, the number of people with HIV in East Java was 18,210 people, while AIDS was 8,976 people.⁽²⁾ In East Java Province, Malang City was ranked second after Surabaya, with the number of cases of "People Living with HIV/AIDS" in March 2014 was 2,929 people.^{(3),(4)} Gay people in Malang also contribute, also *IGAMA*.⁽⁴⁾

Gay and transvestites who are known as homosexuals who live as a special group in the city of Malang, tend to have sexual intercourse by ano-genital or uro-genital, so it does not rule out the possibility of body fluids (sperm/blood) coming out of people with HIV/AIDS or the existence of injuries from the process of sexual activity. This situation increases the chances of transmission of the HIV virus among fellow gays. This should not be allowed, and needs to be watched out, especially when they engage in sexual activities without using safety devices.

Corresponding Author:

Ngesti W Utami
Department of Nursing,
Health Polytechnic of Malang, Indonesia
Ijen Street 77C, Malang, Indonesia
Email: ngesti_wahyuning@yahoo.com

So far, health workers in Malang City have made efforts to prevent transmission of HIV/AIDS through various campaign or counseling activities in schools, Islamic boarding school, high-risk groups such as *IWAMA*, *IGAMA*, along with the “*Paramita*” Community Social Institutions, “*Sadar Hati*” and etc. The results of interviews with Malang Health Service officials show that general awareness to prevent transmission of HIV/AIDS through gays in Malang City is still general.

Other efforts based on personal and group approaches with certain techniques have not been carried out. During this time, it was known that certain learning methods with the right approach succeeded in changing human behavior, especially healthy behavior. Intervention towards behavior is often carried out in the framework of holistic and comprehensive management. *IGAMA/IWAMA* is a special group in the city of Malang that has long been sexually deviant. Deviant sexual behavior is an indicator of a real risk factor for the spread of HIV/AIDS.

Some data shows that the health team has difficulty diagnosing HIV/AIDS because of the difficulty of getting information due to privacy factors. The closure of information is the impact of unpreparedness in facing social isolation for people with HIV/AIDS. Some *IWAMA* and *IGAMA* members feel ashamed as members of the community with abnormal life styles that are not in accordance with the norms and values that apply in society, so they choose to isolate themselves or gather together in groups.

Until now, health education is still considered an effective approach to provide awareness and appropriate behavioral changes to health. There are many approaches to health education, one of which is group education in the form of discussion, brainstorming and simulation, which is expected to help reduce the prevalence of HIV/AIDS through information disclosure, using a simulation model that contains moral messages about the dangers of HIV/AIDS. This simulation model is made interesting so that they can be motivated and open themselves to avoid the dangers of transmission of HIV/AIDS.

The discussion method is chosen as an interesting way, where participants are faced with a problem in the form of questions or problematic statements to be discussed and solved together. In the discussion, the facilitator will facilitate all group members and provide appropriate answers to many possible alternative answers.⁽⁵⁾

This research is expected to produce learning models (prototypes) with a simulation model of moral messages and the dangers of HIV/AIDS, so that it can be useful to encourage the realization of information disclosure and prevention efforts for the community that can ultimately contribute to achieving a high degree of public health.

This study aims to analyze the effect of group education (simulation model) on information disclosure and efforts to prevent HIV/AIDS transmission for HIV/AIDS risk groups in Malang City.

MATERIALS AND METHOD

The method applied in this study is summarized in table 1.

Table 1: Research methods

No	Elements	Implementations
1.	Type of research	Quasi experiment
2.	Design	Pre-test and post-test group design
3.	Population	All people at risk of HIV/AIDS, who had a special group and had names in the community: <i>IGAMA</i> (Malang gay bond), <i>IWAMA</i> (Malang Transgender Association), <i>Penasun</i> (syringe users), <i>Sadar Hati</i> (narcotics users), <i>Paramita</i> (commercial sex vendor) in Malang City, with 1400 people.
4.	Sample	The risk group with HIV/AIDS in the working area of Arjuno Health Center and Dinoyo Health Center, Malang, with a sample size of 30 from <i>IGAMA</i> , <i>Penasun</i> , and <i>Sadar Hati</i> .
5.	Intervention	Group education (simulation method) with smart card game play
6.	Data collection	Information disclosure: filling out questionnaires and interviews Efforts to prevent HIV/AIDS transmission: filling out questionnaires and interviews
7.	Data analysis	Paired sample T-test

FINDINGS

Table 2: Distribution of information disclosure before intervention

No.	Category	Frequency	Percentage
1.	Tell the whole	2	6.67
2.	Tell some	27	90.00
3.	Tell a little	1	3.33
4.	Don't tell	-	-
	Total	30	100

Table 2 shows that before the intervention was given, most respondents only told some of what they knew.

Table 3: Distribution of information disclosure after intervention

No.	Category	Frequency	Percentage
1.	Told the whole	1	3.33
2.	Told some	28	93.34
3.	Told a little	1	3.33
4.	Didn't tell	-	-
	Total	30	100

Table 3 shows that after the intervention was given, most respondents only told some of what they knew.

Table 4: Distribution of HIV/AIDS transmission prevention before intervention

No.	Category	Frequency	Percentage
1.	Made overall efforts	22	73.33
2.	Made partial efforts	8	26.67
3.	Made a little effort	-	-
4.	Didn't Make effort	-	-
	Total	30	100

Table 4 shows that before the intervention was given, most respondents made overall efforts.

Table 5: Distribution of HIV/AIDS transmission prevention after intervention

No.	Category	Frequency	Percentage
1.	Made overall efforts	25	83.33
2.	Made partial efforts	5	16.67
3.	Made a little effort	-	-
4.	Didn't Make effort	-	-
	Total	30	100

Table 5 shows that after the intervention was given, most respondents made overall efforts.

Table 6: Effect of group education on information disclosure and HIV/AIDS transmission prevention (the results of paired sample t-test)

Variabel	Correlation coefficient	p-value	Note
Information disclosure	0.585	0.001	H0 was rejected
HIV/AIDS transmission prevention	0.539	0.002	H0 was rejected

Table 6 shows that there was a difference in information disclosure between before and after the intervention ($p\text{-value} = 0.001$). Likewise, there was difference in HIV/AIDS transmission prevention between before and after the intervention ($p\text{-value} = 0.002$).

DISCUSSION

Most of the respondents actively responded and explained about the learning media cards they held. The results of the paired sample t-test showed that there were differences in information disclosure and HIV/AIDS transmission prevention significantly between before and after group education was implemented.

In general, respondents have often been exposed to various information about HIV/AIDS through the activities they have been following regularly every month with the guidance of nurses from the local community health center. With these activities, respondents became increasingly rich in information and knowledge about these dangerous diseases. Thus, there is a possibility that there is already a similarity of information and knowledge when group education is implemented. The group education method implemented is game. This method is expected to stimulate the activity of the respondents, while providing an opportunity for respondents to express their opinions according to their knowledge and experience about HIV/AIDS. By referring to the game card he holds, respondents can explore the knowledge, attitudes and behaviors that have been occurring in themselves. During this time,

respondents did not realize that their behavior was dangerous and threatening the lives of others around them. This is known from the results of questionnaire filling which shows that most (90%) they are quite open and willing to convey information as a whole.

The results of filling out the instruments both before and after group learning are the data delivered by the respondents according to their life experience. This is important information about the knowledge, attitudes and behavior of a particular community or group as a carrier of the risk of HIV/AIDS transmission.

Most of the respondents know a lot about HIV/AIDS material through the routine activities they follow every month. Unconsciously the respondents had openly and without objections conveyed what had happened in their lives, which had been considered taboo and privacy through questionnaires provided. Based on the results of filling out the questionnaire, it is known that they have been able and willing to convey information openly before and after the implementation of group education.

Referring to the respondent's ability to implement healthy living behaviors, it appears that the current condition is far from the target of reducing the number of HIV/AIDS cases in Malang. The results of filling out the questionnaire showed that most of them did not care about the lifestyle they had chosen and they lived, and almost all of them did not want to quit their deviant sexual behavior.

Based on Cognitive Consistency Theory, in the stage of forming healthy behavior, human behavior is more likely to be consistent with their knowledge, attitudes and behavior. Giving information and experience will produce knowledge & attitudes that are consistent with the desired behavior. Until now, health education is still the best choice in achieving healthy and HIV/AIDS free behavior. The method of group education with game play in the form of cards is intended to give its own meaning that is to attract the attention of the respondent, is not boring, and can explore the abilities and knowledge that have been previously possessed. The data shows that

with the implementation of the learning method of using this smart card game, most of the respondents said that the method of play like this had never been experienced by them, more interesting to follow, and can be done as a medium of play and discussion with fellow friends. Learning models like this can be done at any time and can be followed by anyone.

CONCLUSION

Based on the results of the study, it can be concluded that group education (simulation model) using card games has proven to be effective in improving information disclosure and efforts to prevent HIV/AIDS transmission for risk groups in Malang, Indonesia.

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Health Insurance for Indonesian Migrant Workers

Wafda Vivid Izziyana¹, Harun², Absori², Kelik Wardiono², Heru Santoso Wahito Nugroho³, Arief Budiono¹

¹Faculty of Law, Muhammadiyah University of Ponorogo; ²Faculty of Law, Muhammadiyah University of Surakarta; ³Health Polytechnic of Surabaya

ABSTRACT

Health insurance is one of the aspects and part of the social insurance which must be given by the state to its citizens, including migrant workers. There are millions of Indonesian migrant workers who work overseas, so health insurance is an urgent need to be fulfilled, as it is a constitutional right of the citizens. The government gives a legal protection for migrant workers according to the legislation, the destination country's law, as well as the international laws and customs. One form of protection given by the government is the right to receive health insurance. Each country has its own characteristics and procedures in giving health insurance protection to its migrant workers, which may result to problems and obstacles in its implementation, which is caused by differences in its law and its government's administration. Indonesian social insurance protection for migrant workers is managed by BPJS (*Badan Penyelenggara Jaminan Sosial*/Social Security Administrator) as written in the Mandate of 1945 Constitution (*Amanat UUD 1945*), yet in reality, health insurance protection from the state of Indonesia for Indonesian migrant workers abroad is not yet operated because the facility mechanism overseas cannot work together with BPJS Kesehatan (Health).

Keywords: Health insurance, Migrant workers, Indonesia

INTRODUCTION

Millions of Indonesian labor were forced to work as migrant workers overseas, both legally as well as illegally. This is caused by the fact that the Indonesian government cannot fulfill their need for work^[1]. Undeniably, apart from the absence of working opportunities, the comparison of wages for migrant workers is much larger than the wages they obtain for the same work in Indonesia. Averagely, Indonesian migrant workers work in sectors which may be categorized as dirty, difficult, and dangerous in sectors such as agriculture, husbandry, industry or as blue-collar workers (becoming house-cleaning assistants) which are unwanted by the local citizens of that country. A research from the Mahidol Migration Centre, Institute for Population and Social Research, Mahidol University, Thailand states that the working condition and the health

of Indonesian migrant workers in the blue-collar sector are on average apprehensive, low, and inhumane^[2].

The majority of Indonesians think that working overseas is a choice which may change the degree of lifestyle and the degree of their financial condition. Migrant workers exist in all economic sectors. They play an important role in the positive economic growth of the home state as well as the host state. But the increase of the citizens' migration is followed by the different cases of violation towards their rights^[3].

Based on the BNP2TKI (*Badan Nasional Penempatan dan Perlindungan Tenaga Kerja Indonesia*/The National Agency for Placement and Protection of Indonesian Workers) on July 2018, there are 159.702 Indonesian migrant workers overseas. Indonesia is one of the largest sending countries of migrant workers in Southeast Asia^[4]. Because of that, social insurance for Indonesian migrant workers is urgently needed as a form of the citizens' constitutional rights protection. The government's protection towards the migrant workers overseas is regulated in the Constitution, No.18, 2017 (*Undang-Undang No.18, 2017*) on the protection of Indonesian migrant workers. This law regulates the social insurance, in which one of its elements is the health insurance during pre-hosting, hosting, and post-hosting.

Corresponding Author:

Heru Santoso Wahito Nugroho
Pucang Jajar Tengah Street 56
Surabaya, Indonesia
Email: heruswn@gmail.com

Indonesian migrant workers are often said to be foreign currency heroes, as they contribute foreign currency through remittance^[5]. The various problems connected to the Indonesian migrant workers forces the government to work harder in protecting them^[6]. According to many, the Indonesian government are still not proactive nor comprehensive enough in protecting the migrant workers, physically, financially, and especially in the form of social insurance and health insurance towards the Indonesian migrant workers overseas.

When analyzing further on the development of the different policy products of the government, we can conclude that so far, those policies don't seem to be supporting the Indonesian migrant workers. On the contrary, it seems to bring more harm and it cannot yet insure the health of the Indonesian migrant workers overseas^[7]. One of the rights of the Indonesian migrant workers overseas is the right of national social insurance as well as the right for health insurance.

The state establishes the social insurance for its citizens to support their lives^[8]. The right for health insurance and social insurance according to Anna Boucher and Terry Carney are as follows, "The definition of 'social security' is malleable and varies according to context. In this chapter, we focus primarily on social security cash transfers, public health provision and the restrictions placed upon newly arrived residents in accessing these provisions (Health care and child care benefits, these can legitimately also be viewed as forms of social security^[9]).

The Mandate of the 1945 Constitution article 28 H paragraph (3) [*Amanat UUD 1945 pasal 28 H ayat (3)*] states that each citizen has the right for social insurance which enables self-development holistically as a dignified human being. The protection for social insurance for Indonesian migrant workers is now fully managed by BPJS, every labor worker must have social insurance, if an Indonesian migrant worker does not have social insurance, he/she is not permitted to work overseas.

Each person has the right to access health services^[10]. Global Convention International Labour Organisation No. 102/1952 also states that the establishment of social insurance is the right of the citizens who are migrant workers in which it includes health necessities. Added to that, the issuing of the International Covenant on Economic, Social, and Cultural Rights and the

International Covenant on Civil and Political Rights with the approval of the UN General Assembly^[11]. The establishment for social insurance for the Indonesian migrant workers is the responsibility of the state of Indonesia and the host country of the migrant workers.

One aim of the Republic of Indonesia stated in the Preamble of the 1945 Constitution is the effort to increase the citizens' prosperity^[12]. Based on the Mandate of the 1945 Constitution article 34 paragraph (2) on the state's obligation to develop a social insurance system for all Indonesian citizens and also with the issuing of the Law No.40/2004 on the national social insurance system, social insurance programs, including the public health insurance which is integrated into a system and will be established by a body which was formed by the government (BPJS).

The Law No. 24 year 2011 also declares that the National Social Insurance (Jaminan Sosial Nasional) is established by BPJS which consists of BPJS Kesehatan (Health) and BPJS Ketenagakerjaan (Employment) which was implemented since January 1st, 2014. Parallel to that, in the Constitution article 2 No.24, 2011 on BPJS: BPJS in its service fulfills the principles of humanity, benefit, and justice^[13]. Also, parallel to the Law on the National Social Insurance (Jaminan Sosial Nasional) and the Constitution on BPJS, and there is also the Law No.18, 2017 on the Protection for Indonesian migrant workers.

The right to receive health service and insurance is also the right of the migrant workers as they are also Indonesian citizens. Indonesia does have a limitation in the sovereignty of the country's territory in the place where Indonesian migrant workers are hosted and because of that, an accurate form of negotiation is needed. According to Cruz, a number of migrant-sending and receiving countries have negotiated bilateral social security agreements to enhance the cooperation and to ensure the adequate portability of contributions. Portability in this context is understood as the migrant worker's ability to "preserve, maintain and transfer acquired social security rights to determine the migrant worker's public health care in both countries to guarantee continued health coverage for migrants"^[14].

National health insurance for Indonesian migrant workers must be done to keep the dignity of migrant workers. This opinion is articulated by Majda Al Muhtad, "Objective is simply to organize the system in a way that

treats each member of society with dignity and respect”^[15]. The status of the national government’s budget can also influence both the structure of social welfare institutions and the economic effect of social welfare policies^[16]. Based on the problem above, the research problem is, how is the health insurance for Indonesian migrant workers?

METHODS

This research uses a descriptive method, where we describe the health insurance for Indonesian migrant workers. This research is also a prescriptive study which has the aim to solve the problem of the theory examination, this research is the connector between the essence and the reality of health insurance for migrant workers.

FINDINGS

The government gives a legal protection for migrant workers according to the constitution, the law of the host country, also the international laws and customs. One form of protection given by the government is the right to receive health insurance as well as prosperity, which are part of the human rights, therefore they are the rights of the migrant workers and are agreed by all countries of the world, including Indonesia⁽¹⁾. This agreement is written in the United Nations Declaration year 1948 on the Human Rights. Article 25 paragraph 1 states that every human being and every family has the right to live a sufficient life in terms of health, prosperity, food, shelter, healthcare, social service necessary. They are also responsible for insurances when unemployed, sick, disabled, widowed, aged, or other conditions which forces them to not be able to obtain sufficient income, which are outside their power⁽¹⁸⁾. The protection of social insurance for Indonesian migrant workers is given by BPJS as written in the Mandate of the 1945 Constitution, article 28 H paragraph⁽³⁾, where all citizens have the right for social insurance which makes self-development possible holistically as a dignified human being. Indonesia develops a social insurance system for all citizens and also empowers poor and weak citizens according to the human dignity. As Indonesian citizens whose constitutional rights include social insurance, it should be that Indonesian migrant workers have the right for social insurance as obligated in the Constitution, No.40, 2004.

The Labor Ministerial Regulations (Permenaker/ Peraturan Menteri Tenaga Kerja) No 7 year 2017

only obligates two programs, which are work-related insurance and death insurance, old-day insurance for migrant workers are voluntary, whereas pension and health insurances are not received by the migrant workers. Even though migrant workers are obligated to completely pay for health and work insurances, they do not receive service nor such insurances while working overseas. Employers at the host state cannot be constrained by Indonesian regulations. Also, the health insurance for migrant workers cannot yet be implemented because the health facility mechanism overseas cannot work together with the Indonesian BPJS Kesehatan (Health). Yet there is not yet a regulation which strongly regulates the health insurance for migrant workers overseas.

The state’s protection towards migrant workers are regulated in the Constitution No. 18 year 2017, which includes social insurance with health insurance as one of its elements, in the pre-hosting, during the hosting, and post-hosting. Social insurance for Indonesian migrant workers overseas is regulated in the Law No.18, 2017: the state of Indonesia must fix the whole protection system for Indonesian migrant workers and their families which reflects the values of humanity and dignity as a noble state from before working overseas, during the work overseas, and after working overseas. The general explanation of the constitution also gives social insurance protection for Indonesian migrant workers.

The social insurance while working overseas is the responsibility of the migrant worker and paid by him/ herself without help from the state. This scheme is done by insurance companies which are members of the insurance consortium with a protection program which includes pre-hosting, during the hosting, and post-hosting protection. The role of such protection is now diverted and done by BPJS according to the Law No. 40 year 2004 on the national social insurance system and the Law No.24 year 2011 on BPJS. Yet, after such insurances are diverted to BPJS, the workers lost their health insurances which they usually had while still joining the insurances from the insurance consortium, so the health insurance from the state seems to be half-hearted.

The Labor Ministerial Regulations (Permenaker) No.7, 2017 declares that Indonesian migrant labor must participate in four insurance programs, which are health insurance, work-related accident insurance, death insurance, and old-day insurance. There is an inconsistency in the Labor Ministerial Regulations

No.7, 2017, article 16: migrant workers who experience a work-related accident during the stay do not have the right to receive such health service. Health insurance is not the right of migrant workers while working overseas. This means that the migrant workers must pay for a different health insurance without receiving the national health insurance service.

Problems of health rights and the right to receive health care which are experienced by the Indonesian migrant workers are a reflection of the inexistence of access for health insurance for migrant workers, as they are limited by the state's territory. Based on the Constitution, the state of Indonesia should give a protection in the form of health insurance for migrant workers. Apart from the constitution, international law states that the state must fulfill that right as written in article 22 of the Universal Declaration of Human Right (UDHR): *"every one as a member of society; has the right to social security and is entitled to realization, thought national effort and international co operation and resources of each state."*

The host country's legislation usually only limits the insurance only to its citizens. Even if they offer insurance for migrant workers, there will be administration conditions with a particular amount of premium to be paid, also with the condition of having stayed in the host country for a particular amount of time. Indonesia should have the initiative of giving ease of document issuance and also pay for the health insurance premium for Indonesian migrant workers, as it is the obligation of the state.

CONCLUSION

Health insurance protection for Indonesian migrant workers cannot yet be implemented as the health facility mechanism overseas cannot work together with BPJS Health. The insecure protection for migrant workers during the stay proves that the state cannot yet give a maximum health insurance for its citizens.

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An Artificial Neural Networks (ANN) Based Lung Nodule Identification and Verification Module

S. Sandhiya¹, Y. Kalpana²

¹Research Scholar; ²Associative Professor, Department of Computer Science, VISTAS, Pallavarm, Chennai, India

ABSTRACT

The objective of the work is to propose and identify lung nodule system using Artificial Neural Networks (ANN) which is as of now a hot research territory in medical field and it is trusted that it will get broad application to biomedical frameworks in the following couple of years. Neural systems are perfect in perceiving sicknesses utilizing checks since there is no undeniable reason to give a particular calculation on the most proficient method to distinguish the malady. This paper depicts a calculation to isolate the lung tissue from a Chest CT to lessen the measure of information that should be broke down. We will probably have a completely programmed calculation for sectioning the lung tissue, and to isolate the two lung sides too. The picture is threshold to isolate low-thickness tissue (lungs) from fat. Cleaning is performed to expel air, clamor and aviation routes. At last, an arrangement of morphological tasks is utilized to smooth the unpredictable limit. The database utilized for assessment is taken from a radiology-instructing document. The present assessment demonstrates that the connected division calculation takes a shot at an expansive number of various cases. The textural highlights were removed from the portioned lungs and it was given as. The neural system is utilized to distinguish the different lung maladies.

Keywords: Biomedical frameworks, Radiology scan, lung swelling, lung maladies

INTRODUCTION

Lung malignancy is the main source of passing in the two people in the US. Measurements from the American Cancer Society assessed that in 2017, around 222,500 new lung malignancy cases happened in the U.S with assessed 155,800 passing. It represents 1 out of 4 tumor passing ^[1]. The 5-year relative survival rate for lung growth is 15% for men and 21% for ladies. In any case, the survival rate is 55% for early recognized lung malignancy that is at a confined stage which just takes just 16% everything being equal. The visualization of lung tumor is generally poor since patients tend not to feel debilitated until the point that it is at a propelled organize. Despite the fact that advances had been made in careful, radio helpful, and chemotherapeutic methodologies have been made, the long haul survival rate remains low^[2].

The future advancement of Neural Network are utilizing the hereditary calculation which holds the level of achievement in biological field. It depicts about Neuro-Genetic approach of lung picture division. Division is a critical instrument in restorative picture handling and it has been generally utilized as a part of numerous restorative indicative applications, for example, estimating tumor volume and its reaction to treatment, identification of small scale calcification on mammograms, mechanized grouping of blood cells, examining mental health, picture enlistment, and so on^[3].

Concentrate medicinal pictures depends primarily on the visual translation of the radiologists. The American Cancer Society report ^[4], it recommended that screening with low-measurements winding processed tomography (LDCT) has been appeared to decrease lung disease mortality by around 20% contrasted with standard chest x-beam among grown-ups with no less than 30 pack-year smoking history who were ebb and flow smokers or had stopped inside 15 years. Lung knobs are characterized as adjusted opacities, with reasonably identifiable edges and distances across littler than 3cm in ^[5]. Granulomatous infection and lung tumor are

Corresponding Author:

S. Sandhiya

Asst. Professor, Bhaktavatsalam College Chennai

Email: vsmyfuture@gmail.com

two normal reasons for lung knobs [6]. The complexity between the knob and lung of CT is higher than that of chest radiography. CT likewise disposes of overlying structures, for example, the chest divider, mediastinum, and vessels [7].

Nonetheless, confinements in knob ID utilizing CT must be taken note. In [6], the neglected knobs were little, swoon in attenuation, adjacent to vessels, or contiguous discoveries of earlier tuberculosis. There are different ways to describe lung knobs: by their morphology, densitometry, size and development [8]. In the recent development the improvement of CT that empowers higher spatial and differentiation determination, more knob portrayal highlights are thought about CT filters. A standard neural network (NN) consists of many simple, connected processors called neurons, each producing a sequence of real-valued activations. Input neurons get activated through sensors perceiving the environment [9]. The basic determination is to overcome the difficult extraction of image through NN are simplified. However, overfitting is a serious problem in such NN. The solution is to arbitrarily plunge units beside with their associations from the neural network during training [10].

Proposed lung analysis method: It is concentrated on lung segmentation which is necessary for the mainframe aided analysis from CT scan images and it is to fundamentally divide the voxels equivalent to the lung hollow in the axial CT scan separates from the contiguous lung anatomy. We have proposed a scheme that first performs an most favorable thresholding which selects the threshold based on the entity and background pixel means. Once the threshold has been preferred and functional, province mounting and connectivity investigation are then used to extract the accurate crater region with accuracy. The classification starts by preprocessing and augmenting the image regions obtained in the segmentation process. An ANN is then trained with back-propagation using the augmented dataset. It is achieved to reduce overlapping detections through an adjacent image classification and rejection rule.

Lung nodule verification with Ann and Hereditary Algorithm:

Neuro-Genetic Segmentation: In outlining the division-demonstrate utilizing Artificial Neural Networks, the model straightforwardness, representativeness and sufficiency are fundamental to the unwavering quality of

the exploration to be done. Effortlessness of the model relies upon the best approach to hybridize two unique procedures in which just the least complex hypothesis that fits the reality of an issue is to be considered. In the present examination Artificial Neural Networks and Genetic calculation with insignificant parameters were engaged with the calculation. In the mean time, representativeness of the show relied upon the nature of the information which must speak to the sort of data that is being explored. Both Artificial Neural Networks and Genetic Algorithm are versatile, powerful and ready to bargain effectively with an extensive variety of issues including profoundly nonlinear models and uproarious information. What's more, they don't require earlier data to display the issue being studied. Therefore, from a pragmatic point of view, Neural Network and Genetic Algorithm appeared to work best in blend. The Neuro-Genetic approach performs programmed and hearty lung division by figuring the ideal edge of the picture.

The proposed technique deals with the subsequent steps.

Preprocessing → Threshold → Conditions elimination → Border discovery → Image segmentation

Lung segmentation involved the above mentioned steps. The subsequent model is to show cast the represented form of Background image filtering Genetic segmentation.

Lung province in CT cross sectional image: Lung dataset of frontal chest x-beams ordered by the Japanese Society of Radiological Technology (JSRT) and Dataset of CT pictures were taken from the lung Image Database Consortium (LIDC) which had been utilized as the info pictures for the trials. The set contained 200 chest x-beams, among which 125 x-beams were strange and 81 x-beams were ordinary. It is intended to state that the lungs in the X-beam had been influenced by some malady that had been talked about in section 1. The LIDC dataset comprised of 200 CT pictures out of which 196 pictures were anomalous and 102 were typical pictures. All x-beam pictures had a size of 1024x1024 pixel and dark scale shading profundity of 12 bit. The pictures were isolated into two sections. One half was utilized for preparing and the other for testing the calculation. Translating a chest radiograph was amazingly a testing work. Radiographs frequently contained substantial differentiation varieties and critical low complexity points of interest as shown in the code below.

MATLAB Code to locate the two lung regions in a CT cross sectional image.

```

load clown
subplot(221)
Z = ind2gray(Z,map);
imshow(Z)
title('Original','FontWeight','bold')
for n = 2:4
IDX = otsu(Z,n);
subplot(2,2,n)
imagesc(IDX), axis image off
View ([ 'n = ' int2str(n)], 'FontWeight','bold')
End

=====
% Recite the lungs gray scale demo image.
Binder =password;
IgnobleFileName = 'lungs_CT.png';
% Get the full filename, with path prepended.
CompleteFile Name = complete file(folder,
baseFileName);

% Patterned if file exists.
if ~exist(complete FileName, 'file')
% File doesn't exist -- didn't find it there. Check the
search path for it.
Complete FileNamearrangedSearchPath =
baseFileName; % No path this time.
if ~exist(complete File Name arranged SearchPath,
'file')

% Immobile didn't find it. Attentive user.
InaccuracyMessage = sprintf('Error: %s does not
exist in the search path folders.', complete FileName);
Uiwait(warndlg(errorMessage));
Return;
End
End
GrayImage = imread (complete FileName);

% Grow the dimensions of the image.
% numberOfColor Bands should be = 2.
[Rows, columns, numberOfColorBands] =
size(grayImage);
if number Of Color Bands > 2

% it's not really gray scale like we expected - it's
color.

```

% Convert it to gray scale by taking only the green channel.

```

GrayImage = grayImage (0.5, 1.5, 2); % Take green
channel.

```

End

% Exhibit the imaginative gray scale image.

```

subplot(2, 3, 1);
imshow(grayImage, []);
axis on;
view ('Original Grayscale Image', 'image Size',
fontSize);
drawnow;

```

% widen figure to complete screen.

```

set(gcf, 'Units', 'Normalized', 'exterior Position',
[0 0 1 1]);
set(gcf,'units', 'normal', 'interior position', 'ON')
% Stretch a name to the heading bar.
set(gcf, 'Name', 'Demo by ImageAnalyst', 'Number
view', 'Off')

```

Image preprocessing in infected lung area: Keeping in mind the end goal to section the lung imaged effectively the researcher included the preprocessing advance for the proposed technique to recognize whether the info picture was defiled with some kind of clamor. In the event of tainted picture, the procedures of division may be influenced. Picture upgrade techniques improved pictures look. Picture improvement was an answer for a PC imaging issue. Different picture upgrade methods were underscored to hone picture highlights for show and analysis. The histogram was gotten for the picture partitioning the interim amongst least and most extreme pixel esteem into similarly divided canisters. The researcher relegated every pixel to the container that encompassed its esteem. Next, number of pixels relating to each receptacle was checked.

The picture histogram was a plot of these recurrence considers a component of the receptacle areas. The states of histograms for a similar picture changed relying upon the span of the intervals. Histograms were the reason for numerical spatial area preparing strategies (Brant et al., 2012). Histogram control was a successful technique for picture enhancement. Histogram evening out was a standout amongst the most critical parts for any picture processing. The essential standard of histogram leveling was that all the picture powers ought to be similarly visit. A picture whose pixels had a tendency to possess the

whole scope of conceivable dark levels and, also, had a tendency to be appropriated consistently would have an appearance of high differentiation and display a vast assortment of dim tones. Crests in the histogram spoke to visit pixel forces, and could frequently be identified with almost homogeneous locales. After histogram evening out, the pinnacles expanded, implying that unpretentious force contrasts in a district turned out to be better settled. Histogram balance did not “level” a histogram. It redistributed power circulations.

This implied any quantitative data in the pixel force was lost. The requesting of pixel esteems were just kept up, not their quantitative relationship. Since histogram adjustment was a point procedure it didn't bring new forces into the picture. The accompanying articulation was utilized to compute the recently doled out esteem R for every brilliance level k in the first image

$$R = \sum_{i=0}^K \frac{P_i}{A} * P_o \max \quad \dots(1)$$

Where P_i was the quantity of pixels with splendor esteems P_o , $I_{\max}$ was the most extreme pixel power esteem, and A was the aggregate number of pixels in the picture.

Figure 2 demonstrates a unique info picture of lung X-ray. The picture was one of the pictures utilized as a part of this examination.

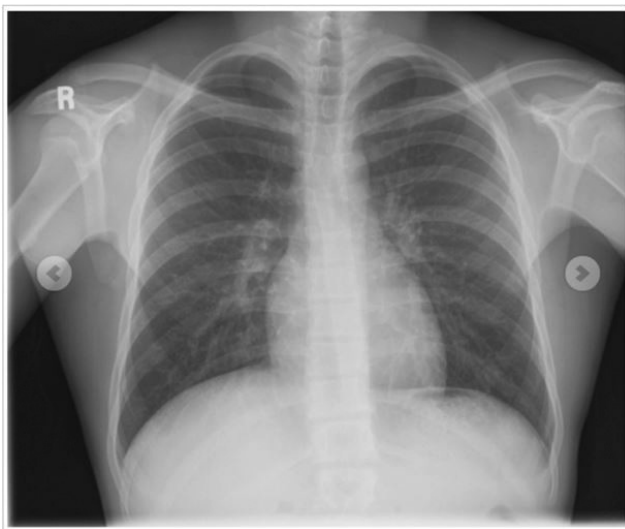


Figure 1: Original Lung X-Ray Image

Lung enlargement classification: A strategy proposed to utilize a multi-scale neural system architecture to recognize genuine knobs from foundation designs. An arrangement of Gabor channels and a Laplacian of

Gaussian channel are utilized to remove highlights from the information areas and to bolster a 3-layer neural system using MATLAB. Most approaches section knob areas to catch highlights from specific districts of the knobs. At that point, they convolve the info locales with an arrangement of Gaussian channels to separate measurements from the inward and band areas of the knob. A two-advance lung image segmentation window order is performed utilizing rough k-closest neighbor calculation.

Image Thresholding and dissection: Image now had enhanced differentiation however there was excessively immaterial foundation data and mess that should have been expelled. It was distinguished that a large portion of the foundation data by pixel esteems were not quite the same as those of the lungs. Picture thresholding was a subclass of picture division as it partitions a picture into portions in view of the estimation of pixels with respect to limit esteem. Ideal thresholding was the initial phase in thresholding the picture. A thoracic CT contained two fundamental gatherings of pixels: high power pixels situated in the body and low force pixels that were in the lung and the encompassing air. Because of the extensive contrast in force between these two gatherings, thresholding lead to a decent detachment. The thresholding was utilized for assurance of the genuine double veils for the lung territory. Twofold veils are created from input dark level CT information utilizing an iterative threshold calculation and it's a superior technique than the traditional threshold calculation, in which the limit was just picked as the least between the two maxima of the dark level histogram. The picture histogram was at first partitioned into two sections utilizing a beginning limit esteem, which could be for instance a large portion of the greatest of the dynamic scope of the present picture, or the traditional edge esteem just described. Afterwards, the example mean of the dim qualities related with the closer view pixels and the example mean of the dark qualities related with the foundation pixels were processed, and edge esteem was resolved as the normal of these two examples implies as shown in figure 4.

Image segmentation is the next essential process for image analysis. Segmentation divides an image into regions that constitute the image. The segmentation of images in 2D has many useful applications in the medical sector: estimation of volume and visualization of objects of interest, detection of abnormalities (such as tumors), tissue quantification and classification, are among the few (Lee cum et al, 2015). The objective of segmentation is to change the representation of an image into something more meaningful and easier to analyze.

Image segmentation is generally used to locate objects and boundaries in images. To be more precise, image segmentation is the process of assigning a label to each pixel in an image such that the pixels with the same label share certain visual characteristics. The result of segmentation is a set of similar segments that collectively make up the entire image. All pixels in a given region are similar with respect to some characteristic or computational property, such as color, intensity or texture.

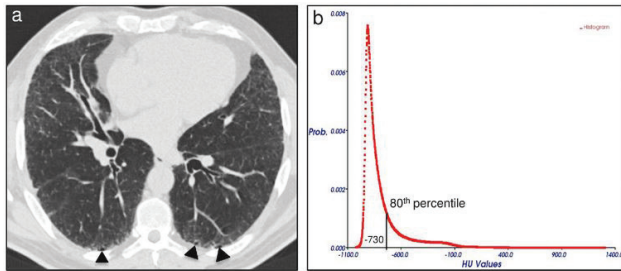


Figure 2: Original Lung image after background removal (a) (left) and percentile graph (b) (right)

Results on lung image background removal and segmentation: Foundation Removal After picture thresholding, foundation evacuation of the picture was finished. By applying the limit to the picture, the entire lung picture could be gotten from the foundation. So there was a need of a foundation evacuation instrument to expel the foundation. Along these lines, the histogram based strategy was utilized for this reason.

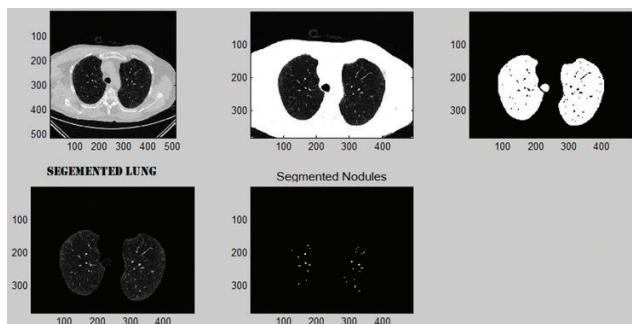
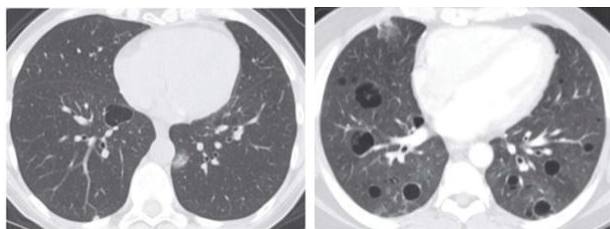


Figure 3: Lung image original (left) after background removal (right) and Segmented lung image results

The system began crossing the picture from the beginning of the primary segment of original lung image and segmented lung image results are navigated the entire limit completing at a similar point where it began as shown in figure 5.

CONCLUSION

It has been presented a system that works with ANN that are trained on point labels with respect to lung swelling identification, which is focused mainly on lung image background verification and it is easier to obtain. While the initial results look promising, there are areas to further improve the system. The current research is processed with lung nodule identification and image retrieval and border discovery in image segmentation; this could be improved with processing, threshold and condition elimination. A lung segmentation approach could also eliminate the air tracts which are a primary cause for false positives, but these cannot be differentiated when observed in normal view. Next, the training set can be invaded even further using image transforms of existing labels, which has been done for ANN. Such a technique will also ensure there is little overlap between the original label and transformed label to avoid image filtering and nodule lung recovery

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Training and Communication Skills of Little Dentist Cadre

Ristya Widi Endah Yani¹, Isa Ma'rufi², Yunita Puspita Sari Pakpahan³

¹Faculty of Dentistry, ²Faculty of Public Health, University of Jember, Indonesia; ³Bina Sehat Hospital of Jember, Indonesia

ABSTRACT

Training for little dentist turns into one of promotion efforts to empower the cadre. Meanwhile, the communication skills is expected to promote the importance of dental and oral health to others. This study aims to analyze the relationship between little dentist's training towards their communication skills. The cross sectional research was done to the participant of little dentist's training at Bina Sehat hospital, involved 82 children selected by purposive sampling. The variables were training and communication skills of little dentist cadre. Data were collected using checklist and questionnaire, then analyzed by Gamma correlation test. The most of repondents (86.59%) got high score dealing with the training. There was 42.68% respondents'score categorized as good, 54.88% as sufficient. The p-value of Gamma correlation was 0.000 (there was relationship between little dentists cadre's training and their communication skills

Keywords: Little dentist cadre's, Training, Health promotion, Communication skills

INTRODUCTION

Around 25.9% of Indonesian people have oral and dental health problem during the last 12 months. Besides, 31.1% of them decide to have treatment with the dentist, while 68.9% having no treatment. In other words, there was only 8.1% ability to get the treatment from the medical personnel, where the percentage of those who live in city is higher than people living in village⁽¹⁾.

The scope of medical check up to the elementary school students at Jember runs into ups and downs in 5 years recently. The lowest scope happened in 2012 (15.79%) while 2013 was 21.5% scope of students' medical check up. In 2016, the total amount of dental treatment towards preschools had target 18.601 children, yet the fact was only 15.705. Besides, it was expected that 111,214 elementary students got dental treatment, but the realization reported that it was 88,001 children. The 49 community health center from 31 Districts in Jember, Patrang Health Center targeted 9477 but the realization

was only 683 children, Sukorejo Health Center had 921 out of 4885 from the first target and the last, Lojejer Health Center realized 805 from the target which was 2777 children⁽²⁾.

The difficulty of achieving the target by the community health center happens because of lack medical professional while the elementary and junior high school students are quite a lot. Thus, to do the health sorting towards the students will need longer time. Besides, the integrating of reporting management is not well yet⁽³⁾. It shows that children health service in Jember has low quality.

The data of dental patient visitors in Bina Sehat hospital of Jember from January to May 2016 showed that children patient was 4% from the total of dental patient visitors with diagnose 54% caries, 38% persitention, and 8% others. Based on the data of 54% caries, it was found that it can cause severe disease namely abscess 38%. Dental fear and anxiety (DFA) refers to a big problem for every people, especially children and teenagers. DFA prevalence of children and teenagers is around 5-20% in all over the world and some cases towards dental phobia. Children will try their best to avoid or postpone the treatment, so their oral cavity will not be taking care of^{(4),(5)}. The evidence research shows that hospital environment rises children's traumatic such as

Corresponding Author:

Ristya Widi Endah Yani
Faculty of Dentistry-University of Jember;
Kalimantan Street, Summersari,
Jember, Indonesia, 68121
Email: ristya_widi@unej.ac.id

hospital physical environment, medical professional; whether coming from how to dress (white dressing) or their attitudes, the medical equipment, and social environment of one patient to another⁽⁶⁾. Survey results of Commission for Child Protection in 2017 reported that children's access to get any information about the dental and oral health was still limited, so it was necessary to hold socialization dealing with dental and oral health through education in school or society environment.

Bina Sehat hospital of Jember has used marketing communication strategy public relations through Little Dentist Cadre's Training. This program had held since 2011. The target program was pre-school children. Those are also called the golden age period. According to FIP-UPI of Science Development Team Research (2007), the domination characteristics of preschool children in line with Sholehudin's idea relating with their study activity are active and energetic, having high sense of curiosity, high learning enthusiasm, and learning from experience. Montessori argues that children within the age of 0-6 has sensitivity to language⁽⁷⁾.

One of training materials given is training becomes little dentist cadre. The participants are trained become little dentist cadres. The method used is role playing, they act out as their own or other characters in certain condition. The participants are asked to act out the role of characters they probably know in advance. Moreover, it seems to be effective method to be applied, or even to complete other methods. For instance, after giving the explanation through oral explanation, the participants do role play to give them more understanding about those have been explained. Applying only role play sometimes are difficult and meaningless⁽⁸⁾. Role play method is able to improve their communication skills through expressing idea or knowledge from dialogue they use during role play. This method is appropriate with their characteristic which tends to show their interests to their friends. As they passed, they grow older and they will show their interests more to their friends. They start to show their skill to collaborate and communicate with their friends. Moreover, they will improve their vocabulary skills to communicate with others.

This study has aimed to know whether or not the relationship between little dentist training towards their communication skills. Having good communication skills will help them to be such an informant for their friend.

METHOD

This study applied quantitative research using analytic observational with cross sectional approach. It was done in mini laboratory of Bina Sehat hospital of Jember which is located in Jaya Negara Street, 81 as the place for training of little dentist cadre. Moreover, it was done in May-August 2017. It started in May 2017, June for validity and instrument reliability test and respondents' study was done in August 2017.

Population involved were all the participants of little dentist in August 2017, consisting of two classes, As-Sholihudin Kindergarten of Mumbulsari that consists 50 participants (it was done in 30th August, 2017) and 52 students of An-Nur Kindergarten of Kaliwates (it was conducted in 31st August, 2017), so the population size was 102. The total was 102; 5% for error rates, so the sample used was: $n = 102/102 (0.05)^2 + 1 = 81.274 = 82$ participants. Purposive sampling was used for taking the samples.

The variables were little dentist training and communication skills of little dentist cadre. Training score of little dentist cadre belongs to the results' cadre gotten during the learning process of dental and oral health through role play. It consists of speaking skills, listening skills, and communication skills related with dental and oral health behavior. This research applied few data collection method techniques, namely interview and observations. During the interview, respondents were accompanied with their parents, so their parents can help them to fill out the form or to read the questions given since the respondents do not have the ability yet in reading and writing. The observation was also done to know the respondents' skill by using observation form. The observation form provided and it was done by the parents. The data was drawn in table and descriptive either analyzed by using Gamma correlation test to know the relationship between little dentist training and the little dentist cadre's communication skills.

RESULTS

Table 1: Training score of little dentist cadre

Training score	Frequency	Percentage
Good	71	86.59
Sufficient	11	13.41
Total	82	100

Table 1 shows that some of the little dentist cadre had the training scores in good categories.

Table 2: Communication skill score of little dentist cadre

Communication skill score	Frequency	Percentage
Good	35	42.68
Sufficient	45	54.88
Less	2	2.44
Total	82	100

Table 2 shows that some of the little dentist cadre had the communication skill score in the sufficient and good category.

Table 3: Distribution of Communication skills score

No.	Communication material	Explaining, role-playing and asking other to do	Explaining and role-playing	Telling simply thing	No telling at all
1.	Communicating their own experience	18%	43%	28%	11%
2.	Maintaining their own health	23%	46%	28%	2%
3.	Looking for and applying health system or health service	11%	27%	45%	17%
4.	Taking care of the environment	35%	26%	28%	11%
	Total	22%	35%	32%	10%

Table 3 shows that respondents had communication skill the most of the stage namely explaining and role-playing, that was 35%, telling simply thing was 32%, 22% explaining, role playing and asking others to do, and the rest was only 10%. Most topic chosen (35%) for explaining, role-playing and asking others to do was taking care of environment. Besides, for explaining and role playing (43%) was about maintaining their own health topic such as brushing teeth, taking bath, etc and 43% respondents were reported communicating their experiences. Moreover, it was found that 45% respondents were able to tell simply thing dealing with looking for the health system or health service. This study found 10% respondents who tell noting at all.

Table 4: The results of Gamma correlation test

Variable	Correlation coefficient (r)	p-value
Training-Communication skills of little dentist cadre	0.951	0.000

Based on Table 4, the p-value of Gamma correlation test was 0.000 and correlation coefficient was 0.951 (there was a strong relationship between training and communication skills of little dentist cadre)

DISCUSSION

Most of respondents got good score because they are ready to do the training. The training had been done in the previous weeks by the school. Teachers and parents told us that the children were awaiting for the training. The methodology used were oral explanation, demonstration and role play, likewise, it was appropriate with their characteristic. One of Dewey's theory is said that children need to be really interested in getting involved of any activity, experiences, and educated-work to get better result for their score⁽⁹⁾.

The result showed that most of respondents had good communication skill score. It happens because one of the methods used is role-play. Rumilasari, *et al.* argues that role playing can give positive effect toward children's development⁽¹⁰⁾.

The differentiate of children's communication skills are affected some factors. They are culture, intelligence, family relationships, numbers of family members, speak-up chance, and their role model⁽¹¹⁾.

Three main components of communication are message, sender, and channel for communication.

Message is something to deliver. Sender includes spokesman, sponsorship, partner, that belongs the person who deliver the message. Meanwhile channel communication is involving two persons or more face to face directly⁽¹²⁾. The result found that cadre is able to get the information well through the little dentist training, whether it is medical things or the result of the introducing oral and dental health to the respondents. The message gotten is accepted by the children and expected to be able to motivate them as the communicator. At the end of the result, they are hoped as communication for health promotion.

The results showed that 35% respondents have communication skills in the stages namely explaining and role playing. Explaining simply 32%, 22% explaining, role playing and asking others to do, and there was 4% respondents who tell nothing at all. Pre-school children within the age of 4-5 years old have 1.600-2.100 vocabularies. In this stage of age, they start learning to make a sentence by connecting word to word and concerning to the grammar use and the understandable language⁽¹⁰⁾. Those who are 5-6 years old belong to the children who like to live in groups. The pre-school children quality is the mobility to understand the others' talking and point of view are increasing. The capability of communication skills can raise their pleasure to have relationship with others.

It was reported that there was 35% respondents chose the topic namely respondents' attention dealing with the environment and the indicator is explained, being role played, and asked others to do. The most communication material used that is being role played by the respondents is about maintaining their own health such as taking a bath and brushing teeth that reaches 46% and respondents' experiences that shows 43%. There was 45% respondents who can tell simply about health system and medical services. Besides, it was found that there was 10% respondents who tell nothing at all. The differences of respondents' communication skills can be affected by some factors such as children's culture, intelligence, family relationships, numbers of family members, speak-up chance, and their role model⁽¹¹⁾.

The result showed that the respondents have good understanding dealing with the material given related to their attitude toward oral and dental health. It covers their habitual in maintaining their own health, looking for and using medical service. Their ability while starting to

learn at kindergarten is they are able to understand many vocabularies, pronounce some words well and they are able to make a sentence consisting of six up to eight words that covers verb, suffix, affix, and conjunction⁽¹³⁾.

There is a strong relationship between training and communication skills of the little dentist cadre. The higher score of theirs show they are participated actively during the training. The communication skills shows their speaking, listening, and communication non verbal skill that is related with their health habitual.

This training applied role-playing method. This method can improve their ability to communicate with other. Through role playing, they can get involved directly so they can learn it easily. Role-playing method is chosen with the target respondents of preschool children and it is suitable with their characteristic. Those who were 5-6 years old is categorized as children who like to live in groups. The quality of pre-school children have high modality in understanding words and others' point of view, so they communication skills will automatically increase. Mastering communication skill can raise their pleasure to have friend as well as relationship with others. They are able to use many vocabularies, pronounce some words well and they are able to make a sentence consisting of six up to eight words that covers verb, suffix, affix, and conjunction⁽¹³⁾.

Role-playing method makes children get involved actively during the training. Kamil argues that the children's participation is so important since they can learn effectively when they are participated actively. This case make there is a positive relationship and strong correlation between training score and their communication skills⁽⁸⁾.

CONCLUSION

There is a relationship between training and communication skills to the little dentist cadre with strong relation. Those who has higher score for training are those who have better communication skills.

Ethical Clearance: taken from The Ethical Committee of Medical Research Faculty of Dentistry, University of Jember, No: 088/UN25.8/KEPK/DL/2018.

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Service Quality Model with Cultural Perspective in Effect on Patient Satisfaction in Hospitals with Different Accreditation Status

Tjatur Sembodo¹, Cholichul Hadi², Windhu Purnomo³

¹Faculty of Medicine, Islamic University "Sultan Agung"/Faculty of Public Health,

²Faculty of Psychology, ³Faculty of Public Health, Airlangga University, Indonesia

ABSTRACT

There is a problem in achieving the accreditation status of hospitals in Indonesia and their understanding. The existence of an accreditation process is designed to improve the safety culture and quality culture in the hospital, so that the hospital will always strive to improve the quality of its services. The purpose of this study is the implementation of indicators of quality culture and safety culture for the development of indicators of dimensions of hospital service quality with different accreditation statuses. This type of research is observational research for the development of models from the Quality Dimensions of Services. Conducted in private hospitals in Central Java and Yogyakarta Special Region in April to August 2017. The study population was patients who were treated surgically, aged between 20 and 70 years. A total of 190 patients were collected proportionally from 5 private hospitals based on their accreditation status strata. The result is a positive relationship between Quality Culture and Service Quality, There is a positive relationship between the Culture of Safety and Service Quality, a Accreditation Status positively meaningful with Service Quality, Service Quality is positively related to Patient Satisfaction and There is a significant positive relationship indirectly between Accreditation Status and Patient Satisfaction.

Keywords: *Accreditation, Quality culture, Safety culture, Service quality, Patient satisfaction*

INTRODUCTION

In Indonesia, there are problems with hospital accreditation status, namely from the accreditation target of all hospitals in Indonesia in 2014 have been accredited locally, realization until July 2013, 41.81% of 2,083 hospitals have not been accredited in 2007 version and 99.42% of homes ill has not been accredited in version 2012. In Central Java the perceptions of each hospital are different, namely: accreditation causes an increase in management costs, because to prepare documents, facilities and infrastructure that are in accordance with the

standards require a large amount of costs and accreditation due to being linked with permits⁽¹⁾. Problems related to accreditation in Canada, among others, are to obtain and maintain accreditation status requiring large investment of resources. For many service organizations, there are doubts about the benefits of accreditation, namely whether the accreditation is worth the time, effort and cost, and whether it can show measurable improvements in health service delivery and outcomes⁽²⁾ in North America, where there is competition sharp among health care providers, accreditation is voluntary. Without an accredited status, health service organizations can already run. Conversely, not 100% of forced accreditation participation fosters a culture of transparency and improvement, or only encourages sanction avoidance and even encourages deviant behavior⁽³⁾.

Corresponding Author:

Tjatur Sembodo
Faculty of Medicine,
Islamic University "Sultan Agung"
Faculty of Public Health,
Airlangga University, Indonesia
Email: tjatursembodo@unissula.ac.id

In Australia, health service providers who do not accredit on the grounds of high costs, difficulties in meeting standards and data collection, and accreditation programs are difficult to implement and take time to

implement⁽⁴⁾. The accreditation process is not always satisfactory, problems related to accreditation can occur due to deficiencies or obstacles which include Quality Culture⁽³⁾. From the hospital, the existence of an accreditation process was designed to improve the safety culture and quality culture in the hospital, so that it always tried to improve the quality of its services^{(5),(6),(7)}. A strong organizational culture will encourage and enhance strong organizational and mission work so that behaviors are aligned with the priorities of the strategy⁽⁸⁾. Organizational culture is used to implement strategic changes in organizations. Organizational culture can accelerate the achievement of desired results and allow the achievement of optimal levels of work⁽⁹⁾. Organizational culture in the health service sector has a significant influence on quality improvement practices⁽¹⁰⁾. Organizational culture is needed to achieve success in the business environment, organizational culture encourages the creation of good services⁽⁸⁾.

Status Accreditation stimulates continuous improvement and quality improvement efforts⁽²⁾. Status of Accreditation is useful for Service Improvement, Improvement in the Administration & Development Planning process of the Hospital⁽¹¹⁾. Based on the gaps model of service quality, the source of service quality problems comes from the recipient of the service (customer) and the process from the service provider (management). The dimensions of service quality from patient perceptions refer to the concept of "RATER" namely Responsiveness, Assurance, Tangible, Empathy, and Reliability⁽¹²⁾. Accreditation is based on the premise that compliance with reliable evidence-based standards will produce high-quality health services, in a safer environment, than those without accreditation⁽²⁾. Accreditation levels according to Adhani⁽⁷⁾ are based on their graduation, namely the basic level, Middle level, Primary Level and Plenary Level. The ability of the Hospital to prepare for its accreditation is proof of the hospital's managerial ability in dealing with market mechanisms. The more services that can be given, the more it shows its readiness to compete with other hospitals. This is very important for resource-based strategies and competitive advantages⁽¹³⁾.

Competition in the health services industry is the ability to provide consumers with goods or services for health care with better quality, lower value, more perfect services, easier to reach, meet needs, demands,

expectations, and customer satisfaction⁽¹⁴⁾. The purpose of Accreditation is based on the Republic of Indonesia Minister of Health Regulation No. 012 of 2012, including improving the quality of Hospital services and in improving competitiveness. The purpose of Joint Commission International accreditation is to determine whether the organization has met a set of standards. improve the safety and quality of services⁽⁵⁾. Standards are one measure of where performance is measured. Performance is said to be successful if it is able to reach the specified standard⁽¹⁵⁾. Individual performance contributes to group performance, then group performance contributes to organizational performance^{(16),(17)}. Individual performance will affect organizational performance^{(18),(19)}. Customer satisfaction is categorized as a high-level goal in the public service performance measurement system⁽¹⁷⁾. Customer satisfaction is the level of one's feelings after comparing the perceived performance with expectations⁽²⁰⁾.

To measure the level of satisfaction of the service unit, the Minister of Administrative Reform issued Decree No. KEP/25/M.PAN/2/2004 concerning the preparation of the Community Satisfaction Index which consists of 14 elements that are relevant, valid and reliable. Namely: Service procedures, Service Requirements, Clarity of Service Officers, Discipline of Service Officers, Responsibility of Service Officers, Ability of Service Officers, Speed of Service, Justice in Obtaining Services, Courtesy and Hospitality of Officers, Fairness of Service Costs, Certainty of Service Costs, Certainty of Service Costs, Certainty of Service Schedule, Service Comfort, Environmental Comfort , and Service Security⁽²¹⁾.

This research is limited to the implementation of indicators of quality culture and safety culture for the development of indicators of service quality dimension models from Parasuraman, Zeithami & Berry⁽¹²⁾ namely Physical Evidence (Tangible), Reliability, Responsiveness, Assurance , and Empathy and its effect on patient satisfaction in hospitals with different accreditation statuses.

MATERIALS AND METHOD

The purpose of this study was to describe the influence of quality culture and safety culture which was added as an indicator of the dimensions of hospital service quality, which was analyzed from the effect of accreditation status on service quality, influence of service

quality on patient satisfaction and indirect influence of accreditation status on patient satisfaction. This study was an observational study for the development of Quality Dimension of Services Model. This research was conducted at private hospitals in Central Java and

Yogyakarta in April to August 2017. The population was patients who were treated surgically, aged between 20 and 70 years. A total of 190 patients were collected proportionally from 5 private hospitals based on their accreditation status strata.

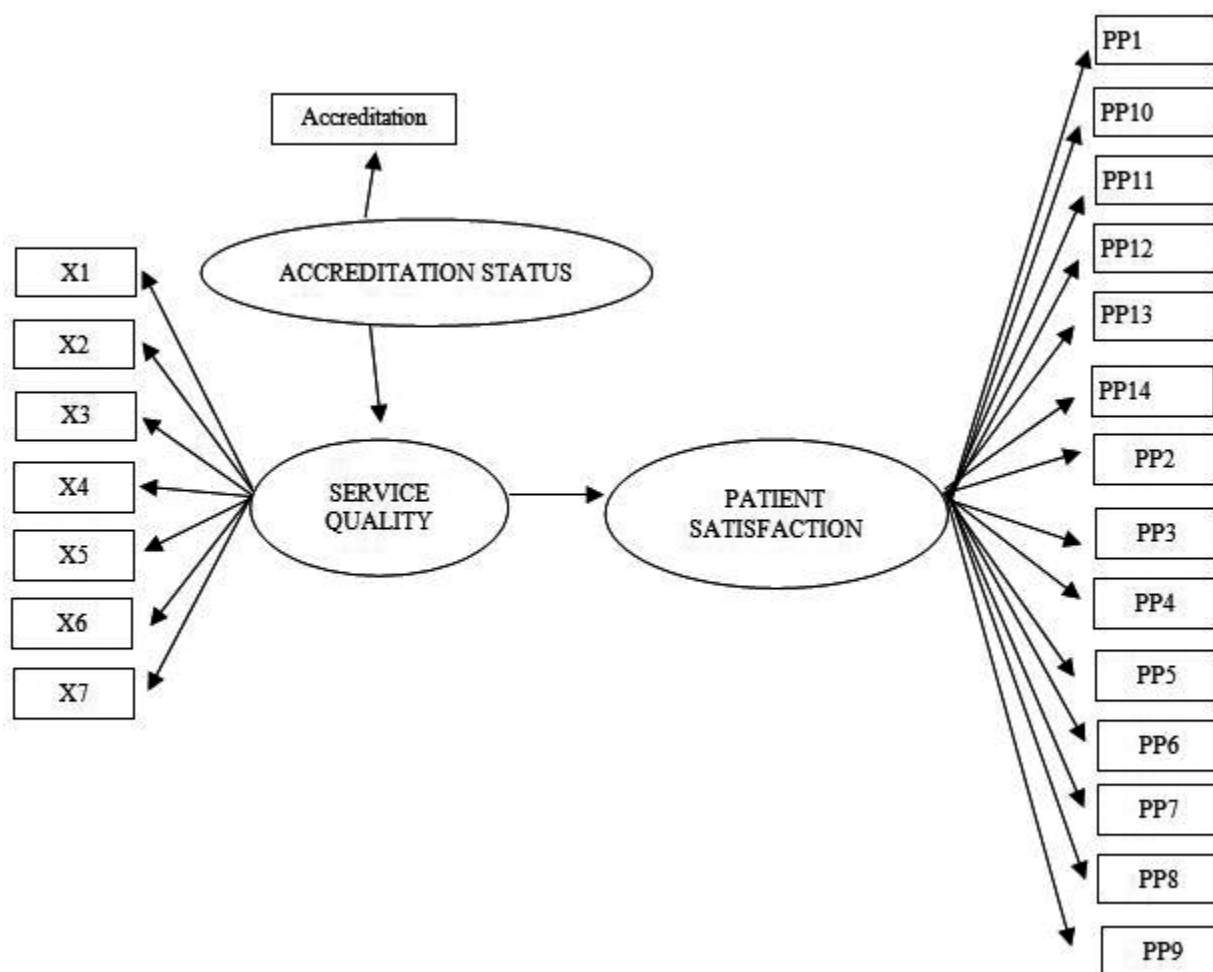


Figure 1: Structural Model Design

The hospital accreditation status assessment was carried out by looking at the accreditation status listed in the Ministry of Health, namely Plenary, Main, Middle, Basic and Not Accredited, Likert Scale. Assessment of the quality of hospital services was done by direct interviews with patients using 7 indicators consisting of indicators of service quality dimensions from Parasuraman, Zeithami & Berry⁽¹²⁾ namely Tangible (X1), Reliability (X2), Responsiveness (X3), Assurance (X4) and Empathy (X5) plus Cultural indicators namely Culture of Quality (X6) and Safety Culture (X7). Patient satisfaction assessment was done by direct interviews

with patients, using 14 indicators namely Service Procedure (PP1), Service Requirements (PP2), Clarity of Service Officers (PP3), Discipline of Service Officers (PP4), Responsibilities of Service Officers (PP5), Ability of Service Officers (PP6), Service Speed (PP7), Justice Getting Service (PP8), Courtesy and Hospitality of Staff (PP9), Fairness of Service Costs (PP10), Certainty of Service Costs (PP11), Certainty of Service Schedule (PP12), Environmental Convenience (PP13), and Service Safety (PP14). The data were analyzed using Partial Least Square Structural Equation Modeling (Figure 1).

FINDINGS

Table 1: Outer Loading

	Original Sample (O)	Sample Mean (M)	Standard Deviation	T Statistics	P Value
Accreditation ← Accreditation Status	1.000	1.000	0.000		
PP1 ← Patient Satisfaction	0.686	0.688	0.060	11.471	0.000
PP2 ← Patient Satisfaction	0.710	0.711	0.056	12.771	0.000
PP3 ← Patient Satisfaction	0.783	0.779	0.047	16.738	0.000
PP4 ← Patient Satisfaction	0.586	0.582	0.072	8.175	0.000
PP5 ← Patient Satisfaction	0.458	0.452	0.089	5.132	0.000
PP6 ← Patient Satisfaction	0.804	0.803	0.039	20.770	0.000
PP7 ← Patient Satisfaction	0.776	0.775	0.047	16.425	0.000
PP8 ← Patient Satisfaction	0.786	0.788	0.040	19.723	0.000
PP9 ← Patient Satisfaction	0.814	0.812	0.034	23.954	0.000
PP10 ← Patient Satisfaction	0.348	0.349	0.101	3.432	0.001
PP11 ← Patient Satisfaction	0.343	0.344	0.105	3.263	0.001
PP12 ← Patient Satisfaction	0.617	0.618	0.064	9.614	0.000
PP13 ← Patient Satisfaction	0.424	0.427	0.079	5.366	0.000
PP14 ← Patient Satisfaction	0.566	0.570	0.069	8.213	0.000
X1 ← Service Quality	0.715	0.716	0.048	14.989	0.000
X2 ← Service Quality	0.814	0.814	0.032	25.517	0.000
X3 ← Service Quality	0.826	0.825	0.028	29.114	0.000
X4 ← Service Quality	0.706	0.705	0.044	16.135	0.000
X5 ← Service Quality	0.850	0.850	0.026	33.155	0.000
X6 ← Service Quality	0.872	0.872	0.019	46.256	0.000
X7 ← Service Quality	0.561	0.561	0.058	9.761	0.000

Outer loading of service quality with indicators of Tangible=0.715, Reliability=0.814, Responsiveness=0.826, Assurance=0.706, and Empathy=0.850, Quality Culture=0.872 and Safety Culture=0.561. Outer loading of Patient Satisfaction with indicators of service Procedure=0.686, Service Requirements=0.710, Service Officer clarity=0.783, Service Officer discipline=0.586, Service Officer Responsibility=0.458, Service Officer Ability=0.804, Service Speed=0.776, Justice Get Service=0.786, Courtesy and Hospitality Officer=0.814, Service Costs Fairness=0.348, Service Costs Certainty=0.343, Service Schedule Certainty=0.617, Environmental Comfort=0.424, and Service Safety=0.566. T results calculate all indicators greater than T table. According to Ghazali⁽²²⁾, indicators with factor loading of 0.5 to 0.6 can still be maintained, which is less than 0.5 removed. But if the T is greater than T table it is still called valid, even though the value of the loading factor is less than

0.5, so the indicator can be maintained. It was concluded that the indicator was declared valid and could be used for further analysis.

Table 2: Discriminant Validity

	Accreditation Status	Patient Satisfaction	Quality Services
Accreditation	1.000	0.335	0.490
PP1	0.348	0.686	0.262
PP2	0.239	0.710	0.268
PP3	0.280	0.783	0.296
PP4	0.103	0.586	0.212
PP5	0.000	0.458	0.104
PP6	0.306	0.804	0.288
PP7	0.262	0.776	0.352
PP8	0.342	0.786	0.287

Conted...

PP9	0.300	0.814	0.291
PP10	0.025	0.348	0.183
PP11	0.021	0.343	0.179
PP12	0.214	0.617	0.310
PP13	0.156	0.424	0.276
PP14	0.126	0.566	0.251
X1	0.373	0.299	0.715
X2	0.372	0.355	0.814
X3	0.442	0.310	0.826
X4	0.219	0.248	0.706
X5	0.432	0.305	0.850
X6	0.420	0.383	0.872
X7	0.322	0.306	0.561

The correlation coefficients between the indicators and the construct was greater than the correlation coefficient with other constructs. This showed good discriminant validity, meaning that the construct of latent

variables predicts indicators on their blocks is better than indicators in other blocks, in other words the indicators used in this study have good discriminant validity in arranging their respective variables.

Table 3: Reliability Test

	Cronbach' Alpha	Rho A	Composite Reliability
Quality Services	0.881	0.893	0.909
Patient Satisfaction	0.880	0.897	0.902
Accreditation Status	1.000	1.000	1.000

From Cronbach's alpha and composite reliability test, each construct very reliable, because it had Cronbach's alpha and composite reliability that were high (>0.80).

Table 4: Path Coefficients

	Effects	Original Sample	T Statistics	P Value
Accreditation Status → Patient Satisfaction	Indirect	0.203	4.427	0.000
Accreditation Status → Quality Services	Direct	0.490	9.047	0.000
Quality Services → Patient Satisfaction	Direct	0.414	5.995	0.000

Assessment of the inner model, from the results of calculating path coefficients, for the hypothesis test, found a significant positive relationship at 0.05 (T table=1.96) between accreditation status and service quality with a path coefficient of 0.490, between service quality and patient satisfaction with path coefficient of 0.414, and indirectly between accreditation status and patient satisfaction with path coefficient 0.203. From this calculation the hypothesis can be accepted and proven significantly.

DISCUSSION

Quality of Service according to the patient's perspective is a service that can meet the needs felt and organized in a polite and polite manner, timely, responsive and able to heal complaints and prevent them from developing or expanding⁽²³⁾. Service quality can be obtained from Accreditation Status due to status accreditation is beneficial for Service Improvement, Improvement in the Administration & Development Planning process of the Hospital⁽¹¹⁾, the Accreditation Process evaluates a health service place, so that

accreditation status can be established^{(5),(24)} to create a culture of safety and quality of the patient care process and results. The standard of accreditation is based on the principles of quality management and continuous quality improvement⁽⁵⁾. Accreditation status stimulates efforts to improve and improve sustainable quality. ditasi Hospital that is increasing protection for patients, the public, human resources hospitals and hospitals as an institution⁽²⁾. Customer satisfaction is the level of one's feelings after comparing perceived performance with expectations⁽²⁰⁾, customer satisfaction is Impact service, customer satisfaction is categorized as a high-level goal in the public service performance measurement system⁽¹⁷⁾. This research develops the service quality dimension indicator model of quality from Parasuraman, Zeithami & Berry⁽¹²⁾ by adding indicators of culture of quality and safety culture, the results of which models can be applied.

CONCLUSION

Development of dimensions of service quality dimensions with a cultural perspective influences patient satisfaction in different hospitals with accreditation

status, with the main concern adding indicators of quality culture and safety culture into Dimensional Indicators Service quality is proven to be acceptable model, which is seen from the acceptance of the accreditation has a positive and significant relationship with Service Quality: Service Quality has a positive and significant relationship with Patient Satisfaction and there is a significant positive relationship indirectly between Accreditation Status and Patient Satisfaction.

Ethical Clearance: from Ethic Committee of Health Research, Faculty of Public Health, Airlangga University, Indonesia

Source of Fundings: Authors

Conflict of Interest: No

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SPEOS (Stimulation of Endorphin, Oxytocin and Suggestive): Intervention to Improvement of Breastfeeding Production

Indah Lestari¹, Ima Rahmawati¹, Emik Windarti¹, Hariyono²

¹Faculty of Nursing, Institute of Health Science “Bina Sehat PPNI” of Mojokerto, Indonesia;

²Health Department, Mojokerto Regency, Indonesia

ABSTRACT

Background: The problem of preliminary breast milk expenditure that is not yet smooth is often the reason for the mother to delay or replace it with breast milk substitutes. Even though they have obtained early breastfeeding initiation, the expenditure and production of breast milk are not yet smooth.

Objectives: Proving the SPEOS method (Stimulation of Endorphin, Oxytocin, and Suggestive) is effective against increasing breast milk production.

Method: The study used a quasi-experimental pre and posttest design. The sample was 60 postpartum mothers in the Mojokerto area hospital who met the research criteria, taken with a simple random sampling technique. The control group gets early breastfeeding initiation according to the procedure. The intervention group was given the SPEOS method (Stimulation of Endorphin, Oxytocin and Suggestive) intervention method, which was carried out according to the procedure. Assessment of breast milk production is carried out by pumping breast milk, using Pigeon (ml) pumps. Data collection used a weighing test for breast milk production. Processing and analysis of data used paired t-test, Mann Whitney test, and LSD test.

Result: The SPEOS method affected the increase in breast milk production. There were significant differences in the production of breast milk pre-post control group, obtained t-count 8.923 ($p = 0.000$) and the experimental group t-count 18.886 ($p = 0.000$). The difference in the level of comfort between groups with the LSD test obtained p-value = 0.035.

Conclusion: The findings of the study show that the SPEOS method (Stimulation of Endorphin, Oxytocin, and Suggestive) is one of the alternative interventions for increasing milk production and accelerating the release of breast milk through increased work of prolactin and oxytocin.

Keywords: SPEOS method, Breast milk production, Postpartum

INTRODUCTION

Indonesia, encouraging exclusive breastfeeding for infants up to 6 months of their first life and continued until the child is two years old. For babies, breast milk has an important role to support growth, health, and survival. Whereas for mothers, breastfeeding can reduce

morbidity and mortality because the breastfeeding process will stimulate uterine contractions there by reducing puerperal complications⁽¹⁾. UNICEF asserted that babies are given formula die 25 times higher than babies who are exclusively breastfed⁽²⁾.

Nationally, mothers who breastfed alone in the first 24 hours were 30.2%. Data shows that the coverage of exclusive breastfeeding in Indonesia is still low, only 54.3% of babies in Indonesia are exclusively breastfed, meaning that there are still 45% of babies in Indonesia who are not getting enough breast milk⁽³⁾. While the national target for exclusive breastfeeding is 80%, in Southeast Asia the achievement of exclusive breast milk shows numbers that are not much different. In

Corresponding Author:

Indah Lestari

Faculty of Nursing,

Institute of Health Science

“Bina Sehat PPNI” of Mojokerto, Indonesia

Email: ns.indah@yahoo.com

comparison, exclusive breastfeeding coverage in India has reached 46%, in the Philippines 34%, in Vietnam 27%, and Myanmar 24%⁽⁴⁾.

Research in Ghana shows that 16% of infant deaths can be prevented through breastfeeding babies from the first day of birth. This figure rose to 22% if breastfeeding began in the first hour after birth⁽⁵⁾.

Failure in the breastfeeding process is often caused by the emergence of several factors, including maternal factors, infant factors, psychological factors, health personnel factors, socio-cultural factors. The research conducted by Diana (2001) showed that inhibiting factors of exclusive breastfeeding in the form of false beliefs about baby food, promotion of formula milk, and health problems for mothers and babies led to the failure of exclusive breastfeeding⁽⁶⁾.

The reality in the field, the production, and ejection of breast milk which is a little on the first day after birth, becomes an obstacle in early breastfeeding. The problem of breastfeeding is affected by the reduction of stimulation of the hormone oxytocin, the physical and psychological changes in the mother during the lactation process. Theoretically, the workings of the oxytocin hormone are influenced by psychological conditions. Therefore maternal postpartum preparation is an important factor that can influence the success of breastfeeding, stress, excessive worry, unhappiness plays a role in breastfeeding success⁽⁷⁾.

The problem of breastfeeding does not come out on the first day of birth must be anticipated since pregnancy through lactation counseling, but the dissemination of information among officers has not been optimized, so it is necessary to do alternative ways to stimulate milk production⁽⁸⁾. Various researches that have been carried out in Indonesia to facilitate breast milk production include methods of Oxytocin Massage, Marble Technique, Warm Compress, Massage Rolling (back), Breast Care, but due to limited information on health services about the procedure of implementation, these methods are only known and rarely given by health workers as care giver to patients⁽⁹⁾.

The SPEOS method (Stimulation of Endorphin, Oxytocin, and Suggestive) is one of the preferred interventions to stimulate the release of oxytocin through oxytocin and endorphin massage, provide comfort and

foster confidence in the mother that breast milk must come out and mothers can breastfeed exclusively⁽¹⁰⁾.

Endorphins are known as substances that have many benefits. Endorphin massage can stimulate the release of endorphin hormones and can stimulate the appearance of prolactin and oxytocin reflexes to increase the volume and production of breast milk⁽¹¹⁾. When combined with oxytocin massage and supported suggestively so that the mother has confidence in her ability in the process of breastfeeding, the resistance to the release of oxytocin will increase. This has an impact on increasing milk production in the early life of the baby.

MATERIALS AND METHOD

The research design was quasi-experiment with pre and post-test design, measurements were taken before and after intervening in the SPEOS method which was a combination of endorphin massage, oxytocin massage, and suggestion, starting 1-6 hours postpartum every day up to week 4. Deep population of this research is all postpartum mothers in the Mojokerto area hospital. Samples were primiparous postpartum mothers giving birth to 60 people (divided into 30 experimental groups and 30 control groups). Research criteria: samples aged 20-35 years, postpartum first day (1-6 hours postpartum), primiparous and multiparous, it did not experience postpartum complications, gestational age above 37 weeks, infants were not given formula milk, BB $\geq$ 2500 gram, mother, did not smoke, form of nipples on both mother's breasts stood out, condition of mother and baby healthy. Taken with a simple random sampling technique.

The SPEOS method is given every day starting on day 1 (1-6 hours post partum) for four weeks. The duration of the massage starts 10 minutes at week I, then increases to 15 minutes week II. Then evaluating if the milk production is small then the time that the massage is increased to 20 minutes and maintained until week IV, breast milk production assessment is carried out by pumping breast milk, using a Pigeon pump (ml), breast milk is pumped before and after massage every week up to 4 weeks, pumped 2 hours before the breastfeeding baby. Data collection uses a weighing test for breast milk production. Processing and analyzing data using a paired t-test for breast milk secretion, Mann Whitney test to measure the mean difference of breast milk secretion, while to see the difference in comfort level between groups of respondents with the LSD test.

FINDINGS**Table 1: Distribution of Age, Parity, Education, BMI and Baby Weight**

No.	Variable	Control		Experiment		p-value
		Frequency	Percentage	Frequency	Percentage	
1.	Age					
	< 20 years	5	17%	2	6%	0.241
	20-30 years	16	53%	18	60%	
	> 30 years	9	30%	10	34%	
	Total	30	100%	30	100%	
2.	Parity					
	Primigravida	11	37%	8	27%	0.356
	Multigravida	16	53%	19	63%	
	Grande multi	3	10%	3	10%	
	Total	30	100%	30	100%	
3.	Education					
	Elementary school	5	17%	4	13%	0.489
	Middle school	10	34%	12	40%	
	High school	9	30%	10	34%	
	College	6	19%	4	13%	
	Total	30	100%	30	100%	
4.	BMI					
	Thin skinny level	8	27%	8	27%	0.653
	Thin weight	0	0%	0	0%	
	Normal	16	53%	20	66%	
	Light weight level	6	20%	2	7%	
	Fat weight level	0	0%	0	0%	
	Total	30	100%	30	100%	
5.	Baby weight					
	2500-3000	11	37%	8	27%	0.356
	3001-3500	16	53%	19	63%	
	3501-4000	3	10%	3	10%	
	Total	30	100%	30	100%	

All variables showed p-value >0.05, which indicated that there was no significant difference of the characteristics of the respondents between the experiment and control group. It could be said that both group were homogeneous.

Table 2: Breast milk secretion in the experiment and control group

Variable	Mean	SD	t-count	p-value
Control Group				
Pre-test	17.49	5.063	8.923	0.000
Post-test	73.00	29.047		
Experiment Group				
Pre-test	17.49	5.063	18.886	0.000
Post-test	221.29	55.738		

The table shows that there are differences in the results of pre-post in the control and experimental groups, as evidenced by the results of the t-count of the control group = 8.923 and the experimental group = 18.886. This show that SPEOS, increase milk production.

Table 3: Mean difference of breast milk secretion in the experiment and control group

Variable	Control	Experiment	p-value
Difference of breast milk secretion			
Mean	55.51	203.80	0.0001
SD	29.98	51.689	

The difference in mean values, shows that the SPEOS intervention in the experimental group increased breast milk production, with p-value = 0.0001

Table 4: Differences in the level of comfort between groups

Variable	Mean	SD	p-value
Control group	0.56	9.86	0.035
Experiment group	13	11.55	

The difference in mean values, shows that the SPEOS intervention in the experimental group increased level of comfort, with p-value = 0.035.

Table 5: Indicators of breast milk production in the control and experimental group

Indicators	Control group				Experimental group			
	Yes		No		Yes		No	
	%	n	%	n	%	n	%	n
Tense breast	45	14	55	16	65	20	35	10
Mother relaxes	55	16	45	14	65	20	35	10
Let down good reflexes	55	16	45	14	100	30	0	0
The frequency of breastfeeding is > 8 times	100	30	0	0	70	21	30	9
Use 2 breast	40	12	60	18	70	21	30	9
Correct attachment position	25	8	75	22	70	21	30	9
Putting is not blisters	65	20	35	10	100	30	0	0
Looks full red breasts	20	6	80	24	70	21	30	9
Breastfeeding without schedule	45	14	55	16	75	22	25	8
Babies suck strongly with a slow beat	55	16	45	14	65	20	35	10

Increased production of breast milk, indicated by tense breasts, Mother relaxes, Let down good reflexes, Use 2 breasts, Correct attachment position, Putting is not blisters, Looks full red breasts, Breastfeeding without schedule, Babies suck strongly with a slow beat. While the frequency of breastfeeding is > 8 times, experienced by all control groups. This shows that the quantity of breast milk production is insufficient, so the baby must breastfeed more often than the experimental group.

DISCUSSION

The theory of neurotransmitters that produce endorphins is by affecting the area of the brain, stimulating the secretion of β -endorphin and enkephalin in the brain and spinal cord. Neurotransmitter release affects the immune system and antinociceptive system⁽¹²⁾.

Endorphins are naturally produced by the body's pituitary gland which is useful for reducing pain, affecting memory and mood which then gives a relaxed feeling⁽¹⁰⁾.

While oxytocin massage is a massage along the spine (vertebrae) to the fifth-sixth costae bone and is an attempt to stimulate the hormone prolactin and oxytocin after childbirth. This massage serves to increase the feeling of comfort and relaxation that can stimulate the release of endorphins, with smooth blood flow to the brain, the hypothalamus quickly receives a signal, forwarded to the posterior pituitary that secretes oxytocin, so that the milk automatically comes out⁽¹³⁾.

Relaxing muscles, vasodilation of blood vessels, stimulates long fibers and opium receptors such as β -endorphin, which contains large peptides that can be released slowly. Furthermore, the opium on the dorsal

spinal cord blocks the pain signal, closes the substantial galatinosa so that the pain signals are pressed⁽¹⁴⁾.

By the theory that prolactin produced during the breastfeeding process has been studied has a relaxation effect which causes breastfeeding mothers to feel calm and even have a euphoric effect, so that the higher the prolactin level, the better the production of breast milk⁽⁷⁾.

The massage will eliminate tension and can cause relaxation of body muscles. This will give a sense of safe and comfort which means psychologically giving a positive impact on the feeling of calm, comfort, relaxation and decreased stress; this stimulates an increase in body morphine, namely endorphins⁽⁶⁾. A comfortable, calm and relaxed atmosphere will bring positive emotions that can increase the secretion of neurotransmitter endorphin through POMC which serves as a pain reliever and excessive control of Corticotropin-releasing hormone (CRH) secretion⁽¹⁵⁾. This positive response through the HPA pathway will stimulate the hypothalamus to reduce CRF secretion followed by a decrease in corticotropin, adrenocorticotrophic hormone (ACTH), and the adrenal medulla will respond by decreasing catecholamine secretion, then peripheral resistance and cardiac output will decrease, so that blood pressure decreases. The state of relaxation that is felt by the mother will improve maternal comfort so that it increases the letdown reflex and increases the amount of the hormone prolactin and oxytocin⁽¹⁵⁾.

Endorphin and oxytocin massage are actions that function to stimulate the production of the prolactin hormone from the brain. This hormone which affects a lot of breast milk. The main massage points to facilitate breast milk, according to Daris, are in the breast itself. The three main points for a massage on the breast are one point above the nipple, right on the nipple, and the point under the nipple. If this is done routinely and correctly, this effort can facilitate breast milk production. In addition to the dots in the breast, the point below the knee (point ST 36) will also help facilitate breastfeeding⁽¹⁶⁾.

Mother's belief in being able to breastfeed her baby is a factor that supports the success of breastfeeding. What the body experiences depend on its subconscious mind. The unconscious soul plays 82% of the function of the self, while the conscious soul plays 18. When the recording is negative, it can be neutralized to be reprogramming with positive suggestions. Suggestions made by relaxing the mind will cause feelings of relaxation and happiness so that breast milk will come out smoothly⁽¹⁷⁾.

The most important period of breastfeeding babies is the first 30 minutes of birth for up to 3 days because at that time colostrum was first produced. This means that it shows signs that breastfeeding in the first hour decreases mortality, and breast milk is exclusively six months old, will reduce infant mortality⁽⁶⁾.

CONCLUSION

In postpartum mothers, the SPEOS method can be used as an intervention option for increasing breast milk production. In addition to increasing production, SPEOS has advantages that can be done from an early, has a good impact on the acceleration time of release breast milk and provides confidence and comfort for postpartum mothers.

Ethical Clearance: Yes

Conflict of Interest: No

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Natural Insecticide Spray for *Aedes sp.*, Made from Ethanol Extract of Purple Eggplant Fruit (*Solanum melongena L.*)

Yunan Jiwintarum¹, Erlin Yustin Tatontos¹, Anisa Noviana¹, Maruni Wiwin Diarti¹, Setiawan²

¹Health Polytechnic of Mataram, Indonesia; ²Health Polytechnic of Surabaya, Indonesia

ABSTRACT

Dengue Hemorrhagic Fever (DHF) is an infectious disease caused by the Dengue virus. This virus is transmitted by *Aedes sp.* Many studies have been carried out on the use of plants as biological insecticides, one of which is purple eggplant (*Solanum melongena L.*). This study aims to determine whether *Solanum melongena L.* extract spray can be used as an insecticide for *Aedes sp.* This research was a true experimental study, with a sample of 25 *Aedes sp.* 2-5 days old. The treatment given was eggplant extract spray with a concentration of 80%, 60% and 40% then left for 24 hours, with 3 replications. The concentration of 80% ethanol extract caused 84% of the deaths of *Aedes sp.*, The concentration of 60% caused 68% of deaths, and a concentration of 40% caused 44% of deaths. The p-value of the probit test was 0.000 (*Solanum melongena L.* ethanol extract in spray form significantly caused the death of *Aedes sp.*) LC_{50} and LC_{90} values were at concentrations of 49.124% and 81.343%. Spray of *Solanum melongena L.* ethanol extract can be used as natural insecticide for *Aedes sp.*

Keywords: Ethanol extract, *Solanum melongena L.*, Natural insecticide, *Aedes sp.*, Spray

INTRODUCTION

DHF is an infectious disease caused by the dengue virus, which is transmitted through the main vectors, namely the mosquitoes *Aedes aegypti* and *Aedes albopictus*. DHF is spread throughout the tropics including Indonesia. The spread of this disease is influenced by rainfall, temperature, and urbanization⁽¹⁾. Before 1970, dengue outbreaks occurred in only 9 countries, but subsequently became endemic in more than 100 countries in Africa, America, the Eastern Mediterranean, Southeast Asia and the Western Pacific. The highest rates of DHF occur in America, Southeast Asia and the Western Pacific, with the number of cases > 1.2 million in 2008 > 2.3 million cases in 2010. In 2013 there were 2.35 million cases in America, and 37,687 cases were Severe DHF. From 1968 to 2009, WHO reported that Indonesia was the country with the highest DHF cases in Southeast Asia⁽²⁾.

In 2015, the Ministry of Health of the Republic of Indonesia noted that the number of dengue sufferers was 129,650 cases, with the number of deaths being 1,071 (morbidity = 50.75 per 100,000 population and mortality = 0.83%). This number is greater than in 2014, namely 100,347 cases, with morbidity = 39.80⁽¹⁾. In 2015, the number of dengue cases in NTB province was 1,340, then increased to 3,385 cases, with an increase of 152.61% in 2016. The most cases occurred in Sumbawa, East Lombok and Mataram City. DHF morbidity in NTB in 2016 was 69.10 per 100,000 population. This condition shows an increase compared to 2015, even exceeding the nationally defined limit of <40 / 100,000 population, with the number of cases dying = 32 people⁽³⁾.

Indonesia has high air humidity, and this condition triggers the breeding of *Aedes aegypti* and *Aedes albopictus*. *Aedes sp.* is a diurnal animal that starts sucking blood when the sun rises (08.00 - 12.00) until before sunset (15.00 - 17.00). *Aedes aegypti* prefers human blood and is often found indoors, while *Aedes albopictus* prefers animal blood and is usually found outside the home. Population of *Aedes sp.* greatly increased in the rainy season, due to the availability of breeding sites, namely puddles of rain water in used cans, used tires, pieces of bamboo, holes in trees, places to drink birds, etc.⁽⁴⁾.

Corresponding Author:

Setiawan

Health Polytechnic of Surabaya, Indonesia

Email: setiawan.jemblung@yahoo.com

Vector control has been carried out both mechanically, biologically and chemically. Vector control is mechanically and biologically friendly to the environment. Mosquito repellent products generally contain high concentrations of synthetic chemicals, which can interfere with human health⁽⁵⁾, so that there are currently many studies conducted on the use of plants as biological insecticides to minimize negative effects on humans. Biological insecticides have proven potential for controlling vectors, both for eradicating adult larvae and mosquitoes. In addition, these insecticides are biodegradable so they do not pollute the environment, and are relatively safe for nature, humans and livestock, because the residues of these substances quickly disappear.

The power to kill biological insecticides comes from the toxic substances they contain. These substances can be contact poisons, respiratory toxins and stomach poisons in soft-bodied animals⁽⁵⁾. Biological compounds that have functions as insecticides include saponins, tannins, flavonoids, alkaloids, steroids and essential oils⁽⁶⁾.

Purple eggplant contains an active substance that can be used as an insecticide, because it contains steroid alkaloids (solasodine, solanine, solanidine), saponins, flavonoids, tannins, coumarin. This fruit skin is rich in anthocyanin and chlorogenic acid⁽⁷⁾. Saleh (2015) reported that purple eggplant ethanol extract contained flavonoids, tannins, glycosides, steroids and alkaloids. Purple eggplant has better antioxidant activity than 5 other eggplant varieties because it contains high levels of total flavonoids⁽⁸⁾. The total flavonoid content of purple eggplant ethanol extract was $29.35 \pm 0.09\%$ b / b Equivalent of Quercetin⁽⁹⁾. Purple eggplant also contains alkaloids = 0.99 ± 0.0 mg / 100 g, tannin = 11.34 ± 0.48 mg / 100 g, and saponin = 11.63 ± 0.29 mg / 100 g (11). Kandita et al. (2015) reported that leunca fruit had an insecticidal effect on *Aedes aegypti* with a concentration of 80%. Purple eggplant is one genus with leunca fruit, so it is logical to do research on the utilization of purple eggplant fruit ethanol extract as an insecticide for *Aedes sp.*, Because purple eggplant fruit is easier to obtain in NTB and has high flavonoids⁽¹⁰⁾.

MATERIALS AND METHOD

The design of this study was Post-Test Only Control Group Design, with 3 treatments and 1 negative control, namely T0: Negative Control (Aquadest); T1:

Extract with a concentration of 80%; T2: Extract with a concentration of 60%; T3: Extract with a concentration of 40%. The population of this study were *Aedes sp.* adults obtained from egg breeding. The sample were 25 *Aedes sp.* adults 2-5 days for each group, referring to WHO guidelines, using insecticides in the form of spray, with 3 repetitions⁽¹¹⁾. The sample was chosen by purposive sampling technique. The research tools and materials were knives, trays, ovens, blenders, analytic balance, glass jars (simplicia containers), funnels, filter paper, extract storage, aluminum foil, rotary evaporator. The tools used for preparation and maintenance of mosquitoes were black buckets, filter paper, cages, containers (eggs and mosquito larvae), drops of pipettes, aspirators. The tools used for dilution of the test solution were beaker glass, measuring cup, stirring rod, mosquito cage (test barrel) measuring 30 x 30 x 30 cm³, sprayer, label, cotton, paper cup, aspirator, tweezers, tray, basin, observation sheet, purple eggplant fruit, 96% ethanol, water, sugar solution, fish pellets, *Aedes sp.* adult.

The preparation stage was preparing the eggs of *Aedes sp.*; making ovitrap using black bucket 3; insert clean water up to $\frac{3}{4}$ bucket; put filter paper on the bucket wall; put the ovitrap in dark places and leave it for 5-7 days. Filter paper containing eggs was removed and then dried.

The maintenance phase of *Aedes sp.* was soaking filter paper in a container filled with water; leave it for 1-2 days until the eggs hatch, then become larvae. Larvae develop from stage I to IV within 5 days. The larvae turn into pupae; then transferred to the cup. Each cup contains 30 pupae, then the cup was moved into the barrel, each barrel contains 2 cups. During its development period, pupae which had become adult mosquitoes were fed with a 10% sugar solution on cotton.

Making ethanol extract of purple eggplant fruit was washing purple eggplant, then slicing it thinly, then putting it in the oven at 40°C for 24 hours. The dried fruit is mashed using a fine mesh, then dissolved in 96% ethanol with a ratio of 1:5, then taken 200 grams then added to 1000 ml of 96% ethanol. The maceration container is closed and then stored for 3 x 24 hours in a place protected from direct sunlight, then stirred every 5 minutes. After leaving, then filtered, then the extract is separated from the pulp. Ethanol was evaporated using a rotary evaporator at 40°C, so that 100% extract was obtained⁽⁸⁾.

Making variations in extract concentration was: making a solution of purple eggplant ethanol extract with a concentration of 80%, 60%, and 40% from the solution of 100% purple eggplant ethanol extract using a dilution formula:

$$\text{The 1 time spray weight} = \frac{(A - B) + (B - C) + (C - D) *}{3 \text{ replicants} \times 10 \text{ sprays}}$$

The amount of spray needed is calculated by the formula:

$$\text{Amount of spray} = \frac{\text{Standard does (0.70 grams) **}}{\text{The 1 time spray weight}}$$

Note:

*The difference between each test must be <0.20 grams

**Standard dosage used at UPKV/USM Malaysia⁽¹⁰⁾.

The testing stage was to prepare 4 barrels of square test (30 cm³) and 4 spray bottles containing a solution of ethanol extract of purple eggplant fruit. Prepare 10%

sugar solution for each barrel. Move 25 *Aedes* sp. to each barrel. Spray the extract solution with a certain concentration into each barrel, on the barrel wall. Barrel 1 is sprayed using aquadest, a maximum of 10 sprays; 2-4 test barrels were sprayed using extracts with concentrations of 80%, 60% and 40%; then let stand for 24 hours, then the number of dead mosquitoes was calculated and recorded. If the number of mosquito deaths in the negative control group was <5%, it could be ignored; but if > 80%, then the test must be repeated. If the mortality of mosquitoes in the negative control group was 5% -80%, then the percentage of mosquito deaths in each dose was calculated using the Abbot formula:

$$\frac{\text{Percentage of deaths in the treatment group} - \text{Percentage of deaths in the control group}}{100\% - \text{Percentage of deaths in the control group}} \times 100$$

The data analysis stage was using a probit test with a confidence level of 95%, to prove the effect of giving purple eggplant ethanol extract and Lethal Concentration value (LC₅₀ and LC₉₀).

FINDINGS

Insecticide test results of purple eggplant fruit extract against *Aedes* sp. can be seen in table 1.

Table 1: Death of *Aedes* sp.

Extract concentration	Number of <i>Aedes</i> sp.	<i>Aedes</i> sp. Deaths (replication)			Mean	Percentage
		1	2	3		
80%	25	22	21	21	21	84%
60%	25	17	18	16	17	68%
40%	25	11	11	10	11	44%
Negative control	25	0	0	0	0	0%

Table 1 shows that the number of deaths of *Aedes* sp. the highest was at a concentration of 80%, followed by a concentration of 60%, 40% and control with the number of deaths = 0.

The relationship between the percentage of mosquito deaths with extract concentrations is shown in Figure 1.

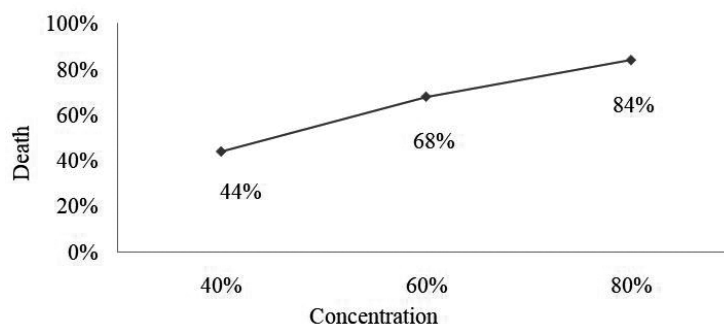


Figure 1: Relationship between the percentage of mosquito deaths with the concentration of purple eggplant extract

Figure 1 shows that the percentage of mosquito deaths was directly proportional to concentration.

Effect of purple eggplant extract on the death of *Aedes sp.* can be seen in tables 2 and 3.

Table 2: Parameter estimates

	Parameter	Estimate	Std. Error	Z	Sig.	95% CI	
						Lower	Upper
PROBIT	Concentration	0.040	0.004	9.457	0.000	0.032	0.048

Table 2 shows the p-value of the Probit test was 0.000 (purple eggplant extract caused the death of *Aedes sp.* significantly).

Table 3: Chi-square test

		Chi-Square	df	Sig.
PROBIT	Pearson Goodness-of-Fit Test	5.327	10	0.868

Table 3 shows that Pearson goodness-of-fit-test was 0.868 (> 0.500), so it was interpreted that the relationship between extract concentration and mosquito mortality was directly proportional.

The values of LC_{50} and LC_{90} are presented in table 4.

Table 4: Nilai LC_{50} dan LC_{90}

	LC	95% CI		
		Estimate	Lower	Upper
PROBIT	50	49.124	44.431	53.474
	90	81.343	75.029	90.208

Table 4 shows that extract concentrations caused 50% of the deaths of *Aedes sp.* was 49.124%, while the concentration of extract which caused 90% of deaths was 81.343%.

DISCUSSION

Eggplant powder was extracted by maceration method using 96% ethanol. The maceration method is chosen because it is a simple method of retrieval. The use of 96% ethanol aims to attract active substances namely flavonoids, glycalkaloid, saponins and tannins which are thought to have an insecticidal effect on *Aedes sp.* 96% ethanol is semipolar so it can dissolve polar and non-polar chemicals⁽⁶⁾.

Aedes sp. in this study was 2-5 days old. The age of mosquitoes is a factor that greatly influences the resistance of mosquitoes to exposure to chemical compounds, so

the age of mosquitoes is important. Referring to WHO insecticide test guidelines, 2-5 days is the best age, with good and productive body resistance⁽⁶⁾.

The results showed that the higher the concentration of purple eggplant extract given, the higher the percentage of death of *Aedes sp.* with LC_{50} and LC_{90} being 49.124% and 81.343%, respectively. Similar reports were submitted by Kandita et al. (2015) that leunca fruit extract (one genus with purple eggplant) has an insecticidal effect on *Aedes aegypti* with a concentration of 80%⁽¹⁰⁾.

Musdalifah (2016) reported that the average mortality of mosquitoes given lime peel extract with a concentration of 15% was 25%, with a concentration of 30% was 45% mortality, and with a concentration of 60% was 62% death⁽⁶⁾. These results are similar to the results of this study, that the percentage of mosquito deaths is directly proportional to the concentration of extracts of biological materials used. The higher the concentration used, the higher the active ingredient in the extract. The toxic power caused by purple eggplant extract is caused by the presence of active ingredients contained in the extract. Some bioactive compounds that are thought to be contained in purple eggplant extract include flavonoids, saponins, glycalkaloid and tannins which have proven to be contact poison and respiratory toxins in insects, especially *Aedes sp.*⁽⁶⁾.

As a phenol, flavonoids attack the nerves in some vital organs of insects, causing nerve weakness, such as respiratory problems and death. As terpenoids,

saponins can bind to free sterols in the digestive tract of mosquitoes, where sterols are precursors of the hormone ecdysone, so that if the number of free sterols decreases, there will be disruption of moulting of insects. Saponins can also destroy red blood grains and are toxic to cold blooded animals (6). Glycosalkaloid functions as a contact poison for *Aedes sp.* The ability of the glycosalkaloid to bind the 3 β -hydroxy sterol membrane can interfere with membrane function. This substance also inhibits the action of the acetylcholinesterase enzyme, giving rise to the accumulation of acetylcholine in the nervous system, which in turn causes digestive defects, nervous disorders and death⁽¹⁰⁾.

Utilization of biological compounds is relatively safe for the environment and humans, because it is easily biodegradable so that the residue quickly disappears. In general, the function and effectiveness of insecticides is directly proportional, meaning that the higher the dose of insecticide, the higher the chance to control insects. Even though there are no studies that directly explain the effects of using natural insecticides on human health, its application in the environment must remain under control. For now, the use of natural insecticides is an alternative to controlling insects in households safely, and helps minimize the risk of environmental damage.

CONCLUSION

Based on the results of the study it can be concluded that purple eggplant fruit extract is effective as an insecticide for *Aedes sp.*

Conflict of Interest: This research is free from conflict of interest

Ethical Clearance: This study has been equipped with a certificate of ethical clearance from the health research ethics committee

Source of Fundings: The authors are funders of this study

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Effect of Vitamin A and Zink Intake of Breastfeeding Mothers on Infection in Infants

Lydia Fanny¹, Retno Sri Lestari¹, Hijrah Asikin¹

¹Department of Nutrition, Health Polytechnic of Makassar, Indonesia

ABSTRACT

Background: Breastmilk is an important nutrient for newborn baby that can improve health and reduce morbidity so the babies are expected to achieve an optimal growth and development according to their abilities so that later they can become a nation's successor with high quality and competitiveness. However, giving exclusive breastfeeding based on The "Basic Health Research" is increasingly alarming, namely the average coverage of exclusive breastfeeding in 2013, which was 67.80% and decreased by 61.0% in 2014. Ministry of Health of Republic of Indonesia in 2017 set a target of achieving 44% Exclusive Breastfeeding, but the achievement was 35.7%.

Purpose: Knowing the effect of Vitamin A and Zink Intake for Breastfeeding Mothers on Infection in Infants in the Sudiang Raya Health Center.

Method: This research was an survey with cross sectional design. Sample were breastfeeding mother that selected by simple random sampling. The collected data were analyzed using contingency coefficient.

Result: In general breastfeeding mothers get less vitamin A and zinc. The frequency of infection was twice that of 59.79 percent. The results of the Spearman test showed p-value = 0.000, with a correlation coefficient marked negative, so it was concluded that the intake of vitamin A breastfeeding mothers correlated with the frequency of infectious diseases in infants.

Conclusion: Reduced intake of vitamin A will have an impact on increasing the frequency of infections in infants.

Keywords: *Vitamin A, Zinc, Breastfeeding, Infection, Infant*

INTRODUCTION

Exclusive breastfeeding is very useful for reducing child morbidity and improving maternal health, in accordance with one of the goals of the Sustainable Development Goals (SDGs), which is to ensure that children consume exclusive breastfeeding during the first 6 months after birth. Mother's milk not only provides benefits for 'mother and baby health', but also has high economic and practical value. In addition, breast milk

contains important nutrients that can improve health and reduce infant morbidity, so that they can achieve optimal growth and development according to their abilities, so that later they can become qualified future generations and have high competitiveness and productivity⁽¹⁾.

Children who get breast milk early, generally have a better immune system than those who do not get breast milk. Children who are not breastfed, their development is hampered, or the quality of their development is not optimal⁽²⁾.

The percentage of exclusive breastfeeding in infants 0-6 months in Indonesia in 2013 was 54.3% (lower than the condition in 2012, which was 48.6%). The coverage of exclusive breastfeeding for infants aged 0-6 months in South Sulawesi Province is 56.02%. The percentage coverage of exclusive breastfeeding in 2013 at Sudiang was 40.13%. The percentage of exclusive breastfeeding

Corresponding Author:

Lydia Fanny

Paccerakkang Street, Km: 14, Number: 77,

Paccerakkang, Biring Kanaya,

Makassar, Indonesia, 90241

Email: lydiafanny90@yahoo.com

for infants 0-6 months in the work area of community health centers in Makassar in 2011 was 36.8%, in 2012 it was 63.7% and in 2013 it was 67.8%. This achievement is lower than the target of the National Development Program and National Strategy⁽³⁾. In 2015, the Ministry of Health of the Republic of Indonesia had set a target for achieving exclusive breastfeeding as outlined in the strategic plan. The target of exclusive ASI achievement in 2017 was 44%, but the national achievement was only 35.7%^{(4),(5)}.

Based on the explanation above, it is important to conduct research on the effect of intake of Vitamin A and zinc for breastfeeding mothers on the incidence of infection in infants in the Sudiang Raya Health Center, Makassar.

MATERIALS AND METHOD

The design of this study was cross sectional, which was conducted in the Paccerrakkang Daya Village, Makassar. The sample was selected using a systematic sampling technique with the help of random number tables. The variables in this study were: 1) intake of vitamin A and zinc for breastfeeding mothers, obtained through interviews, with the help of food recall = 3x24 ja; 2) the incidence of infection in infants obtained through filling in questionnaires. Data was collected by trained enumerators with an educational background in Applied Nutrition Bachelor, Makassar Health Polytechnic graduates. Categorical data types are presented in the form of frequency and percentage⁽⁶⁾, then analyzed using the contingency coefficient test.

FINDINGS

Distribution of vitamin A and zinc intake from breastfeeding mothers is presented in Table 1 and Table 2. It appears that in general breastfeeding mothers get less vitamin A and zinc.

Table 1: Distribution of Vitamin A Intake of Breastfeeding Mothers

Vitamin A Intake	Frequency	Percentage
More	8	8.25
Sufficient	9	9.28
Less	80	82.47
Total	97	100.00

Table 2: Distribution of Vitamin A Intake of Breastfeeding Mothers

Zinc Intake	Frequency	Percentage
More	0	0.00
Sufficient	0	0.00
Less	97	100.00
Total	97	100.00

The distribution of incidence of infection in infants is presented in Table 3. It appears that the frequency of infection was twice that of 59.79 percent.

Table 3: Distribution of Twice Infections in Infants

The incidence of infections	Frequency	Percentage
Never	17	17.53
Once	7	7.22
Twice	58	59.79
Thrice or More	15	15.46
Total	97	100.00

Table 4: Effect of Vitamin A Intake of Breastfeeding Mothers on the Incidence of Infection in Infants

No.	Vitamin A Intake	The Incidence of Infection in Infant				Total
		Never	Once	Twice	≥ Thrice	
1.	Less	1 (1.3%)	7 (8.8%)	57 (71.3%)	15 (18.8%)	80 (100%)
2.	Sufficient	9 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	9 (100.0%)
3.	More	7 (87.5%)	0 (0.0%)	1 (12.5%)	0 (0.0%)	8 (100%)
Total		17 (17.5%)	7 (7.2%)	58 (59.8%)	15 (15.5%)	97 (100%)
Spearman Rank ($\alpha = 5\%$)		p-value = 0.000, r = - 0.368				

Based on Table 4 it is known that the results of the Spearman test showed p-value = 0.000, with a correlation coefficient marked negative, so it was concluded that the intake of vitamin A breastfeeding mothers correlated with the frequency of infectious diseases in infants. In this case, reduced intake of vitamin A will have an impact on increasing the frequency of infections in infants.

DISCUSSION

In general, breastfeeding mothers in Paccerrakkang Daya Village get less vitamin A. Low vitamin A intake often occurs in developing countries. Lack of intake of vitamin A will reduce the body's resistance to infectious diseases and cause growth delay⁽⁷⁾. Vitamin A has an important role in maintaining health and survival. Vitamin A deficiency in children will increase the risk of infectious diseases, increase mortality, and cause growth delay. Vitamin A content in breast milk is influenced by maternal vitamin A intake, both in terms of quantity and quality.

Vitamin A also supports the function of vision, reproduction, growth, immunity, and plays an important role in the differentiation, proliferation and delivery of signals in cells. Vitamin A, protein and zinc are related to one another in order to support the process of growth and development⁽²⁾. Research on breastfeeding mothers in Brazil, showed that serum retinol was higher in the group given vitamin A intake than the group that carotenoid intake⁽⁹⁾. In his research, Zakaria reported that referring to recommended daily needs, breastfeeding mothers' intake of vitamin A was in the less category⁽¹⁰⁾.

The results showed that all mothers experienced a lack of zinc intake. Similar results were reported by Chen Halijao that zinc consumption in the nursing mothers group was lower than the nutritional adequacy rate⁽¹¹⁾. In his research, Zakaria also reported that zinc intake in nursing mothers was lower than recommended daily needs⁽¹⁰⁾.

Zinc has an important role in various functions in the body. In the metabolic process, zinc plays a role in reactions related to the synthesis and degradation of carbohydrates, proteins, fats, nucleic acids, and vitamin A. Zinc acts as an integral part of the enzyme DNA polymerase and RNA polymerase. Zinc is needed to stabilize the DNA binding protein structure by regulating gene expression. Zinc is part of the collagenase enzyme, which plays a role in the degradation of collagen⁽¹²⁾.

Zinc deficiency due to lack of food intake and bioavailability is still a problem in developing countries including Indonesia. The result will affect the composition of nutrients in breast milk which ultimately affects the quality of the milk.

The results showed that the frequency of infection was the most twice (59.8%). Problems with malnutrition

and malnutrition are directly affected by food consumption and infectious diseases; and indirectly by parenting, food availability, socio-economic, cultural and political factors⁽¹³⁾.

Nutrients are very important for life. Nutrient deficiency in children can cause several negative effects such as slow body growth, more susceptibility to disease, decreased health status and mental disruption of children. Lack of consumption of nutrients can cause serious problems, namely death in children⁽¹⁴⁾.

One nutrient that is very influential on the immune system is vitamin A and zinc. Both work together to help increase a child's immunity⁽⁸⁾. If the intake of vitamin A is given in sufficient quantities when the child is in an infectious condition, then vitamin A will fight the infection, resulting in a decrease in the degree of infection⁽¹⁴⁾.

This is consistent with research conducted on children aged 6-24 months. The results of the study showed that there was a decrease in the incidence of diarrhea/infection in children who were given zinc supplementation, vitamin A and multi micronutrients, so that death could be prevented⁽¹⁶⁾.

Zinc and beta-carotene supplements in pregnant women will affect the development of newborn immunity and significantly affect the decrease in the incidence of morbidity in infants⁽¹⁷⁾.

CONCLUSION

Vitamin A intake can reduce the frequency of infectious diseases in infants in Paccerrakkang Daya Village, Makassar, Indonesia.

Source of Funding: Authors

Ethical Clearance: Yes

Conflict of Interest: No

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Knowledge, Attitudes towards Health Insurance, Eradication of Mosquito Breeding Places and the Incidence of Dengue Hemorrhagic Fever in Badung Regency

I Nyoman Gede Suyasa¹, Ni Made Sirat¹, Ni Luh Putu Yuniarti Suntari¹, I Nyoman Wirata¹

¹Health Polytechnic of Denpasar, Indonesia

ABSTRACT

People who have health insurance feel comfortable and safe because their health is protected. If they are hospitalized, there is an institution that pays, so that efforts to prevent themselves from becoming sick are forgotten. People are reluctant to take preventive measures, such as being lazy to eradicate mosquito nests. The purpose of this study was to analyze the relationship between knowledge, attitudes towards health insurance, eradication of mosquito breeding places, and the incidence of dengue hemorrhagic fever in Badung Regency. This type of research was observational, involving 330 people as sample selected by cluster sampling. The cluster number was 10, each cluster consisted of 33 respondents. The cluster was selected using the Probability Proportional to Size (PPS) technique. Data were collected through filling out questionnaires and then analyzed using multivariate statistics. The results showed that there was a positive correlation between knowledge and attitude and the incidence of dengue hemorrhagic fever; negative correlation between knowledge and attitude with the act of eradicating mosquito nests; and a negative correlation between action and the incidence of dengue hemorrhagic fever. It is hoped that the community will be more active in doing voluntary work or cleaning the environment periodically, both weekly and monthly.

Keywords: *Dengue hemorrhagic fever, Mosquito breeding places, Eradication, Health insurance, Knowledge, Attitude*

INTRODUCTION

National Health Insurance provides several benefits for the community, namely affordable premiums, the existence of quality control and cost principles, is a social health insurance that guarantees the certainty of sustainable health service financing, as well as social health insurance that can be used in all regions of Indonesia^{(1),(2)}.

Community behavior is a person's response to stimuli related to illness and disease, health care systems, food, and the environment. There are passive human responses such as knowledge, perception, and attitude; some are active⁽³⁾. Public knowledge about the

National Health Insurance is very minimal, especially in the periphery areas need to be solved gradually. In overcoming this problem, government policies on health must be carefully determined, so that investments made so far do not become futile⁽⁴⁾.

In Indonesia, until now dengue haemorrhagic fever is still a major health problem. Since it was first reported in Jakarta and Surabaya in 1968, the incidence of this disease is increasing and spreading throughout Indonesia⁽⁵⁾. The regions with the highest morbidity are Java, Bali and parts of the island of Borneo. *Aedes aegypti* has several characteristics, which are only able to live at a temperature of 8 °C to 37 °C, on the body there are silvery white or yellowish white spots⁽⁶⁾.

The Badung District Health Office reported that cases of dengue fever in Badung Regency were included in the high category, with 2178 cases in 2015, with deaths of 6 people, with IR 0.3%. As of the end of July 2016 there were 2751 cases, with 10 deaths, with IR 0.4%⁽⁷⁾.

Corresponding Author:

Name: I Nyoman Gede Suyasa
Health Polytechnic of Denpasar, Indonesia
Jl.Sanitasi 1, Sidakarya, Denpasar, Indonesia, 80224
Email: suyasanyomangede@yahoo.co.id

People who have become members of the National Health Insurance program feel comfortable and safe because their health is protected or guaranteed, so in their thinking, if they are sick or hospitalized, there are institutions that pay. With the existence of such thoughts, then there is one aspect that is forgotten, namely prevention of self so as not to experience health problems or suffer from disease. The community becomes lazy to take actions that can prevent the occurrence of illness, such as lazy to eradicate mosquito breeding places in order to prevent the incidence of dengue fever.

The statement of the problem in this study is: Is there a correlation between knowledge, attitudes toward health insurance with the eradication of mosquito breeding places and the incidence of dengue hemorrhagic fever in Badung Regency? The purpose of this study was to analyze the relationship between knowledge, attitudes towards health insurance, eradication of mosquito breeding places, and the incidence of dengue hemorrhagic fever in Badung Regency.

MATERIALS AND METHOD

This research was carried out in Badung Regency, Bali Province, Indonesia in 2017. This study was observational research that examined programs that had been carried out by the government⁽⁸⁾. The sample was 330 people selected by cluster sampling technique. The cluster number was 10, each cluster consisted of 33 respondents. The cluster (Table 1) was selected using the Probability Proportional to Size (PPS) technique, using software⁽⁹⁾.

Table 1: List of Selected Clusters

Cluster	Name of Village
1	Abiansema
2	Bongkasa
3	Darmasaba
4	Mengwi
5	Kapal
6	Kuta
7	Kerobokan
8	Tibubeneng
9	Unggasan
10	Jimbaran

The independent variable in this study was knowledge and attitudes towards national health insurance, the intermediate variable was the act of eradicating mosquito breeding places, while the dependent variable was the incidence of dengue hemorrhagic fever. Data were collected through filling out questionnaires. The categorical data were presented in the form of frequency and percentage⁽¹⁰⁾, then analyzed using multivariate statistics.

FINDINGS

Description of Knowledge and Attitude toward Health Insurance, The Act of Eradicating Mosquito Breeding Places and The Incidence of Dengue Hemorrhagic Fever

Table 2: Distribution of Knowledge about Health Insurance

Knowledge about Health Insurance	Frequency	Percentage
Good	309	93.64
Not Good	21	6.36

Table 3: Distribution of Attitude toward Health Insurance

Attitude toward Health Insurance	Frequency	Percentage
Good	273	82.73
Not Good	57	17.27

Table 4: Distribution of The Act of Eradicating Mosquito Breeding Places

The Act of Eradicating Mosquito Breeding Places	Frequency	Percentage
Good	127	38.48
Not Good	203	61.52

Table 5: Distribution of The Incidence of Dengue Hemorrhagic Fever

The Incidence of DHF	Frequency	Percentage
Not Occur	156	47.27
Occur	174	52.73

Referring to table 2 to table 5, the majority of people had a good level of knowledge and attitude towards

health insurance, but the act of eradicating mosquito breeding places tend to be not good, and more dengue fever occurs.

HYPOTHESIS TESTING RESULTS

Table 6: The Correlation between Knowledge about Health Insurance, Attitude toward Health Insurance, The Act of Eradicating Mosquito Breeding Places and The Incidence of Dengue Hemorrhagic Fever

Correlation	r	p-value
Knowledge–The Act of Eradicating Mosquito Breeding Places	-0.597	0.000
Knowledge–The Incidence of Dengue Hemorrhagic Fever	0.694	0.000
Attitude–The Act of Eradicating Mosquito Breeding Places	-0.545	0.000
Attitude–The Incidence of Dengue Hemorrhagic Fever	0.676	0.000
The Act of Eradicating Mosquito Breeding Places–The Incidence of Dengue Hemorrhagic Fever	-0.835	0.000

Table 6 shows that each correlation test produces p-value <0.05; so it was concluded that all correlation test results were significant.

DISCUSSION

The majority of respondents' knowledge about national health insurance is in the good category. This can be seen from the National Health Insurance participants who generally come from communities with sufficient economic levels, the community has a culture of saving in preparation for the occurrence of illness, there are still people who think that the National Health Insurance is not a government program to seek profits, and there are people who do not know about the principles of National Health Insurance that are applied such as mutual cooperation, without seeking profit, sustainable social security, and compulsory participation for all Indonesian people.

Knowledge is the result of knowing, which occurs after a person has sensed a particular object⁽¹¹⁾. Knowledge is also an effort that underlies a person to think scientifically, while the level depends on the knowledge or basic

education of the person concerned⁽¹²⁾. Thus, knowledge can be influenced by education, experience, age, economic status, information, environment and culture.

The results showed that knowledge of national health insurance correlated negatively with the eradication of mosquito breeding places. This shows that respondents' knowledge of national health insurance is good, the community feels comfortable and safe when they have health insurance, so they forget to take preventive measures to avoid dengue fever. With these findings, it is expected that the community will be more active in carrying out mutual cooperation activities to eradicate the breeding of mosquitoes.

Community attitudes towards national health insurance are generally in the good category. Most people who already have a national health insurance card. But there are also people who do not have a National Health Insurance card. They did not immediately register themselves as national health insurance participants, even though the conditions needed were easily obtained. There are also people who consider that it is still difficult to obtain national health insurance registration requirements. On the other hand there are also people who consider that national health insurance is not a public health insurance.

Actually, people already know about national health insurance even though there is little information that can be absorbed by the community. Many people still think that national health insurance can be taken care of suddenly when it is needed to get medical check up or to pay for expensive treatment; whereas national health insurance has 6 principles, namely mutual cooperation, non-profit, portability, mandatory participation principle, trust fund, and the results of the management of social security funds⁽¹⁾.

Attitude is a feeling of supporting (favorable) or not supporting (unfavorable) such as readiness to react in a certain way if the individual is faced with a stimulus that requires a response⁽¹³⁾.

The results showed a negative correlation between attitudes towards national health insurance and eradication of mosquito breeding sites. This shows the attitude of the people who are lazy to carry out mutual cooperation activities to clean the mosquito breeding grounds. The community considers that if they suffer from dengue fever, there is already health insurance

that covers the funding at the hospital. It is hoped that the community will continue to increase its awareness through health education, so that they can prevent dengue fever by eradicating mosquito breeding sites.

With the national health insurance program, community actions to eradicate mosquito breeding sites are in the “not good” category. Perception is a process in a person in understanding the situation or situation in his environment, which involves organizing and interpreting as a stimulus in a psychological experience. Perception is formed in a process with sufficient time to produce a response. Perception can help someone to choose and interpret something that is felt or seen as a complete and meaningful form, such as an action that appears⁽¹⁴⁾.

The results showed that there was a negative correlation between eradication of mosquito breeding sites and the number of people affected by dengue fever in one house. This shows that the eradication of mosquito breeding sites plays an important role in the prevention of dengue fever. The more inactive in carrying out mutual cooperation activities to clean the environment, the more chance for dengue hemorrhagic fever to occur.

Based on the results of this study, it is expected that the community will be more active in carrying out voluntary work activities to eradicate mosquito breeding sites, coupled with activities to close water reservoirs, bury containers and drain water reservoirs. Community service activities to clean the environment can be done in the yard, in public places, schools and others; periodically every week or monthly.

CONCLUSION

The results showed that in Badung Regency, the incidence of dengue hemorrhagic fever was related to the eradication of mosquito breeding sites. Knowledge and attitudes towards national health insurance have weakened the eradication activities of mosquito breeding sites, due to a tendency to rely on the existence of health insurance.

Source of Funding: Author

Ethical Clearance: Yes

Conflict of Interest: No

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The Anachronism of the Indonesian Social Security Policy in Health

Arief Budiono¹, Absori², Harun², Heru Santoso Wahito Nugroho³, Khudzaifah Dimiyati², Ayesha Hendriana Ngestiningrum³, Wafda Vivid Izziyana¹

¹Muhammadiyah University of Ponorogo, Indonesia; ²Muhammadiyah University of Surakarta, Indonesia;

³Health Polytechnic of Surabaya, Indonesia

ABSTRACT

The rights for social security can be found in the 1945 Constitution of Republic of Indonesia, Article 34 section (2) which reads “The state develops a social security system for all citizens and empowers the weak and the poor according to the human dignity”. With the purpose of achieving every citizen’s rights for social welfare as stated in the Mandate of the Constitution, so the Constitution No. 40 year 2004 on the JKN (National Social Security) and the Constitution No. 24 year 2011 on the Social Security Administering Body are issued as the legal protection of the National Social Security System and the National Healthcare Security in Indonesia. The implementation of National Healthcare Security is rather problematic. Some complaints of the BPJS (Social Security Administering Agency) participants regarding the BPJS-Health include rejections form health facilities or health workers to the BPJS patients with various reasons. A protruding problem is the minimum activation number or the BPJS waiting period for social welfare participants. This results to the citizens’ violation of rights in receiving healthcare services form the social security program.

Keywords: *Anachronism, Social security, Healthcare security, Indonesia*

INTRODUCTION

A country that adheres to social welfare is absolutely obliged to have an integrated system of social security for its citizens, this is because the welfare rights is one of the most pivotal aspects that one citizen can have⁽²⁾. The implementation of social security program is one of the responsibilities and obligations of the state, as mandated by the constitution, to provide social economic protection to its citizens⁽³⁾. Especially for those whose welfare reaches the minimum standard and even socially impoverished⁽⁴⁾.

The state protects its citizens from social distresses which are caused by wage payment termination (unemployed), termination of employment, disability, aging, death, etc. The said protection is given to the

community members through certain programs such as reimbursement of healthcare costs, child support, family allowances and others⁽⁵⁾.

According to Anies Baswedan as quoted by Dinna Wisnu, “The state was established with a common promise to promote public welfare. The Social Security System is built to ensure that the said promise is able to be fulfilled to each citizen. The management of the social security system with the principles of good governance is the key”⁽⁶⁾. Some of the opinions of the scholars above always involve citizen welfare as one of the aims in establishing a particular state⁽⁷⁾.

The Indonesian State Constitution has mandated the state administrators to carry out a particular social security on a national scale with the intention that each Indonesian citizen is able to reach the good standard of health and welfare for both themselves and their family and also the mandates regarding the implementation of the social security system.

Thus, one of the tasks of the state of Indonesia is the implementation of social security for each and every

Corresponding Author:

Arief Budiono
Muhammadiyah University of Ponorogo, Indonesia
Budi Utomo Street, 10, Ponorogo, Indonesia
Email: ariefbudiono@umpo.ac.id

citizen as mandated in Article 28H section (3) regarding the rights to social security and Article 34 section (2) in the Constitution of the Republic of Indonesia of 1945, and Decree of The People's Consultative Assembly of the Republic of Indonesia contained in Number X/MPR/2001, which assigns the President to establish a National Social Security System in order to provide a comprehensive and an integrated social protection. The ratification of the Constitution Number 24, 2011 concerning BPJS is in the juridical formal manner a manifestation of the constitution mandate regarding social security for Indonesian citizens. The Constitution No. 24 year 2011 also stipulates that the National Social Security Policy will be held by a public organization named BPJS which consists of BPJS-Health (focusing in Healthcare Security) and BPJS-Labor (focusing in Labor Security)⁽¹⁾.

BPJS-Health as the sole provider of JKN turned out to run and work things in such a slow pace due to the huge workload it borne. Organizing JKN to hundreds of millions of people in an area as large as Indonesia is not an easy nor a simple matter. The state has obligations (State Obligation) to take a role in facilitating and securing each citizens' rights fairly to be able to implement social security to all citizens which would also be the dream of Indonesia's Founding Fathers⁽⁸⁾.

The citizens are expected to obtain the JKN they deserve. JKN is expected to reduce health costs which is relatively expensive. To the citizens who are not supported by JKN and suffer from illness, it will bring them farther from prosperity and closer to the poverty instead⁽⁸⁾.

The implementation of JKN by BPJS is problematic and full of conflicts. Among the complaints from BPJS participants to BPJS-Health is the occurrence of rejection from health facilities or health workers for various reasons. One of the prominent problems is the minimum activation number or the BPJS waiting period of social security participants, which causes violations to citizen rights in obtaining services from the social security program. Constitution of the National Social Security System mandates the state to be involved in this matter.

Asih Eka Putri, who is a member of National Social Security Boards believes that the seven-day waiting period as stipulated in the BPJS Health Regulation No. 4, 2014 needs to be criticized. Moreover, if the participant who has registered and paid the initial premium suffers

an emergency situation which requires an immediate aid. "It is potentially resulting in the violation of rights and it is against the law regulations above it," she stated during the interview.

This waiting period is also highlighted by Nasruddin, "Public service is supposed to be able to be provided immediately. After the citizens register, they will be able to instantly obtain the service. A solution must be sought so that BPJS-Health program will be able to run continuously with no violation of the participants' rights," advised Nasruddin⁽¹⁰⁾. This issue is one small example of the problems of JKN which occurred in the field.

There is a difference between the BPJS policies as the JKN organizer and the citizens who are the JKN participants and also the providers of the health facilities. Upon setting the priorities between these three parties, the citizens are always put in a disadvantageous position which results in an imbalance of the citizens' bargaining position⁽¹¹⁾.

The law and the authorities are misused in the implementation of JKN. This denies the principle of the National Social Security itself, namely the principle of equity as explained in the UU-SJSN Article 19 section (1), which states that, "The principle of equity is the equality in obtaining services according to one's medical needs regardless of how the amount of premium they pay." Which means, the citizens are served not based on the cost (premium) they pay but based on the health services they need.

MATERIALS AND METHOD

As a scientific endeavor, the method is a way of working which aims to understand the objects that is a subject of the said relevant science⁽¹²⁾. This research uses a mixed method approach or collaborative, with the normative or doctrinal juridical approach which is connected or which supports the sociological juridical approach (non-doctrinal). This research uses secondary and primary data, through library research and field studies, and data analysis with qualitative analysis⁽¹³⁾. According to Denzin and Lincoln as quoted by Ayu⁽¹⁴⁾ it is stated that qualitative research is the research which uses natural settings, aimed to interpret phenomena which occur and carried out by involving various existing methods.

Approaches on this research includes: Conceptual Approach, Statute Approach, Comparations Approach also Sociological Approach.

FINDINGS AND DISCUSSION

JKN policies and implementations in Indonesia have many problems, because the National Healthcare Security program, known as JKN, is a policy which violates the principle of equity. This principle means that citizens are served not based on the fees (premium) they pay, but based on the health services they need.

The problems of JKN participants are such as being denied by Health Facilities and having modestly treatments according to the JKN class they had. These are the excesses from the application of the INA CBG's policy (Indonesian Case Base Groups). Article 39 of 2016's Presidential Decree Number 19 concerning Healthcare Insurance contains provisions that BPJS-Health (which focuses on Healthcare Security) applies Indonesian Case Base Groups system (INA CBG's). The INA CBG's system follows the prospective payment system. It is a method of payment made for health services, which the amount is already known before the health services are provided.

Article 39 Paragraph 1 states that, "BPJS-Health makes payments to first-level health facilities pre-emptively based on the capacity of registered participants' amount at first-level health facilities". Article 2 states that, "BPJS-Health makes payments to first-level Health Facilities pre-emptively based on the capacity of registered participants' amount at first-level Health Facilities. Article 3 then states that, "BPJS-health makes payments to advanced level of Health Referral Facilities based on the Indonesian Case Based Groups (INA-CBG)'s method".

The policy concept of INA CBG's in the Presidential Decree itself brings a big problem regarding the citizens' constitutional rights. The problem is when there are patients who are required to be treated with better health services and it exceeds the amount of payment that must be paid by BPJS to Health Service Providers in INA CBG's.

These problems result in disruption of health services for BPJS patients to undergo maximum treatment because the BPJS budget limit is lower than the health care needs. Yet the citizens have the right to

obtain good service and it is the government's obligation is to provide the best quality of public services⁽¹⁵⁾.

This indicates that private health services have not received nor served the health social insurance owners provided by the government. Therefore, to support social security, there needs to be a synergy between government-owned and private-owned health services. There needs to be a legal protection and incentive awards to attract private-owned health services to actively support the SJSN-Health⁽¹⁶⁾. So far, it appears that private institutions tend to be reluctant in getting involved because there is a range of gaps between the real needs that are spent and the costs that can be claimed through INA CBG's, which causes losses to private health facilities.

The application of INA CBG's with a minimum tariff range certainly makes the people as BPJS users the victims. Health facilities and hospitals often refuse JKN-BPJS patients with reasons such as the treatment room is full. It is caused by the JKN fees determined through the INA CBG's policy which cannot meet the real costs of patient treatment.

Another problem is the JKN system. This is the matter of fact that the JKN system is still based on premium payments and it has caused the Constitution No. 40/2004 on the National Social Security System to have its constitutionality criticized. The provisions for compulsory premium payments to obtain social security are considered as a harm to JKN's constitutional rights and equity principles.

The premium payment to JKN organizers can be considered as an exploitation of the people. Moreover, JKN services are no longer based on health service needs but based on the amount of premium payments. Compulsory premium payments for all citizens, regardless of their socio-economic status, for all social security programs held by the government have obscured the social security and the social insurance⁽¹⁷⁾.

The next problem that cannot be resolved is that the coverage of JKN participants cannot reach the UHC (Universal Health Coverage)'s expected target, which is all residents should be covered by JKN as of January 1st, 2019. In fact, the participation of JKN users only reached 77 percent nationally⁽¹⁸⁾. This is because the JKN system follows an active registration system (meaning citizens must register and it is not automatically granted by the state) which is based on contributions. Hence, residents

in remote areas, who are far from the city, are not yet covered by JKN, as they do not know about the JKN program. Furthermore, Indonesia's social security system will run more effectively if the government or the state implements an automated system and uses the service of coming for citizens to join the JKN registration.

Health insurance or health care insurance is an effort to create a risk pooling, which is to transfer personal risk into group risk so that there is a sharing of risk. In health insurance, the community shares the costs through a system of preemptive contributions⁽¹⁹⁾. The state's responsibility in developing a national social security system is really off the hook. The national social security system implemented with an insurance scheme or social insurance releases the state obligations and is then charged to the people.

It is ironic when the people are burdened with the obligation to develop JKN, and on the other hand the government is reluctant to give or to allocate more budget for health. The health budget in the APBN is only about 0.84% - 1.85% from 2002-2012 from the total of the state budget⁽²⁰⁾. The small allocation indicates that the government actually does not have serious intentions in developing the JKN system. Hence, they choose a system or policy that transfers obligations from the government to citizens

CONCLUSION

Indonesia's policy of national social security system, especially the National Healthcare Security is an anachronism because INA CBG's policies are not in accordance with the Cost Recovery Rate (CRR) or the real cost of health services given by hospitals or health facilities. This condition makes JKN participants being rejected or being given modestly services by hospitals or health facilities. The application of INA CBG's also violates the rules and principles of JKN, namely equity or JKN participants are given services not based on the amount of payment contributions yet based on the services required.

Another problem is that UHC coverage is only 77% as of January 2019 even though the target given by law is 100% UHC as of January 1st, 2019. The UHC target is missed because JKN applies an active registration system in which citizens must register for JKN services and not an automatic system where every citizen is automatically registered in JKN.

The contribution-based JKN system and policy, and INA CBG's were implemented in order to cover the small commitment of Indonesian government in implementing JKN. The government is reluctant to provide or to allocate a higher budget for health. The health budget in the national budget is only about 0.84% to 1.85% from 2002-2012 from the total of the state budget. The small allocation indicates that government does not actually have serious intentions in developing the JKN system. Hence, they choose a system or policy that transfers obligations from the government to citizens.

Source of Funding: Authors

Ethical Clearance: Yes

Conflict of Interest: No

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Effect of Alkaline Water Consumption on Decreasing Blood Sugar Levels of Diabetes Mellitus Patients

Dwi Agustanti¹, Purbianto¹

¹Health Polytechnic of Tanjungkarang, Indonesia

ABSTRACT

Day by day the number of patients with diabetes mellitus is increasing. In this case, patients must always take medication in order to control their blood sugar levels. In the community, it was found that there were still many patients who were unable to control their sugar levels because they were bored to take medical drugs. One alternative therapy that has become a trend now is to consume alkaline water (pH = 8.5 - 9.5). The purpose of this study was to determine the effect of alkaline water consumption on blood sugar levels of diabetes mellitus patients in the working area of Tulang Bawang 1 Health Center, Tulang Bawang Regency. This research was a pre-experimental study with one group pre-post test design approach. The population of this study were all people suffering from diabetes mellitus in the work area of the Tulang Bawang 1 Health Center, with a population size of 86 people. The sample size was 50 people selected by purposive sampling technique. The collected data was presented descriptively in the form of mean values, then the hypothesis was tested using T-Test. The mean blood sugar levels of the patients before being given the intervention were 285.58 gr/dl. The mean blood sugar levels of the patients after being given the intervention (2 liters of alkaline water for 1 week) were 233.34 g/dl. It was known that there has been an average decline in blood sugar levels of 51.84 gr/dl. T-test shows that p-value was 0.000 (<0.001), so it was interpreted that alkaline water consumption can reduce blood sugar levels in diabetes mellitus patients in the working area of Tulang Bawang 1 Health Center, Tulang Bawang Regency. It is recommended that further research be carried out to find out more about the most effective fluid time and volume. In addition, people are expected to consume alkaline water as an alternative therapy in order to control blood sugar levels.

Keywords: *Diabetes mellitus, Blood sugar, Alkaline water*

INTRODUCTION

Indonesia is currently experiencing a double burden of diseases, namely non-communicable diseases and infectious diseases. The main non-communicable diseases include hypertension, diabetes mellitus (DM) cancer and chronic obstructive pulmonary disease (COPD)⁽¹⁾. According to the World Health Organization (WHO) report, from the estimation of the International Diabetes Federation (IDF), there were 382 million people living with diabetes in 2013. By 2035, this

number is expected to increase to 592 million⁽²⁾. The prevalence of DM in Indonesia is based on the results of Basic Health Research in 2012 which was 1.1% and in 2013 increased to 2.4%. In addition, mortality due to diabetes mellitus in the 45-54 year age group in urban areas is ranked second, namely 14.7%, while in rural areas, DM is ranked sixth, namely 5.8%⁽³⁾. DM prevalence in Lampung Province based on the results of Basic Health Research has increased. The prevalence of DM for ages > 15 years according to a doctor's diagnosis or according to existing symptoms, based on the results of Basic Health Research is 0.5% percent in 2012, then increased to 0.8% in 2013⁽³⁾.

Corresponding Author:

Dwi Agustanti
Health Polytechnic of Tanjungkarang, Indonesia
Jl. Soekarno-Hatta, 1 & 6, Bandar Lampung, Indonesia
Email: dwiagustanti@poltekkes-tjk.ac.id

DM complications can be either acute complications or chronic complications. Acute complications include hypoglycemia, diabetic ketoacidosis and non ketotic hypermolar, whereas chronic complications include macrovascular complications, microvascular

complications and neuropathy⁽⁴⁾. Complications of DM have started early before the diagnosis of DM is established. About 50% of patients when diagnosed with DM, have suffered one chronic complication, 21% of them have retinopathy, 18% have abnormal ECG images and 14% have impaired blood flow to the legs so that the pulse of the leg is not palpable or ischemic in the limbs arises. Various complications of DM will reduce life expectancy by about 15 years, 75% of them die from macrovascular complications.

Apart from complications, another problem faced by DM patients is high maintenance costs. According to Hartini, in developed countries such as the United States in 2011, the total health budget spent on dealing with DM was US \$ 174 billion for 25.8 million people suffering from DM. WHO estimates that the majority of countries around the world spend 2.5 to 15 percent of their health budget for DM. In 2006, the ROSSO study (Retrospective Study Self-Monitoring of Blood Glucose and Outcome in People with type 2 Diabetes) by Weber, reported that expenditure by DM patients increased year by year, along with the rate of complications experienced. In the first year after being diagnosed, DM patients spend IDR 18.3 million a year, up to IDR 49.1 million in the eighth year⁽⁵⁾.

To avoid complications and expensive maintenance costs, it is necessary to manage DM in an integrated manner called the pillar for managing diabetes. The four pillars of DM management are: 1) diet, 2) physical exercise, 3) pharmacology or drug use, 4) education. DM management aims to provide support for DM patients to live with a risk of minimal or no risk of complications, with specific targets for blood sugar, fat and body weight. For pharmacological management of DM, chemical drugs or herbal medicines can be used. Herbal medicines that are well-known to the public include pare/*Momordica charantia*, Garlic/*Allium sativum*, Lager flower/*Lemia stroemia speciosa pers*), acupunctur, acupressure, therapeutic aroma and alkaline water.

Herbal therapies using alkaline water are currently in great demand by the public, because they only drink water. Alkaline water or hydrogen-rich water, is currently a trend in medical practice in Indonesia. The basis used in this therapy is that hydrogen contained in water will enter the body and bind various harmful substances such as free radicals⁽⁶⁾.

Ionized alkaline water is known to act as an antioxidant because it can prevent oxidative stress from

the body's cells by exposure to oxidants every day, which can continue to damage various levels of cells⁽⁷⁾.

Tulang Bawang 1 Health Center is one of the health centers in Tulang Bawang Regency, Lampung Province, Indonesia, with the highest number of DM diseases compared to other health centers in the Tulang Bawang Regency. This disease is always included in the top 10 non-communicable diseases that people often complain about. Based on data from Tulang Bawang 1 Health Center, it was found that the number of DM patients in 2015 was 67 and increased in 2016 to 86⁽⁸⁾. Based on the results of interviews with 20 DM patients who came for treatment at the Tulang Bawang 1 Health Center in July 2017, all patients said that they had to take DM drugs and inject insulin continuously. This causes boredom, so patients sometimes ignore the obligation to take DM medication, which results in uncontrolled blood sugar levels. They want another alternative treatment to control blood sugar levels easily, cheaply and practically.

MATERIALS AND METHOD

The type of this research was quasi-experimental with the design of "The One Group Pre-Test and Post-Test". This research was conducted on 13 to 20 November 2017 in the working area of Tulang Bawang 1 Health Center, Tulang Bawang Regency, Lampung Province, Indonesia. The population of this study was all DM patients in the working area of Tulang Bawang 1 Health Center, with a population size of 86 people⁽⁸⁾. The sample size was 50, which was calculated based on the unpaired categorical analytic formula. The sample was chosen by purposive sampling technique. The collected numerical data was presented descriptively in the form of mean scores⁽⁹⁾, then the hypothesis was tested using T-Test.

FINDINGS

The results of random blood sugar levels were explained before and after alkaline water therapy was given (Table 1 and Table 2).

Table 1: Distribution of results of random blood sugar levels before alkaline water therapy

Variable	Mean	SD	Min	Max
Random Blood Sugar	285.58	87.462	201	570

Based on table 1 it is known that the average random blood sugar level was 285.58 mg/dl. In general, before

being given alkaline water therapy, people with DM had blood sugar levels ≥ 200 gr/dl.

Table 2: Distribution of results of random blood sugar levels after alkaline water therapy

Variable	Mean	SD	Min	Max
Random Blood Sugar	233.74	79.378	96	460

Based on table 2 it is known that the average random blood sugar level was 233.74 mg/dl. It appears that there was a decrease in blood sugar levels after being given alkaline water therapy.

Table 3: Distribution of Random Blood Sugar Check Results Before and After Given Alkaline Water Therapy

Random Blood Sugar	Mean	SD	SE	P-value	n
Before	285.5	87.46	13.36	0.000	50
After	233.7	79.37	11.226		

Based on table 3, it can be seen that the mean results of random blood sugar examination after being given alkaline water therapy were lower than the average blood sugar level before being given therapy. The t-test results showed p-value = 0.000 so it was concluded that there was an effect of giving alkaline water to random blood sugar levels of DM patients.

DISCUSSION

The results showed that before being treated with alkaline water, all DM patients had random blood sugar levels > 200 mg/dl. Price and Wilson state that DM is a chronic hyperglycemia condition that affects the entire body system. This situation is caused by factors that inhibit the work of insulin or the amount of insulin decreases⁽⁴⁾. According to Smeltzer and Bare, DM is a group of heterogeneous disorders characterized by hyperglycemia or increased levels of glucose in the blood. Glucose normally circulates in a certain amount in the blood. Glucose is formed in the liver from food consumed. DM is characterized by an increase in random blood glucose ie > 200 mg/dl (11.1 mmol/L). In DM patients, the body's ability to react to insulin can decrease, or the pancreas can stop insulin production altogether. Insulin is a hormone produced in the pancreas, which functions to control glucose levels in the blood by regulating its production and storage⁽⁴⁾.

Based on the results of one study it was also known that the average blood sugar level of DM patients before being given alkaline water therapy was 285.58 mg/dl, while the average blood sugar level after being given alkaline water therapy for one week with a volume of 2 liters per day was 233.74 mg/dl. It was seen that there was a decrease in the average blood sugar level of 51.84 mg/dl.

According to Angela, alkaline water with a pH of 8.5 to 9.5 produced by ionizers can help alkalizing body tissues so that it can improve overall health. This alkaline water helps rinse acidic waste from around the pancreas and from inside the body. In addition, alkaline water also provides ionized calcium, which can prevent excess buildup of protein in the blood vessels. Alkaline water serves as an alternative therapy in managing DM patients with high blood sugar levels⁽¹¹⁾. According to Jatmiko, complementary therapies that can be used for the treatment of DM are alkaline water, which is currently a trend in medical practice in Indonesia. The basis used in this therapy is the entry of hydrogen contained in water into the body and binding various harmful substances such as oxygen radicals⁽⁶⁾.

The results of this study are in line with the results of a study conducted by Gadek, which provides alkaline water to DM patients⁽¹²⁾. The results of this study indicate that 45% of patients experienced improvements in HbA1c and blood sugar. In fact, he reported that Number Need to Treat (NNT) is 4, which means that it requires the consumption of alkaline water in 4 patients to reduce HbA1c levels and blood sugar in 1 patient. The results of this study are also in line with the results of a study conducted by Li et al., that alkaline water is able to protect pancreatic β cells from damage after consuming alloxan. He concluded that alkaline water might be useful for preventing Type I DM⁽¹³⁾.

In this study, consumption of alkaline water is done by using it as a substitute for daily drinking water for 1 consecutive week, with a dose of 2 liters per day will cause changes in blood sugar levels. The majority of DM patients after being given alkaline water experienced a decrease in blood sugar levels, 40% of respondents even the results of examination of blood sugar levels showed normal values (<200 mg/dl). This shows that consumption of alkaline water has a positive impact on decreasing blood sugar levels in patients with diabetes mellitus.

The results of this study are in line with Wahyuningtiyas's statement that alkaline water is an antioxidant because it can reduce and prevent oxidative stress from body cells by exposure to oxidants every day,

which can continue to damage various levels of cells. Apart from being an antioxidant, because the content of water molecules is relatively smaller, water molecules will be easier to diffuse into cells. Thus, the cell hydration process will be easier to occur⁽⁷⁾.

Kajiyama conducted a study of DM patients who were given alkaline water. He concluded that alkaline water supplementation may have a beneficial role in the prevention of Type 2 DM and insulin resistance⁽¹⁴⁾.

It is assumed that alkaline water can help regulate the absorption of blood sugar into the body through the work of the pancreas. Alkaline water has a high pH, which means it can neutralize acidic conditions in the body because the size of small molecular clusters of water in alkaline water is easier to use by cells in order to help hydrate and remove acidic toxins. At the same time, alkaline water contains bicarbonate ions which are very easy to use by the pancreas to help work the pancreas. The pancreas plays an important role in helping to maintain the alkalinity in the body, alkaline water can help the pancreas work, namely by helping maintain the pH balance of body fluids and improve the work of the pancreas in producing insulin, resulting in a decrease in blood sugar levels.

Based on the results of the study, it is known that some DM patients after being given alkaline water still have high blood sugar levels. This may be caused by several factors: 1) the blood sugar level before therapy is already too high, so that the time of 1 week and the liquid volume of 2 liters per day is insufficient to reduce blood sugar levels to normal conditions; 2) non-compliance with DM patients in maintaining their diet, this can be caused by low educational background and advanced age, so that there is difficulty in absorbing the information given; 3) inability to cope with stress, as described above that stress will trigger the organs of the body to improve its work, thus affecting the imbalance of acid base and fluid in the body.

CONCLUSION

Based on the results of the study concluded that alkaline water therapy can reduce blood sugar levels in DM patients. Thus, consumption of alkaline water can be considered as an alternative therapy for DM patients.

Source of Funding: Authors

Ethical Clearance: Yes

Conflict of Interest: No

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Family Support for Diabetes Self-care Behavior in T2DM Patients who Use Herbs as a Complementary Treatment

Anita Joeliantina¹, Mangestuti Agil², M. Bagus Qomaruddin³, Kusnanto⁴, Oedojo Soedirham³

¹Health Polytechnic of Surabaya; ²Faculty of Pharmacy, ³Faculty of Public Health, ⁴Faculty of Nursing, Airlangga University

ABSTRACT

This study aims to identify family support for the use of herbs as complementary treatments based on diabetes self-management in regulating blood sugar levels in patients with Type 2 Diabetes Mellitus (T2DM) in Surabaya City East Java Indonesia, using cross-sectional approach. Participants were collected from 7 public health center in Surabaya using simple random sampling with a sample size of 230. Data were collected with a questionnaire, then analyzed using PLS. The indicator of characteristic of disease and family support had factor loading >0.6. There was influence of disease characteristics and family support on the use of herbs. The use of herbs had an effect on blood sugar regulation. Family support was necessary for patients to keep diabetes self-management when T2DM patients use herbs.

Keywords: *Complementary treatment, Diabetes self-management, Family support*

INTRODUCTION

Patients with T2DM aware of his illness after his body was damaged due to an increase in blood glucose levels. They are often diagnosed with T2DM after complications occur. Some of the major risk factors that can trigger T2DM disease include obesity, incorrect diet, and lack of activity⁽¹⁾. DM can lead to macrovascular and microvascular disorders such as cardiovascular disease, nephropathy, retinopathy and neuropathy⁽²⁾.

The prevalence of DM in Indonesia was ranked seventh along with China, India, USA, Brazil, and Mexico. The percentage of deaths due to DM in Indonesia is the second highest after Sri Lanka⁽¹⁾. T2DM patients should carry out the treatment relating to the control of blood sugar. Medical treatment given to T2DM patients are oral hypoglycemic medications that can trigger insulin secretion, improve insulin sensitivity, gluconeogenesis inhibitors and alpha glucosidase inhibitors. In addition to oral hypoglycemic drugs, patients may also be given an insulin injection as indicated⁽³⁾.

Treatment of T2DM patients should be implemented for life. Medications used by T2DM patients, not only in conventional medicine, but there are patients using complementary medicine. There is a growing trend around the world for patients with T2DM to use or choose complementary and alternative medicine (CAM) in order to improve their health status. Complementary medicine is used together with conventional medicine, not as a substitute for conventional treatment^{(4),(5)}. Ching research results showed the prevalence of CAM use in Malaysia is still high⁽⁵⁾. Research Niswha et al.⁽⁶⁾ shows the results of the high use of herbs as a complementary treatment by diabetic patients in outpatient departments Hospital of Banda Aceh Indonesia.

CAM in Indonesia has been regulated in Regulation of the Minister of Health of the Republic of Indonesia No.1109/MENKES/PER/IX/2007. Complementary medicine is currently applied to public health center in Surabaya which already has a traditional treatment that is in 20 public health centers and Dr. Soetomo hospital. Health care center provided is socialization about the use of herbs, acupuncture and acupressure. Nurses as part of health professionals authorized to conduct complementary and alternative nursing management in performing their duties as a nursing care provider in the field of public health efforts⁽⁷⁾.

Corresponding Author:

Anita Joeliantina
Health Polytechnic of Surabaya
Pucang Jajar Tengah Street-56, Surabaya, Indonesia
Email: anitajoeliantina@yahoo.com

Treatment is part of a component of self-care behaviors, in addition to diet, activity, self-monitoring of blood sugar levels, and reduced risk of complications behavior. Diabetes self-management behavior should be conducted regularly to prevent acute complications and long-term complications, so it needs the support of relatives of patients with T2DM⁽⁸⁾. Factors affecting the implementation of self-care are called basic conditioning factors, such as age, gender, developmental status, health status, socio-cultural orientation, health care system, family system, lifestyle, environment and availability of resources^{(9),(10)}.

Family support is attitudes, actions and family acceptance of family members. Family support, consisting of emotional support, informational support, tangible support, appraisal support^{(9),(11),(12)}. Hensarling divides family support into 4 dimensions: empathetic, encouragement, facilitative, and participative. Referring to Misra & Lager⁽¹³⁾ on 180 adult patients with T2DM in Texas found that high levels of social support can increase patient acceptance of the disease and may reduce the perceived difficulty in self-care behaviors ultimately leads to improved quality of life of patients.

In relation to complementary medicine, family support affects a person to choose CAM on the type of biological treatment and body manipulation⁽¹⁴⁾. People with a positive attitude to CAM and those with a high family support were more likely to use CAM and more involved in self-care behaviors⁽¹⁵⁾. Joeliantina et al. showed that family support for T2DM patients who used herbs as complementary medicine was to give patients permission to use herbs as a treatment, to remind their medication schedule and control, to deliver patients to health facilities, and to help prepare herbal preparations⁽¹⁶⁾. Social support is an important thing that encourages one to behave in a positive manner and perform effective treatment in acute and chronic diseases⁽¹⁷⁾.

The purpose of this study was to identify family support for diabetes self-care behavior in T2DM patients who use herbs as a complementary treatment to regulate modified blood sugar levels from self care nursing theory developed by Dorothea Orem. Family support and disease characteristics as the basic conditioning factors that affect the implementation of self-care.

MATERIALS AND METHOD

This study used cross sectional approach. Sample size was 230 T2DM patients, based on the rule of thumb

(5-10 times the number of parameters studied), selected using simple random sampling. The first step in taking the samples were randomly select 7 public health centers that have a traditional treatment services in Surabaya, then determine the sample according to predefined criteria. The inclusion criteria were patients with T2DM >1 year, in stable condition, age: 30-70 years, and using herbs for ≥ 2 months.

Data were collected in 2016 by a questionnaire. The instrument consisted of: disease characteristics, family support, diabetes self-care behavior, and blood sugar levels. Disease characteristics were about the complications, complaints, duration of disease, hereditary history, and drug administration. The family support was developed from the Hensarling Diabetes Family Support Scale (HDFSS)⁽¹⁸⁾ and Nursalam⁽⁹⁾, consisting of emotional support, informational support, and facilitative support. The diabetes self-care behavior developed from The Summary of Diabetes Self Care Activities (SDSCA) from Toobert⁽¹⁹⁾. The SDSCA was including diet, exercise, blood glucose testing, medication, and foot care. Data were analyzed using Partial Least Square (PLS).

FINDINGS

Outer Model: Convergent validity can be seen from factor loading and t-value. Based on Table 1, indicators that did not meet the convergent validity was X1.5 (factor loading <0.6).

Table 1: Outer Model

Indicators	Factor Loading	Description
X1.1 (Complication)	0.792418	Valid
X1.2 (Complaints)	0.789718	Valid
X1.3 (Duration of disease)	0.769163	Valid
X1.4 (Hereditary history)	0.666363	Valid
X1.5 (Drug administration)	0.204204	Not valid
X2.1 (Emotion)	0.912298	Valid
X2.2 (Informative)	0.914639	Valid
X2.3 (Facilitative)	0.908323	Valid
X3.1 (Diet)	0.770285	Valid
X3.2 (Activity and exercise)	0.745200	Valid
X3.3 (Monitoring)	0.808843	Valid

Conted...

X3.4 (Complementary treatment)	0.783761	Valid
X3.5 (Decreasing risk of complications)	0.768219	Valid
Y (Blood glucose level)	1.000000	Valid

All the indicators that make up each construct X1, X2, and X3 had a value greater than the factor loading with other constructs. This shows that the latent

constructs predict the indicator on the block they are better than the indicator in the other blocks.

The construct validity can be seen from AVE (Average Variance Extracted). The adequacy of good validity if it >0.5. The reliability of the constructs was measured using the composite reliability or Cronbach's alpha. All composite reliability were >0.70 and Cronbach's alpha were >0.6, so it can be concluded that X1, X2, and X3 had good reliability (Table 2).

Tabel 2: AVE, Composite Reliability, and Cronbach's Alpha

Constructs	AVE	Composite Reliability	R Square	Cronbachs Alpha
X1	0.465786	0.795344		0.680040
X2	0.831301	0.936641		0.898629
X3	0.601466	0.882911	0.555243	0.834216
Y	1.000000	1.000000	0.666465	1.000000

The indicators of disease characteristics (X1.1, X1.2, X1.3, X1.4), family support (X2.1, X2.2, X2.3), and the use of herbs (X3.1, X3.2, X3.3, X3.4, X3.5) have met the requirements of convergent validity, construct validity, discriminant validity, and reliability.

Inner Model: Structural model analysis (Figure 1) was done through 2 stages: goodness of fit and hypothesis testing.

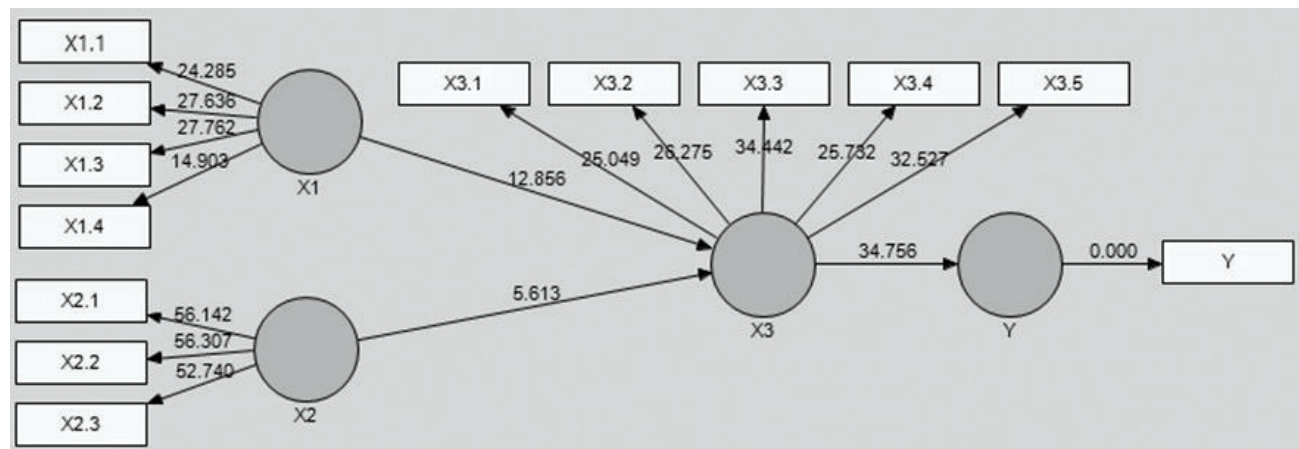


Figure 1: The Inner Model

Goodness of fit test can be seen from: coefficient of determination (R^2), Predictive Relevance (Q^2), and Goodness of Fit Index (GoF). R Square, which means variability X3 (The use of herbs) which could be explained by X1 and X2 was 55.5%, while 45.5% was explained by other variables. Predictive relevance test aims to determine the predictive ability of the family support model for the use of herbs based on diabetes self-management to regulate blood sugar levels. $Q^2 = 1 - (1 - R^2_1)(1 - R^2_2) = 1 - (1 - 0.555243)(1 - 0.666465) = 0.851658$ (the prediction results from the model of family support for the use of

herbs based on diabetes self-management has a good predictor ability, because 85.17% this model can be explained by the variable characteristics of disease and family support). The calculation of GoF result was AVE average (0.725) and R^2 average (0.611). After calculation, the result of $GoF = 0.665$. The result of T-test were 12.856, 5.612, and 34.756 (>1.96), so it could be concluded that disease characteristics, family support had an effect on the use of herbs as complementary medicine based on diabetes self-management, and the use of herbs as a complementary treatment affect the regulation of blood sugar levels.

DISCUSSION

This study identified disease characteristics and family support as a factor that influences the use of herbs as complementary treatments that are integrated into diabetes self-management to regulate blood sugar levels.

Complications experienced were hypertension, cataracts, gangrene, increased-cholesterol, hypoglycemia, mild-stroke, coronary-heart and nerve-disorders. Patients with complications had good herbal treatment behaviors. This is consistent with the study of Gao et al. that complicated DM patients have an increase in self-care behavior because of better physician communication with those without complications. DM patients usually require a doctor's advice to treat the disease⁽²⁰⁾. According to Khalil et al., the history of complications affects patients in choosing complementary and alternative treatments⁽²¹⁾.

Patients who have complications carrying out complementary herbal remedies by trying herbs of more than one type. In accordance with the healer shopping theory developed by Kroeger, during illness, the patient is likely to seek a second healer, without reference from the first healer⁽²²⁾. Similarly, T2DM patients have a tendency to do complementary herbal^{(4),(5)}.

Patient complaints in this study have an effect on the behavior of herbal use. Complaints experienced is the body felt weak or tired, trembling, pain in the body, unable to sleep at night, chest thumping and tingling in the legs. Patients who have a complaint tend to use self-care based complementary herbs, as patients consider complications, so they have high vigilance to manage the disease. Basity and Iravani Research showed that the presence of complaints affecting DM-patients in implementing disease management. Complaints that often felt by DM-patients are frequent urination, extreme thirst and hunger, difficulty working or walking for long periods, stiffness, tingling, numbness, feeling tired and weak, heaviness in the head, and slow wound healing⁽²⁴⁾.

The results of this study are consistent with previous research conducted by Ceylan that diabetes duration affected the use of CAM⁽²⁵⁾.

T2DM patients who have a family history of T2DM had an effect on herbal use behavior. Hereditary history was 56.4% from mothers, 26.4% from fathers, and 17.2% from both. Patients with a family history have

a tendency to choose a self-care based complementary herbal, because the patient feels a serious problem. This is in accordance with research Vazini & Barati, that family history with DM associated with increased self-care. The presence of family history resulting in the involvement of the patient's family in managing the disease and being alert in observing the possibility of DM complications⁽²⁴⁾.

Adherence to the use of herbs as a complementary treatment has an effect on the regulation of blood sugar. Compliance of patients to use herbs is based on the dosage of medicinal drug use coupled with the use of herbs. The regularity of medical treatment should be used according to the dosage prescribed by the doctor, while the regularity of herbal use is based on the frequency of use that is consumed daily according to the rules. The combination of conventional and complementary treatments was believed to produce better results than conventional therapy, especially the reduction of negative side effects⁽²⁶⁾.

T2DM patient response was a feeling of change such as the body feeling good, healthy, blood sugar go down, do not feel weak, feet do not pain, and do not tingling. This is consistent with the previous studies that the response of DM patients using herbs is feeling healed, no complications, increased health status, and lower blood sugar levels^{(5),(29)}.

T2DM patients use herbal medicine as their 2nd choice. According to Kroeger, the behavior is known as healer shopping conducted by patients to overcome the complaints of the disease. Patients with chronic disease have a tendency to seek treatment for more than one treatment regardless of the first treatment^{(22),(30)}.

T2DM patients who received family support when using herbs had good blood sugar. Delamater shows that families have an important role in the management of DM. Family involvement in mentoring, giving input and reminders of patients to obey the management of DM. Family members will more easily receive information, if the information is supported by other family members⁽³¹⁾.

CONCLUSION

Family support influence the behavior of the use of herbs as a complementary treatment based diabetes self-management need to be developed to achieve the regulation of blood sugar levels of T2DM patients.

Regulation of blood sugar levels of T2DM patients optimally can be achieved if the patient can use herbs that is integrated into diabetes self-management comprehensively, precisely and regularly. Family support is indispensable for patients to continue to implement diabetes self-management when T2DM patients use herbs.

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The Influence of Knowledge, Attitude and Action on Family Health Tasks in Controlling Hypertension through the *Germas* Approach

Lembunai Tat Alberta¹, Dwi Utari Widyastuti¹

¹Health Polytechnic of Surabaya

ABSTRACT

One of the government's efforts in controlling hypertension, among others, is by launching the *Germas* (Healthy Living Movement) through activities: increasing physical activity, consumption of vegetables and fruits, regular health checks and not smoking. Through its tasks in the health sector, families are expected to be able to apply early to all family members about how to control hypertension through *Germas*. This study was to analyze the effect of knowledge, attitudes and actions on the implementation of family health tasks in controlling hypertension. This study used a cross sectional design conducted where subjects consisted of 120 family heads/family members. Data on knowledge, attitude, action, implementation of family health tasks in controlling hypertension through the *Germas* approach were obtained. Almost all subjects had good knowledge in the category, most of them had an attitude in the good category, most of them had an action in the sufficient category. This study shows a significant influence of knowledge, attitude and action on the implementation of family health tasks in controlling hypertension.

Keywords: *Germas, Knowledge, Attitude, Action, Family health tasks, Hypertension*

INTRODUCTION

Family as the smallest unit in community is an important component in the effort to succeed the government program in realizing a healthy Indonesian society. Through its duties in the field of health, families are expected to be able to apply early to all members of their families regarding healthy lifestyles, especially those related to improving health and preventing disease. In addition, the family also plays a role in providing support to sick family members through environmental modifications and facilitating relationships with health facilities.

Hypertension is a condition where there is an increase in blood pressure in the arteries and is one of the conditions that usually precedes heart and blood vessel disease. In the early stages of the course of hypertension, often have no symptoms even though they have been diagnosed with hypertension. This causes the patient not to seek treatment

immediately, resulting in hypertension will develop and cause heart disease, blood vessels, kidney failure and stroke. This in addition to causing prolonged suffering to the sufferer will also cause high health costs to be incurred. WHO⁽¹⁾ reports that among non-communicable diseases the burden of heart and blood vessel disease ranks highest at 36.7 trillion USD. The increase in the prevalence of hypertension from year to year is caused by an increase in the population, also due to unhealthy lifestyles such as an unhealthy diet where there is a lack of fruit and vegetable consumption, lack of physical activity, smoking habits and lack of public awareness to check health and control blood pressure if you have been diagnosed with hypertension. Hypertension control aims to help lower blood pressure and maintain blood pressure under normal circumstances⁽²⁾.

One of the government's efforts in controlling hypertension is by launching the *Germas* through activities: increasing physical activity, consumption of vegetables and fruits, regular health checks and not smoking. *Germas* to control hypertension is packaged in the form of integrated and conceptual activities that must be carried out by all members of the community so that hypertension can be prevented, and if it has been diagnosed with hypertension, blood pressure can be

Corresponding Author:

Lembunai Tat Alberta

Health Polytechnic of Surabaya

Pucang Jajar Tengah Street-56, Surabaya, Indonesia

Email: albertalembunaitat@gmail.com

controlled so as not to cause more severe complications. As the smallest unit of the community, the family has responsibility for controlling hypertension through the implementation of family health tasks including knowing family health problems, deciding on appropriate actions, caring for family members who experience health problems, modifying the environment that supports health and utilizing health facilities⁽³⁾. Through his duties in the field of health, the family is expected to be able to apply early to all family members about how to control hypertension through the *Germas* by: increasing physical activity, consumption of vegetables and fruits, regular health checks and not smoking. This study aims to explain the model of the implementation of family health tasks in controlling hypertension through the *Germas* approach.

MATERIALS AND METHOD

The design of this study was a cross sectional, conducted in the general polyclinic and elderly *posyandu* (Integrated Service Post) in the Pucang Sewu Health Center in July 2018. The population were all families who went to the health center in July to August 2018. The sample size was 120 people, selected by non random sampling. Data of knowledge, attitude, action and family tasks in controlling hypertension were obtained by interview using a questionnaire. The data collected was categorical data so it was presented in the form of frequency and percentage⁽⁴⁾, then analyzed using Partial Least Square (PLS).

FINDINGS

Table 1 shows that some families had good levels of knowledge, good attitude and action in enough categories.

Table 1: Distribution of Knowledge, Attitude and Action toward Hypertension

Variable	Frequency	Percentage
Knowledge		
Good	112	93.3
Enough	7	5.8
Less	1	0.8
Attitude		
Good	62	51.7
Enough	52	43.3
Less	6	5.0

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Action		
Good	30	25.0
Enough	66	55.0
Less	24	20.0

Table 2: Distribution of Family Tasks in Controlling Hypertension through the *Germas* Approach

Family Task	Frequency	Percentage
Physical activity		
Good	50	41.7
Enough	61	50.8
Less	9	7.5
Consuming fruit vegetables		
Good	51	42.5
Enough	65	54.2
Less	4	3.3
A routine control approach		
Good	57	47.5
Enough	57	47.5
Less	6	5.0
A non-smoking approach		
Good	52	43.4
Enough	61	50.8
Less	7	5.8

Table 2 shows that the results of the PLS between knowledge, attitude and action towards the implementation of family tasks through the *Germas* approach showed a significant effect with t-value of 10.614 (>1.96).

DISCUSSION

Family Knowledge, Attitude and Action Toward Hypertension: The level of knowledge about hypertension tends to be in the good category, not different from the report of Sinuraya, that the trend is in good category⁽⁵⁾, while different from the report of Omoyeni et al.⁽⁶⁾ and Kiliç et al.⁽⁷⁾, which tended to be in the enough category. The level of knowledge about hypertension is the ability to mention, explain correctly about hypertension. Knowledge is influenced by, experience, level of education and sources of information⁽⁸⁾. The level of knowledge about hypertension that tends to be

high in this study, can be related to the characteristics of respondents who are mostly over 50 years old, the level of education is dominated by high school.

Family attitudes toward hypertension tend to be dominated by good categories, these results do not differ from the report of Susiati et al, that attitudes tend to be positive⁽⁹⁾. Karamoy et al. got different results, that attitudes tended to be in the enough category⁽¹⁰⁾. Attitude is a reaction or response that is still closed from someone to a stimulus. Attitude is a level of affection that has a tendency to be both positive and negative. Attitudes cannot be directly seen, but can only be interpreted in advance of closed behavior⁽⁸⁾. The tendency towards a positive attitude in this study is probably due to the age of the respondents who are mostly >50 years old. Things that relate to one's psychological attitude towards the stimulus that is available, are the level of maturity.

Family actions towards hypertension tend to be in enough category, different from the report of Angkawijaya et al.⁽¹¹⁾ and Firmansyah et al⁽¹²⁾, mostly in the good category. Another trend is the most dominant factor associated with family support in primary prevention of hypertension is a factor of family practice. Actions are responses to active and observable stimuli. To be able to realize an action, supporting factors or a condition that is needed include facilities and support from other parties. To be able to take good action it is necessary to get support for both facilities and family and environmental support. Support from health facilities is mostly good, but support from family and environment is still in sufficient category, so that family actions in controlling hypertension are mostly sufficient.

Implementation of Family Duties in Controlling Hypertension through *Germas* Approach: Controlling hypertension through physical activity shows that the results are mostly enough. Physical activities carried out by workers <600 MET (Metabolic Equivalent Task)/week, risk 1.25 times greater suffering from hypertension than workers with physical activity >600 MET/week. MET score is a physical activity carried out continuously for 10 minutes or more in each activity. Physical activity reduces the risk of hypertension by reducing vascular resistance and suppresses the activity of the sympathetic nervous system and the renin-angiotensin system⁽¹³⁾. Physical activity for >30 minutes every day of the week is a major protective factor against the development of hypertension⁽¹⁴⁾. Increasing the number of sufficient

categories on family duties in controlling hypertension through physical activity, due to age characteristics family that is mostly >50 years old. Physical activity requires great intention and will, besides having to have a strong physique. Another possibility is that the family does physical activity but the type, frequency and duration of physical activity are not the same as those written on the research instrument.

Controlling hypertension through consuming vegetables shows that most results are enough. Lack of consumption of vegetables and fruit is a factor that contributes to the development of hypertension. This is related to the level of Potassium which serves to prevent narrowing of the arteries (atherosclerosis). Thus the artery wall remains elastic and optimizes its function so that it is not easily damaged due to increased blood pressure. An increase in potassium levels can increase intra-cellular fluid concentration and then attract extracellular fluids which have an impact on decreasing blood pressure⁽¹⁵⁾. Consumption of fruit <2 servings/day at 1.01 times the risk of hypertension. Consumption of vegetables <3 times a day has a risk of 1.04 times suffering from hypertension⁽¹³⁾.

Controlling hypertension through a routine control approach is in the good and enough category. Overall, almost 37% of Indonesian adults with hypertension are aware of their condition, significantly more women (43%) will have hypertension compared to men (30%). Greater awareness in urban areas than in rural areas. Among all hypertensive sufferers, 25% have taken hypertension drugs and significantly more women than men. Of all hypertensive patients who received treatment, blood pressure control was reached 25% (27% male, 24% female). Overall adequate blood pressure control is reached around 9%, occurs more in women than men⁽¹⁶⁾. Health facilities in this case the health center is a technical implementing unit that has authority and responsibility for public health maintenance in the area it works. Health services provided by health center are comprehensive health services which include curative, preventive, promotive and rehabilitative. The function of the health center in addition to providing direct health services to the community also provides guidance to the community⁽¹⁷⁾.

Controlling hypertension through the no smoking approach tends to be in the sufficient category. Dwi Jatmika found a different reality where the results of the study were dominated by less behavior (66.67%).

Negative attitudes were also shown by respondents in research on smoking behavior in hypertensive patients in Sidokarto village, Yogyakarta⁽¹⁸⁾. If you have a smoking habit 52.2% suffer from non-smoking hypertension 27.7% suffer from hypertension⁽¹⁹⁾. Every day smokers are at risk of hypertension 1.38 times compared to nonsmokers. Whereas ex-smokers have OR 0.66 which means quitting smoking is a protective factor against the development of hypertension⁽¹³⁾. Smoking cessation behavior is influenced by: education and history of other diseases⁽²⁰⁾. The high prevalence of hypertension is lack of awareness of treatment, low level of education, lack of consumption of fruits and vegetables, lack of physical activity⁽²¹⁾. General risk factors for hypertension: age, sex, smoker, drinking alcohol, lack of physical activity, time and sleep quality, diet, obesity⁽²²⁾. Family health workers in controlling hypertension through a non-smoking approach, are generally sufficient. This is related to the sex characteristics of the family, most of whom do not generally have a smoking habit. Ideally the family health task in controlling hypertension through a non-smoking approach is good, but there are still families who do not understand the dangers of smoking for patients with hypertension in particular and for the community at large.

There is an influence between predisposing factors on family duties in controlling hypertension through the *Germas* approach. Predisposing factors consist of personal knowledge, attitudes, beliefs, skills and references. Knowledge plays an important role in building a person's behavior. Knowledge of respondents can be obtained both internally, namely knowledge originating from itself based on others. One way to obtain knowledge according to Notoatmodjo is based on personal experience. This experience is a source of knowledge or experience that is a way to obtain the truth of knowledge. Personal experience which is a way to gain knowledge, then experience can be a reference for acting in health. Respondents can see other people affected by hypertension.

To be able to carry out family duties in controlling hypertension, knowledge from the family is needed, if the family has good knowledge then it can administer family duties. Judging from the factors that influence knowledge, one of them is the educating factor, from 120 respondents almost half of them educated high school, the higher the level of education, the easier it is for someone to understand knowledge.

CONCLUSION

Knowledge, attitude and action affect the implementation of family tasks in controlling hypertension through *Germas* approach in Pucang Sewu Health Center, Surabaya.

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Student Centered Learning as a Method to Increase Clinical Competencies of Nursing Students at Health Polytechnic of Jakarta I, Indonesia

Mumpuni¹, Uun Nurulhuda¹, Tutiany¹, Dewi Purnamawati²

¹Department of Nursing, Health Polytechnic of Jakarta I; ²Department of Nursing, Health Polytechnic of Mataram

ABSTRACT

Competency of the fresh graduate nursing school remain got complains from the user of nursing services, especially in the hospital. This study aimed to identify the dominant factor upon the clinical competency of student of Nursing School of Health Polytechnic of Jakarta I. The research design was quasy-experimental with t-test and linear regression. Sample were 72 students. Data were collected using questionnaires, then analyzed using the paired sample t-test. Based on t-test result, there was a significant difference in clinical competencies between pre and post intervention of clinical coaching in the hospital. It could be concluded that student centered learning method is significant in increasing clinical competencies of students.

Keywords: *Nursing, Student centered learning, Clinical competencies*

INTRODUCTION

The development of clinical knowledge and nursing skills depends on learning process and clinical experience^{(1),(2)}. Students achievement in clinical learning process was influenced by methods of clinical teaching methods⁽³⁾. Students have higher motivation and satisfaction upon the application of Student Centered Learning (SCL) method⁽⁴⁾, furthermore SCL method could increase the comprehension and retention upon the subject of study⁽⁵⁾.

The improving of skills and attitude needs clinical learning experience to be conducted in proper way on the setting of professional nursing care as real condition. In addition, its necessary to provide constructive environment for supporting learning process for the candidate of nursing. All of the factors above need a supporting set for achieving skills and competency as the previous setting goal.

Learning practice provided students an opportunity to gain learning experience in proper setting of clinical environment as the theory expectation. Current technology and the ability to bring learning to the students offer a platform for providing alternative learning approaches⁽⁶⁾. The students need to get real clinical experience of becoming a nurse in the clinical setting through actual activity in the clinical setting⁽⁷⁾. The students willing to be able to practice their skills to develop the future role in the ward, develop the comperehension about the health regulation system and develop the relationship among the nurse and patient.

MATERIALS AND METHOD

Quasy experiment was used as design of this study. The population of this study were the nursing students in Health Polytechnic of Jakarta I in 2016. The sample size was 72 students. The intervention was clinical coaching with SCL method. Before and after giving the intervention, testing the competency of students through filling out the questionnaire. The collected data were in the form of competency score (numerical) so that they were presented in the form of the mean, minimum, maximum and standard deviation⁽⁸⁾, then hypothesis testing was done using the paired sample t- test.

Corresponding Author:

Mumpuni
Health Polytechnic of Jakarta I,
Wijaya Kusuma Raya Street, No. 47, Jakarta, Indonesia
Email: mumpuni@poltekkesjakarta1.ac.id

FINDINGS

Table 1: The Distribution of Characteristics of Respondents

Variable	Intervention		Control		Total	
	f	%	f	%	f	%
Sex						
Male	1	2.8	1	2.8	2	2.8
Female	35	97.2	35	97.2	70	97.2
Type of School Background						
Science	25	69.4	22	61.1	47	65.3
Social science	2	5.6	5	13.9	7	9.7
Health	9	25	9	25	18	25
Hospital Homebase						
<i>Pasar Minggu</i> Hospital	13	36.1	0	0	13	18.1
<i>Persahabatan</i> Hospital	23	63.9	0	0	23	31.9
RSCM Hospital	0	0	36	100	36	50.0

Based on Table 1, the most of the respondents were female and had school background of science.

Table 2: Competence of Nursing Students Before and After Administration of SCL Method

Competence of Nursing Student	Mean	SD	Paired Sample T-test			
			Mean	SD	t	p-value
Pre-test Score	56.43	9.52	-2.76	10.74	-0.24	0.032
Post-test Score	59.19	8.76				

Based on Table 2, it is known that the p-value of the T test results was 0.032, so it was interpreted that there was a significant difference between the competency scores before and after being given coaching using the SCL method.

DISCUSSION

The results showed that there were differences in nursing student competencies between before and after being given coaching using the SCL method. In this case the post coaching competency score is higher than the previous score. This shows an increase in clinical competency scores after the implementation of the SCL method. The results of this study are in line with Biggs' report that students who undergo clinical learning are student-centered and can get learning processes and results in depth⁽⁹⁾. Tiwari et al. also reported the same thing that the SCL method made students get a deep learning experience so that they could improve the development of their abilities⁽¹⁰⁾.

In his research on the implementation of student-centered learning for students in nursing schools in Maryland, Distler concluded that students need to do a lot of preparation to enter the clinical practice environment, so that there is no gap between on-campus nursing education and hospital nursing practice. In this case, one important method is to give pre-test to nursing students before conducting clinical practice activities. Distler also recommends the need to inform all components of educational organizations that will change the learning method in the curriculum, so that changes can occur constantly⁽¹¹⁾.

The limitation of this study are: 1) Researcher could not control the equation of hospital homebase which used for a period of 4 weeks clinical practice; there are 3 different hospital which has different facility and equipment, where as the control hospital homebase is level "A" with has predicate as national referral hospital, well organized management and advance case of patient if compared with the intervention hospital homebase; 2) Perception of the clinical coach about the evaluation of

clinical competency are not same, emerging difference of perception of students about the role of clinical instructor along their clinical practice.

CONCLUSION

Based on the results of the study it can be concluded that SCL is an effective learning method to improve the clinical competence of nursing students as a preparation for practice after graduation later.

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Ethical Clearance: The ethical clearance taken from Ethical Committee of Health Research, Health Polytechnic of Jakarta I.

Conflict of Interest: All authors jointly state that there is no conflict of interest relating to part or all of the research and publication activities.

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The Factors Making the Law Protection for the Patients of Esthetic Beauty Clinic in Indonesia not fulfilling Citizen's Constitutional Right

Siska Diana Sari¹, I Gusti Ayu Ketut Rachmi Handayani¹, Pujiyono¹

¹Sebelas Maret University

ABSTRACT

Considering Article 28 H of the fourth amendment to the Republic of Indonesia's 1945 Constitution, there is citizen's constitutional right, the right to health and to get healthcare service. Therefore, all healthcare services should fulfill right and obligation of service provider and patient, and medical service standard. Esthetic beauty clinic as a private health service should fulfill it compulsorily. This article studied the factors making the law protection for the patients of esthetic beauty clinic in Indonesia not fulfilling yet the citizen's constitutional right. This study was conducted on stakeholders of esthetic beauty clinic in five provinces in ten cities of Indonesia, using empirical qualitative method. The result of research showed that the factors the law protection for the patients of esthetic beauty clinic in Indonesia not fulfilling yet the citizen's constitutional right.

Keywords: *Law protection, Esthetic beauty clinic*

INTRODUCTION

Considering Article 28 H of the fourth amendment to the Republic of Indonesia's 1945 Constitution⁽¹⁾, there is citizen's constitutional right, the right to health and to get healthcare service. Trend and standard applying to women today is to have bright white face and thin or slim body. Women become afraid of being apparently old. It is relevant to the finding of study in China, showing *that 80% of Asian consumers consider skin whitening to be the most important property of skincare cosmetics, and more than 50% considers their anti-aging effect to be important*⁽²⁾. It makes investors compete for opening beauty clinic business to bring the wish to follow trend into reality.

In addition to global beauty trend, metrosexual phenomenon with its consumptive behavior now triggers the development of body treatment business

as well⁽³⁾. Metrosexual men are *women-oriented men*⁽³⁾. Furthermore, metrosexual man is described as the man loving not only himself but also the big city's lifestyle he is undertaking on his last leg. Metrosexual men are also depicted as a normal or straight, sensitive, and educated figure but they emphasize more on their feminine side. Kartajaya⁽⁴⁾ suggested the characteristics of metrosexual men: generally living and staying in big cities where it is of course related to the opportunities of accessing to information, having intercourse and lifestyle undertaken clearly affecting their existence; coming from the rich class and having much money because they need much money to support the lifestyle they undertake

MATERIALS AND METHOD

The objective of research was to study the factors making the law protection for the patients of esthetic beauty clinic in Indonesia. This study employed empirical qualitative method and sociolegal research. The author collected primary data through observing and interviewing owners, managers, physicians, beauticians, nurses, pharmacists, clients (users) and government institutions.

Corresponding Author:

Siska Diana Sari

Sebelas Maret University

Ir. Sutami Street 36, Surakarta, Indonesia

Email: siskadianasari@gmail.com

FINDINGS AND DISCUSSION

Healthcare Service: The word service in the 5th edition of Online Indonesian Language Big Dictionary (KBBI)⁽⁵⁾ is defined as a way of serving or service, a business of catering to others' need with (monetary) reward; service, the facilities provided in relation to product or service buying and selling. Meanwhile, medical service is defined as the service an individual receives in relation to prevention, diagnosis, and treatment of health disorder.

Considering the national health system, cosmetic service is a part of the first stratum individual health attempt. The Ministry of Health of Republic of Indonesia is actually aware of such condition recalling the problem development and the tendencies of health development in the future and bringing the Ministry of Health's vision into reality, i.e. to create independent community who lives healthily with a mission to make the people healthy.

To achieve the goals above, there should be rearrangement and rebuilding of beauty clinic organization. For that reason, a guideline of beauty clinic organization should be developed in order to be a reference for beauty clinic organizer, government, and related professional organization.

The government obligatorily guarantees "the organization of beauty clinic as an attempt of improving the healthcare service in order to be useful, high-quality, and accountable for, providing a reference in giving operational permission for beauty clinic organization, providing guidance to implement building, supervision, and control over the organization of beauty clinics in province and regency/city, protecting patient/service user and executive staffs including medical workers.

In addition, healthcare service, according to Law Number 36 of 2009 about Health as mentioned in its elaboration, is that providing healthcare service to either individual or community is highly guaranteed in the law achieving healthy. Meanwhile, healthcare service facilities consists of several types as included in Article 30⁽⁶⁾ including Individual Healthcare service.

This individual healthcare service is implemented by physician or health worker practice with both local government and private's help. This individual healthcare service should keep getting permission from the government corresponding to Law Number 36 of 2009 about Health, Public Health Service⁽⁷⁾. The

individual healthcare service, according to Article 30 clause 1, is intended to heal disease and to recover individual and family's health. Meanwhile, public health service is intended to maintain and to improve health and to prevent disease from infecting a group of individual and community. This healthcare service focuses more on helping to save the patient's life than on other interests. The organization of health service is conducted responsibly, safely, in high quality and evenly, and non-discriminatively, in this language (regulation) government is highly responsible for healthcare, according to Law Number 36 of 2009 about Health.

Therefore, returning to the main provider of healthcare service, Law Number 36 of 2009 about Health has confirmed that it is the government that is responsible mostly for the as high as possible health degree for all citizens; the responsibility includes the availability of environment, order, both physical and social healthcare facilities, the evenly and justly distribution of health resource to all people⁽⁸⁾. Health services intended in this study is the one in esthetic beauty clinic, the health service organized by private and or government dealing with body treatment product and service.

The regulation of Esthetic Beauty Clinic organization in Indonesia: The regulation related to Esthetic Beauty Clinic as mentioned in health law includes, among others:

1. Constitution of 1945
2. Law Number 29 of 2004 about Medicine Practice
3. Law Number 25 of 2004 about National Development Planning System.
4. Guideline of Esthetic Beauty Clinic organization from Medical Service Building Directorate General of RI's Ministry of Health in 2007.
5. Law Number 36 of 2009 about Health
6. Law Number 8 of 1999 about Consumer Protection
7. Government Regulation Number 32 of 1996 about Health Workers
8. Presidential Regulation Number 72 of 2012 about National Health System
9. Minister of Health's Regulation 920/MENKES/PER/XII/1986 about Private Health Service Attempt in Medical Area.

10. Minister of Health's Regulation Number 363/Menkes/Per/IV/1998 about Health Equipment Testing and Calibration in Health Service facilities;
11. Minister of Health's Regulation Number 269/Menkes/Per/III/2008 about Medical Record;
12. Minister of Health's Regulation Number 290/Menkes/Per/III/2008 about the Agreement for Medical Action;
13. Minister of Health's Regulation Number 411/Menkes/Per/III/2010 about Clinical Laboratory;
14. Minister of Health's Regulation Number 001 of 2012 about Referral System of Individual Health Service
15. Minister of Health's Regulation Number 36 of 2012 about Medical Secret.
16. Minister of Health's Regulation Number 46 of 2013 about Health Worker Registration
17. Minister of Health's Regulation Number 9 of 2014 about Clinic

Government's Responsibility: The responsibility of government related to esthetic beauty clinic as mentioned in legislations of health sector, particularly the guideline of esthetic beauty clinic organization and the consumer protection law, the state organs authorized in organizing esthetic beauty clinic related to beauty clinic, and the authorized institutions related to beauty clinic.

Health Ministry includes supervising, building, monitoring and evaluation, drug production and cosmetics and equipment used, nuclear power use, drug and cosmetic circulation, halal status of drug and substance used, consumer protection, dispute settlement, and licensing and supervision and building at city/regency level. Meanwhile, the responsibility of esthetic beauty clinic involves fault, risk, product and professional⁽⁹⁾.

Citizen's Constitutional Right in Health Service: The users of esthetic beauty clinics those that should be protected for their constitutional rights called patient or health consumers, because they get health service and product or service in the clinic. The protection of citizen's constitutional right in esthetic beauty clinic's service in Indonesia includes the right to protection guarantee and law certainty corresponding to Articles 28D clause 1 and 28H clause 1 of the 1945 Constitution related to Health Rights and the right to get health service⁽¹⁰⁾.

Thus, the right to health is the right to obtain various facilities, services, products, and other requirements in order to bring the highest health standard into reality and the state should guarantee its availability¹. The right to health has economic and social aspects because this right tries to safeguard individual as much as possible from receiving social and economic injustice related to his/her health⁽¹³⁾. The right to health also has cultural aspect because this right attempts to guarantee the compatibility of available health service to cultural background of each individual.

Law No.36 of 2006 about Health:

- 1. Article 4 states that "Everyone is entitled to health":** (Explanation of Article 4: the Right to Health is the right to get health service from health service facility in order to realize the degree of health as high as possible)
- 2. Article 5 clause 3:** Everyone is entitled to get safe, high-quality, and affordable health service.
- 3. Article 16:** Government is responsible for the just and even availability of health service in order to achieve the maximum degree of health.

Factors Making the Law Protection for Patients of Esthetic Beauty Clinic in Indonesia not fulfilling the Citizen's Constitutional Right: Generally, as suggested by Soerjono Soekanto, there are five factors affecting law enforcement:⁽¹¹⁾ law itself, law enforcement or those creating or applying law, facilities supporting law enforcement, community or environment where the law is enacted, and culture or the product of work, creation, and feeling based on human's willingness in life intercourse.

The factors making the Law Protection Model for Esthetic Beauty Clinic's Users applying today not fulfilling yet the Citizen's Constitutional Right are explained below.

- a. Substance:** The result of previous studies have reported that substantially, esthetic beauty clinic has been governed specifically in Guideline of Esthetic Clinic Organization issued by Medical Service Building Directorate General of RI's Ministry of Health in 2007 and generally there have been other legislations related to health and consumer protection law and its implementation in regions has been governed with the local government of respective Municipals/Regencies.

The data shows that the regulation is less strong as it is a guideline only, thereby cannot be included

into the legal foundation of local regulation development. The sanction imposed is less resolute, considering the result of study on the Court's verdict on esthetic beauty clinic case. Substantially, the guideline does not mention the severe punishment threat, related to product and service provide to the users.

Some matters have not been governed in guidelines applying today: physician course legalization and beautician standardization and education. The findings show many course organizing institutions and cooperation with the producer of beauty clinic equipment and medical equipment used including among others: health service, health worker, pharmacy industry, health equipment, and health insurance.

Esthetic beauty clinics as one of areas in health world start to compete for improving the quality of service given to their users because in the presence of health globalization using most sophisticated equipments and medicines, they can provide the best result in order to attract the users as many as possible.

1. Minister of Health's Regulation No 1419 of 2005 about the Organization of Physician and Dentist Practices replaced with Minister of Health's Regulation No. 512 of 2007 about Practical Permission and Medicine Practice Implementation.
2. Minister of Health's Regulation No 1184/Menkes/Per/X/2004 about the Security of Household Health Equipments and Supplies replaced with Minister of Health's Regulation No. 1190/Menkes/Per/VII/2010 about the License of Household Health Equipments and Supplies Circulation.

b. Structure

1. There is disharmonization of law protection jurisdiction between RI Minister of Health and BPKN related to predicate and position of beauty clinic user as consumer or patient
2. Less maximal supervision and monitoring conducted by Provincial/Regency/Municipal Health Service Office including the Lisence
3. No regulation issued by Ministry of Education and Culture related to training and education institution and certification and standardization of executive staffs in esthetic beauty clinics.

c. Culture: In consumptive community, women's body is created to be commodity and put amid

the promotion of consumptive product, and it is published through mass media either directly or indirectly. Considering this mass media's perspective, a standard is created that beautiful women are those tall, slim, young, and having good looking, so that Indonesian women follow this trend as well ⁽¹²⁾. It of course inspires majority Indonesian women to be the followers of present trend beauty and the investors and esthetic beauty clinic business performers read the opportunity to support this trend.

In consumer society, female body is formed as commodity, and placed at the centre of the consumption. In consumer society, female body, therefore, is a kind of investment according to capitalist ideology. Capitalist ideology bearers such as advertising, billboards, posters and TV fashion reality shows do not only show ideal body image, but also show how to reach and consume those images. From the perspective of these mass media, women are portrait to be tall, slim, young attractive and charming for social approval. These mass media, women are portrait to be tall, slim, young attractive and charming for social approval⁽¹³⁾.

Therefore women are forced to follow the fashion products, which are advertised commodities for beatification of her body. Consequently, body parts of woman (hair, eye, nose, lips, ear, neck, breast, arm, hand, nail, back, waist, belly, legs, feet, skin color) are indispensable for the sustainability of capitalist system. Firstly, portraits all problematic female body images and then to overcome these deficiencies it creates new commodities to preserve its continuity ⁽¹⁴⁾.

According to Green the behavior of an individual or society about health is determined by the level of knowledge in which the person has. Furthermore, a person who has fair economic and earnings will likely have a good education and knowledge.⁽⁸⁾ Limited education and socialization about healthy and safe cosmetics conducted by local government and BPOM in region make the people consumptive and selecting beauty clinic less selectively as they can be tempted easily by advertisement or others' persuasion to undertake treatment in esthetic beauty clinic not consistent with standard medical service. The supervision should be conducted over cosmetics before circulation just like that of food and drug as preventive measure to ensure that food and drug circulating have fulfilled the standard and required safety, benefit and quality of product as specified.

CONCLUSION

The factors making the law protection model applying today to the users of esthetic beauty clinics not fulfilling yet the citizens' constitutional right. substance factor in which there is disharmonization of law at central and local levels.

Incomplete and less firm guideline existing presently, some legal foundation no longer prevailing and guideline no longer fulfilling the citizen's constitutional right. structure in which there is disharmonization of structure between ministry of health, ministry of education and culture, and National Consumer Protection Agency (BPKN), BPOM, and Ministry of Trade and Industry related to the status of user as patient or consumer and the use of dangerous chemical tool and material in the product; and finally community culture, in which government and majority stakeholders not prioritizing yet the law protection for the patients.

RECOMMENDATION

- a. Government as leading sector and regulation developer should change the guideline of beauty clinic prevailing today immediately in order to fulfill the citizen's constitutional right
- b. Esthetic beauty clinics should reform and improve their service system by prioritizing not only profit but also law protection for their patients.
- c. Community and stakeholders should improve their understanding on dangerous chemical materials in cosmetics by attending seminar/socialization and educating themselves.

Source of Funding: Authors

Ethical Clearance: Yes

Conflict of Interest: No

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The Application of Cyclone Ventilator Modification for Indoor Air Sanitation

Khambali¹, Setiawan¹, Kuat Prabowo²

¹Health Polytechnic of Surabaya, Indonesia; ²Health Polytechnic of Jakarta II, Indonesia

ABSTRACT

There was a need to conduct research on the trial use of cyclone ventilator modification using active carbon as CO adsorbent in an indoor area so that its air fulfills the indoor air sanitation condition. This research was intended to put on cyclone ventilator modification to reduce the temperature, humidity, CO gas level and PM10 dust in indoor area so it can fulfill indoor health sanitation standard. The research used One Group Pretest Posttest Design. Cyclone ventilator modification could reduce indoor mechanic temperature by 10.919% in average, air humidity in average by 28.64%. The ability to reduce CO gas level was 28.65% in average and PM10 dust for about 52.80% after 2 hours the instrument works. Cyclone ventilator modification takes 2 hours to reduce temperature, humidity, CO gas level, and PM10 dust accumulated for 4 hours inside of mechanical room. Cyclone ventilator modification worked effectively operated inside of the room with 115.6m³ volume and was able to create a quality standard circumstances. The performance of Cyclone Ventilator Modification as an air sanitation instrument can be evaluated from energy and economical aspect in general. Secondly, those aspects shows that indoor air sanitation instrument can only works (moves) using the wind breeze.

Keywords: Implementation, Cyclon, Modification, Indoor, Temperature, Humidity, CO, PM100 dust.

INTRODUCTION

The reduction of CO gas level after going through indoor air sanitation instrument with the suction using charcoal/active carbon of coconut shell as big as 185.3 ppm with 73.9% reduction. There is also significant different reduction of carbon monoxide⁽¹⁾. The reduction percentage of CO gas level by using active carbon of coconut shell is 81.54%. The effectiveness evaluation of air sanitation stated to be effective because it can reduce CO gas level more than 75%⁽²⁾. Life time active carbon as CO adsorbent as long as 388 hours. This instrument is very effective because it can reduce CO gas level more than 60% in 352 hours. While, the efficiency of this instrument can be showed by the effectiveness of

this instrument in reducing CO and its relatively small cost aspect because it doesn't use electricity energy to operate it⁽²⁾.

Based on the above explanation, there is a need to conduct further research for the trial use of cyclone ventilator modification by using active carbon as CO adsorbent in an indoor area so that its air fulfills the indoor air sanitation condition based on the Decree of Minister of Health No. 1405/MENKES/SK/XI/2002 concerning Health Requirements for Office and Industrial Work Environment⁽³⁾.

MATERIALS AND METHOD

The design of this research was One Group Pretest Posttest. Materials used was coconut shell active carbon by the size of 125 um (got from sieve of 120), glue glass (sealant Seal), reagent gas absorption (CO) to collect CO sample, reagent to examine CO gas, plastic interval (diameter 0.3 cm), glass bottle, and aluminium gauze. Research instruments used in this research were Cyclone Ventilator Modification, Migget Impinger, Flow Meter, Stopwatch, Handscoon, and mask.

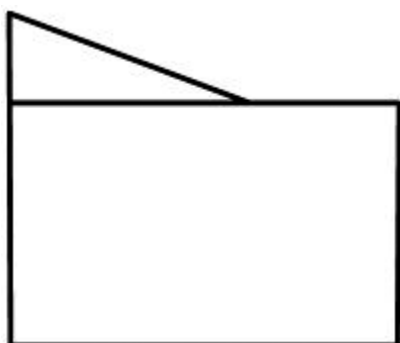
Corresponding Author:

Khambali
Health Polytechnic of Surabaya, Indonesia
Pucang Jajar Tengah Street-56, Surabaya, Indonesia
Email: khambali007@poltekkesdepkes-sby.ac.id

Sample to measure CO gas level was determined based on purposive sampling. Sample was taken by doing measurement as much as 10 times, to detect the average CO gas level, PM10 dust, temperature and indoor wind velocity before and after the treatment (installing cyclone ventilator modification). Data analysis process used paired sample t-test

FINDINGS AND DISCUSSION

The Room Volume of Research Spot: The volume of Mechanical Research Spot was measured by calculating room volume added by roof volume. Here was the detail calculation:



Structure Volume:

Room Volume + Roof Volume

$$\begin{aligned}
 &= (p \times l \times t) + (\frac{1}{2} \times a \times t \times p) \\
 &= (4 \times 6.5 \times 4) \text{ m} + (\frac{1}{2} \times 4 \times 1.45 \times 4) \text{ m} \\
 &= 104 \text{ m}^3 + 11.6 \text{ m}^3 \\
 &= 115.6 \text{ m}^3
 \end{aligned}$$

Figure 1: Research Spot Volume Scetch

Air temperature, air speed, humidity, CO gas degree, and PM10 dust measured before and after cyclone ventilator modification was installed and operated, so that there was air temperature comparison inside of the room before and after cyclone ventilator modification was settled and operated. Data collection was done in two hour duration before the operation of cyclone ventilator modification operated (09.00 and 11.00 WIB) and in two hours after the operation of cyclone ventilator modification operated (13.00 and 15.00 WIB), in one day for 10 days.

The Ability of Cyclone Ventilator Modification to Reduce Temperature, Humidity, CO Gas and PM 10 Dust Inside of Mechanical Room: The ability of

cyclone ventilator modification to reduce temperature inside of mechanical room in average was 10.919% in every 2 hours operation, its ability to reduce air humidity in average was 28.64% in every 2 hours operation, and the ability to reduce PM10 dust in average was 52.80 % in every 2 hours operation. It concurs the previous research about the effectiveness of cyclone ventilator modification instrument to reduce CO gas and PM 10 dust level⁽²⁾. Air flow speed inside of the tmechanical room increases was 48.71% in every 2 hours operation.

The use of active carbon in cyclone ventilator modification was effective to absorb CO gas as same as Nurullita & Mifbakhuddin in their research about Monoxide Carbon Gas Absorption (CO) inside the coconut shell active carbon and durian shell explains that the presentage of CO gas reduction by using coconut shell adsorbent is 62.6%, while durian shell is 70.6%⁽⁴⁾. This concurs and strengthens the previous research⁽²⁾ that life time carbon is active as adsrobent CO as long as 388 hours, while the life time (saturated point) for filtering the dust has not been achieved. This instrument is very effective because it can reduce CO gas more than 60 % for 352 hours. Whereas, the efficiency of the instrument is shown from the effectiveness reduce CO gas and dust and the low non electricity operating cost. The most used adsorbent is active carbon becuase it has big surface. So, it absorbs bigger energy than another adsorbent. The application of adsorption energy is mostly used in industry. The example of adsorption application vapour phase is the restoration of organic solvent used by substance, printing ink and textile coating. While the adsorption of liquid phase used to separete organic components from liquid and water waste from the substance of organic liquidd⁽⁵⁾.

Jaya et al. stated that emission gas NO and Nox that are adsorbtd was 70%. That proves the effectiveness of active carbon used to reduce air pollutant⁽⁶⁾.

The Ministry of Health Decree No. 1405/MENKES/SK/XI/2002 requires that the room temperature has to be 18°C-26°C, the humidity is 40%-60%. Maximum dust content inside the room in average 8 hours meassurement is 0.15 mg/m³. Ventilation air flows is 0.15-0.25 m/s and CO gas pollutant is 25 ppm/8 hours. This research has answered that the existance of cyclone ventilator modification in mechanical room has created and proven that it can be used to fulfill the requirement as air controller instrument inside the room, so that the mechanical room fulfill the requirement/quality standards.

The paired sample t-test in temperatue, humidity, CO gas level and PM 10 dust parameter, inside the room

resulted p-value of 0.000 (there was significant difference between of parameter before and after installing and applying cyclone ventilator modification).

While the air flow speed inside the room increases fluctuatively as shown in Figure 2.

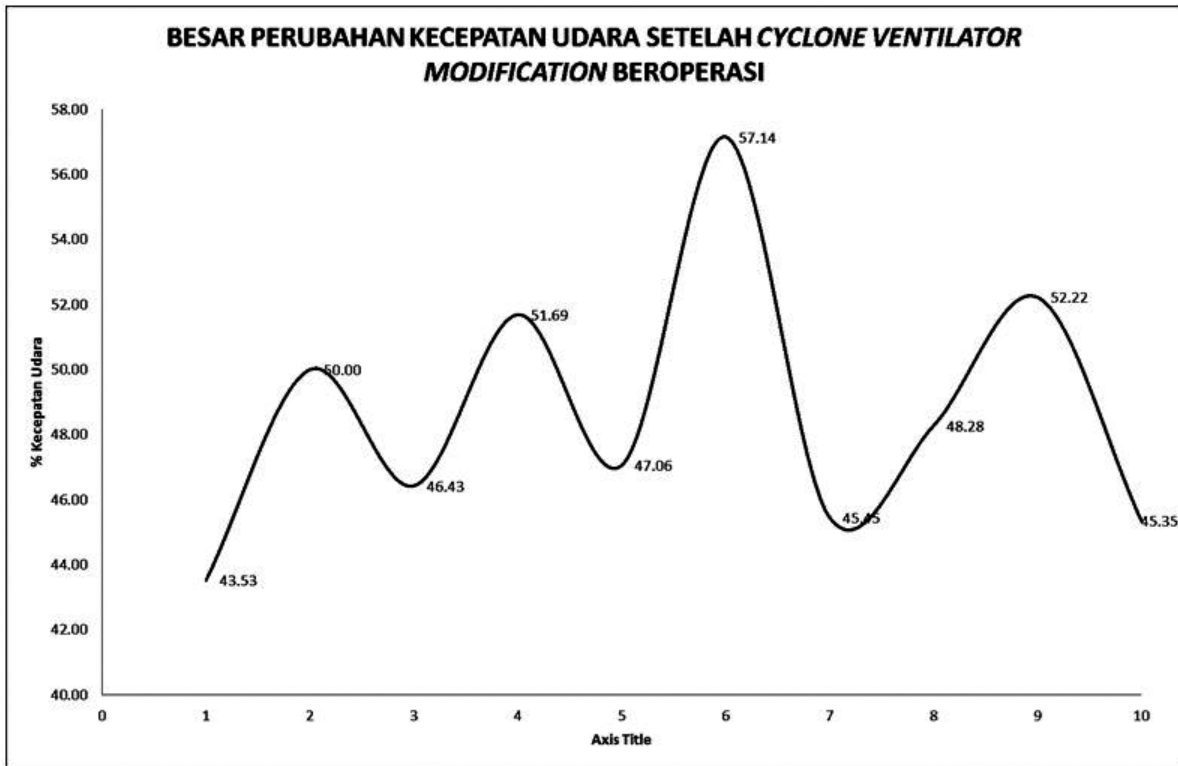


Figure 2: The Increase of Indoor Air Flow Speed After Installing/Operating Cyclone Ventilator Modification

The problem of Cyclone Ventilator Modification application is there should be preliminary test if the instrument will be installed in another place which has higher pollutant variation with the width and volume that is as same as 115.6 m³

Time needed for cyclone ventilator modification to reduce temperature, humidity, CO gas degree and PM10 dust until optimum limit of certain room: The meaning of optimum limit is fulfill quality standard of working area based on The Ministry of Health Decree No.1405/MENKES/SK/XI/2002⁽³⁾ that is 18°C-26°C for room temperature, 40%-60% for humidity. Maximum dust content inside of air temperature in average measurement in 8 hours is 0.15 mg/m³. Ventilation air flows is 0.15-0.25 m/s and CO gas pollution is 25 ppm/8 hours.

Time needed by cyclone ventilator modification to reduce temperature, humidity, CO gas degree and PM10 dust in this research was 2 hours. This is as same as the result of parameter massurement in first length of time, that is 2 hours after being installed and applied. It has accomplished qualification standard of working environment. However, in this research the specific

time, in which minute in particular, the parameter reduction will reach the standard cannot be determined. It is because the measurement is done in the 2 hours length of time. It is not a continous measurement which can get more specific data of time. Cyclone ventilator modification can reduce indoor mechanical temperature in average by 0.919% and reduce air humidity in average of 28.64%. While the ability to reduce CO gas level in the average of 28.65% and decrease PM10 dust in average of 52.80% after 2 hours the instruments operates.

In this research, after the instruments operates for 10 days, the ability to reduce CO gas level was 4.55% in the first day and becomes 62.88% in the tenth day. While, for the PM10 dust was 24% in the first day and becomes 82.68% in the tenth day. The longer the instrument operates, its ability to reduce CO gas and PM 10 dust will increase. Whereas, the temperature parameter and humidity creates fluctuative result.

The Effectiveness of cyclone ventilator modification towards the room area/volume: The use/installation of 1 unit cyclone ventilator modification in a room with the volume of 115.6m³ becomes effective by looking at

the ability in reducing temperature, humidity, CO gas and PM10 dust level until fulfill the quality standards of working room in 2 hours operational of cyclone ventilator modification, it can also maintain the condition of the working condition in further hours. It is because there is an active carbon as cyclone ventilator modification which has a life time of 1388 working hours⁽²⁾.

The implementation of 1 unit cyclone ventilator modification in 115.6 m³ room volume can be recommended and proven effectively to be applied in industry which has working area potentially producing CO gas and PM10 dust level.

In this research, cyclone was operated after having pollutant parameter accumulation with 2 hours measurement in 115.6m³ room volume which has accomplished quality standards. If it is assumed, cyclone ventilator modification operational simulation done in the same time with operational machine in mechanical room. It can be sure that the condition of the working room with that width will not exceed the determined limit (further research).

The excess of active carbon in the cyclone ventilator modification is strengthen by the research of Raso et al. They stated that we demonstrate two steps process where air sanitation system based on active carbon can be regenerated by “in situ” and eliminate volatil organic compound (VOC) from indoor air by using energy efficiently⁽⁷⁾.

Performance of Cyclone Ventilator Modification:

Performance of cyclone ventilator modification as an indoor air sanitation in general can be evaluated by its energy and economical aspect. Those two aspects show that indoor air sanitation operates (moves) by wind breeze and because of the different air pressure inside and outside of the room. Naturally, higher temperature air inside the room will scientifically flow/move to the lower air temperature outside the room through cyclone ventilator modification fin, so the additional energy is not needed to operate the instrument. This is efficient in the instrument operation.

The suction power of cyclone ventilator modification depends on air speed that hits instrument fin. Cyclone ventilator modification can handle hot temperature problem, stuffy and dirty in the room, reducing humidity and freshen working room (normal air circulation). Cyclone ventilator modification is anti-rust

product which is suitable for tropical climate, durable and flexible, doesn't need special treatment, efficient, and very quick and easy in the installation process.

CONCLUSION

1. Cyclone ventilator modification could reduce indoor mechanical temperature in average of 10.919%, air humidity in average of 28.64%, CO gas level in average was 28.65% and PM10 dust in average of 52.80% after 2 hours of operation.
2. Cyclone ventilator modification in 2 hours of operation could reduce temperature, humidity, CO gas and PM10 dust level that were accumulated in 4 hours inside the mechanical room.
3. Cyclone ventilator modification was effectively operated in a room with the volume of 115.6 m³ and was able to produce the condition that meets the quality standards.
4. The performance of cyclone ventilator modification as air sanitation instrument was proven to be able to solve hot temperature, stuffy and dirty problem in the room, reducing humidity, to make the working space more comfortable, anti-rust product which was suitable for tropical climate, durable and flexible, doesn't need special treatment, efficient, and is very easy and fast in the installation process.

RECOMMENDATION

1. The application of cyclone ventilator modification can be done by considering the instrument ability, room volume, and pollutant level in that room to get optimum formulation to fulfill quality standards inside the room.
2. The research of the application of cyclone ventilator modification can be a reference for another researcher to develop further step, such as the application of cyclone ventilator modification to other parameter in this research.

Source of Funding: Authors

Ethical Clearance: Yes

Conflict of Interest: No

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Efficiency Effort of Inpatient Service for BPJS-Health Participants with Lean Method at Surabaya Islamic Hospital

Muryani¹, Thiwit Nurul Huda¹, Yeni Farida Istanti¹, Tito Yustiawan¹, Setya Haksama¹, Samsul Arifin¹

¹Department of Health Administration and Policy, Faculty of Public Health, Airlangga University, Indonesia

ABSTRACT

Hospital is required to provide effective and efficient health services in accordance with hospital service standards, including Surabaya Islamic Hospital. It actively carries out quality improvement services through managing the existing resources effectively and efficiently, evaluating and improving all installations, including inpatient service. This study aimed to perform efficiency effort of inpatient service for BPJS-Health participants at Surabaya Islamic Hospital, in the form of operational research. The samples were 30 inpatients of BPJS-Health participants. There were 8 waste found. Effort made to reduce the waste was by completing SIMRS with the data and information needed by the management for each work unit of inpatient service for BPJS-Health participants.

Keywords: *Inpatients, BPJS-Health Participants, Service efficiency*

INTRODUCTION

Hospital is a health service institution which organizes individual health service in a comprehensive manner providing inpatient, outpatient and emergency services⁽¹⁾. Inpatients are patients who enter the hospital and stays one day or more for the purposes of observation, diagnosis, therapy or rehabilitation as well as other medical supports⁽²⁾. Patients who categorized in inpatient service will experience some levels of service processes, such as the stages of admission, diagnosis, treatment, examination until control. Inpatient activity process in inpatient ward requires several services, including nursing care, medical care, pharmacy service, laboratory service, radiology service, nutrition service and services from other professions according to the needs and conditions of the patient. In fact, the process of inpatient service requires a standard time for each

activity. However, there are several activities which exceed the arranged standard time and do not have added value or categorized as waste.

Waste is all problems or disturbances which arise and hinder work and patient service consisting of 8 types, including defects, overproduction, transportation, waiting, motion, over processing and human potential⁽³⁾. Waste is any activity which adds cost or time but does not add value⁽⁴⁾. One effort to minimize inefficiencies for inpatient service is by applying lean⁽⁵⁾. Lean is a continuous effort to eliminate waste and increase the value added of goods and services to provide value to customer⁽⁶⁾.

Surabaya Islamic Hospital is a type-C-class hospital in collaboration with the Healthcare and Social Security Agency (BPJS-Health). The activity process in the inpatient ward of the Surabaya Islamic Hospital was found to be in waste time, waste motion or waste material, especially in patient discharge service. If calculated, either waste time or waste motion will inflict a financial loss to the hospital.

Research problem in this study was about how the waste in the process of inpatient service for BPJS-Health participants, how to assess the waste with rupiah, and how to improve the effectiveness and quality of services using lean hospital approach in the inpatient ward of the A.Yani Islamic Hospital of Surabaya.

Corresponding Author:

Muryani

Department of Health Administration and Policy,
Faculty of Public Health,
Airlangga University, Indonesia
Campus-C, Airlangga University,
Mulyorejo, Surabaya, Indonesia
Email: yanibakri@gmail.com

Research objective of the study was to identify the waste in the process of inpatient service for BPJS-Health participants, analyze the waste, and give recommendations to improve the effectiveness and quality of services using lean method.

MATERIALS AND METHOD

This study was operational research, conducted in the Inpatient Ward of the Old Building of A.Yani Islamic Hospital of Surabaya. The data were collected through survey and documentation study. In addition, interviews were conducted with related parties, namely ward officers, radiology officers, pharmacy officers, laboratory officers and hospital management to make value stream mapping. Value stream mapping is an integrated journey of patient from the beginning to the end which describes the service process of the patient from coming to the

hospital to returning home⁽⁷⁾.

Documentation study was conducted to obtain regulatory data in the form of policies, standard operating procedures or others. The sample size were 30 inpatients of BPJS-Health who were followed their service process from handing over the patients to the inpatient ward until discharging the patients. This was carried out to find out the standard time needed for each activity. Besides, it observed waste which occurred in the process of inpatient service activities.

FINDINGS

Value Stream Mapping (VSM) of Inpatient Service:

VSM describes a series of service activities, the flow of patients and officers, and the flow of material and information in the inpatient room (Figure 1).

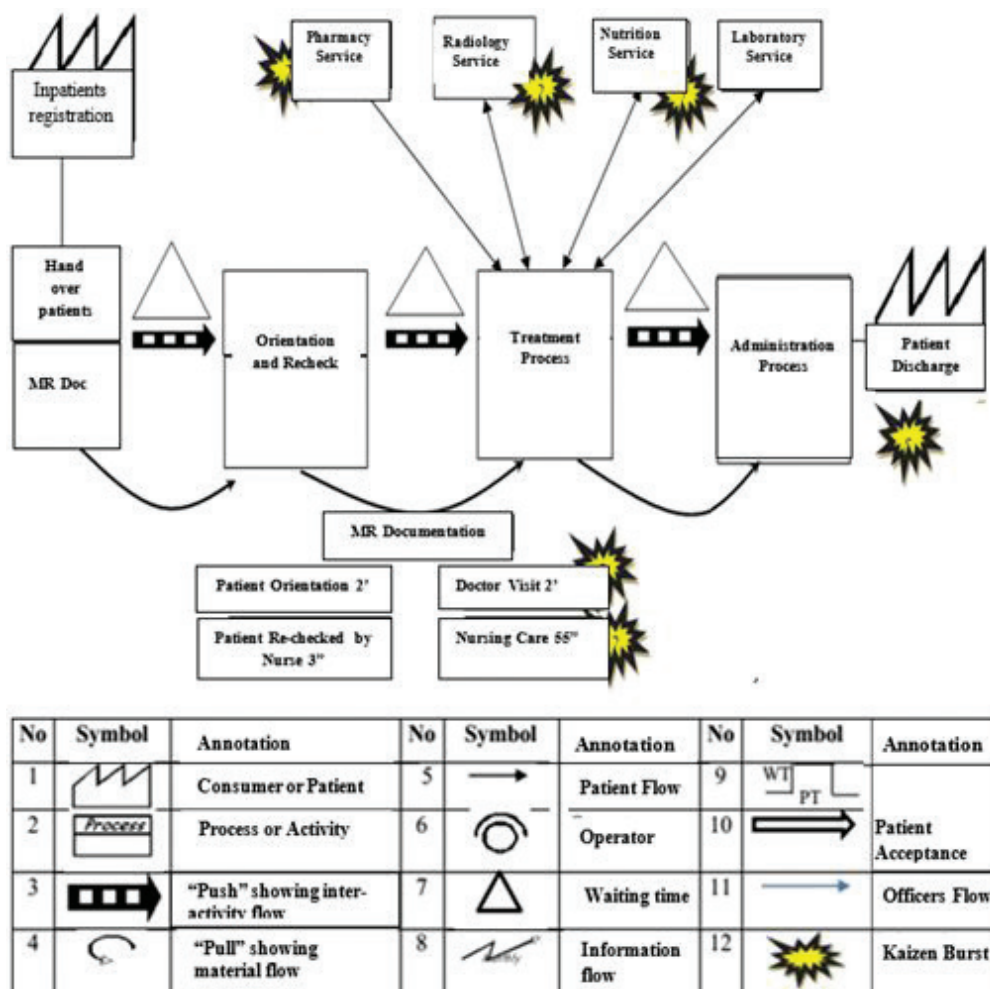


Figure 1: The Value Stream Mapping

Figure 1 describes the process of inpatient activities from handing over patients until discharging. There are 8 waste in the health service process which described by Kaizen Burst (Table 1).

Table 1: Waste category in the inpatient ward

No.	The Existence of Waste	Waste
1.	Repetition the report writing on the patient's capacity book and nursing handover book	Waste of Over Processing
2.	The implementation of prescription is not in accordance with Unit Dose Dispensing (UDD)	Waste of Over Processing
3.	Waiting time for reading critical results by radiologist is not in accordance with Operational Procedure Standard (SPO)	Waste of Waiting time
4.	Waiting time for reading non-critical results by radiologist is not in accordance with Operational Procedure Standard (SPO)	Waste of Waiting time
5.	Provision of ready-to-eat foods which are not consumed	Waste of Over Production
6.	Doctors visit outside the specified time	Waste of Waiting Time
7.	The length of the process for sending BPJS claim files to internal verifiers by inpatient nurses	Waste of Motion
8.	Patients wait to pick up by the family in the inpatient room	Waste of Waiting Time

There were 8 waste in the inpatient ward based on the VSM, which had been grouped as in Table 1. The waste was in nursing service. There was a repetition of report writing on the patient's capacity book and the nursing handover book, the length of the process of transferring BPJS claim files to the internal verifier by the inpatient nurse, and patients who were waiting for the family in the inpatient ward. Waste in the medical service is in the implementation of prescriptions which were not in accordance with Unit Dose Dispensing (UDD) and the doctors who had a visit outside the specified time. Waste in the radiology service was in waiting time for reading critical and non-critical results by radiologist which not in accordance with Operational Procedure Standard. Waste in nutrition service was in the provision of unused portion of ready-to-eat food (not consumed).

Observation Results of Inpatients Service

Table 2: Time and Motion on the Process of Nursing and Medical Care

No.	Service	Category	Activity	Average of time (minutes)	Standard of time (minutes)
1.	Nursing Care	Pre	Preparing TT	9	10
			Preparing Equipment	4	5
			Handwash	1	1
			Preparing Wound Care	6	7
		During	Receiving Patients	3	5
			Handover patients	5	5
			Physical Check up	3	5
			Vital Signs	3	3
			Consulation to doctor in charge	3	2
			Meeting the needs of intravenous fluids	3	2
			Performing drug	7	10
			Accompanying Doctor's visit	6	5
			Meeting the need of oxygen	3	5
			Preparing injection	2	2
			Administering medication (Injection & Oral)	2	5
			Surgical Injury Care	12	20
			Obsevation Patient	2	5
		Post	Nursing Documentation	15	15

Conted...

2.	Medical Care	During	Taking patient's medical record	1	1
			Visit	3	5
			Educating patient	2	3
			Medical record documentation	8	10
		Post	Prescribing	1	3

Table 3: Time and Motion on the Process of Radiology, Pharmacy and Nutrition Service

1.	Radiology	Pre	Ordering via e-billing	1	3
			Confirming to radiology officer	1	1
		During	Educating action preparation	2	3
			Transferring patient to Radiology	30	28
		Post	Radiology officer brings the result to the particular room	180	60
2.	Pharmacy		Recapitulating prescription in the medical record	3	4
			Providing medication	9	15
			Educating patient about medication	9	10
			Distributing drugs	5	5
3.	Nutrition	Pre	Ordering via e.billing	3	3
			Confirming to nutrition officer	1	1
		During	Assessing nutrition	10	5
			Socializing nutrition	5	4
		Post	Documentation in the integrated patient development record (CPPT)	12	5

Table 4: Time and Motion on the Process Laboratory and Administration Service

1.	Laboratory	Pre	Ordering via e-billing	2	3
			Confirming to laboratory officer	1	1
		During	Taking sample	5	5
		Post	The officer brings the results to the particular room10/ward	-	10
2.	Administration	Pre	Completing administration of patient discharge, filling discharge planning	5	5
		During	Taking BPJS file form medical record documentation	3	2
			Delivering BPJS file to internal verificato for scan	11	5
			Returning the file medical record	3	2
			Performing discharge planning	5	3
		Post	Escorting patient to the hospital exit	11	5

Table 2, 3 and 4 shows the calculation of actual time was compared to standard time. Difference over time between the actual time of treatment and the standard time of treatment categorized as time waste. Time waste happened mostly in radiology service especially when delivering patients to conduct radiological examination. There was time waste of 10 minutes and 120 minutes for waiting for the results. The activity of delivering BPJS claim files to the verifier carried out by nurses also had time waste of 6 minutes.

Table 5: Waste Value (in Rupiah)

No.	Service	Waste Value in Rupiah
1	Handover patient	Rp.397,-
2.	Room orientation dan recheck	Rp.2,758,-
3.	Medical treatment	Rp.1,634,-
4.	Medical treatment documentation	Rp.4,348,-
5.	Nursing care	Rp.8,391,-
6.	Nursing care documentation	Rp.17,656,-
7.	Patient's billing documentation	Rp.461,-
8.	Patient discharge process	Rp.22,365,-
9.	Nutritional care	Rp.20,650,-
10.	Nutritional care documentation	Rp.978,-

Table 5 shows that waste which caused the biggest loss was in the patient discharge process amounted to Rp.22,365.

DISCUSSION

In the inpatient ward, nurse reassesses the condition of the patient, conducts room orientation to family and patient regarding regulations and facilities. Then, nurse inserts inpatient billing and delivers it to the doctor in charge stated that the patient has entered the room. The nurse in charge of the room carries out nursing care to the patient for 24 hours.

In the process of inpatient nursing care of BPJS-Health participants in the inpatient ward at A.Yani Islamic Hospital of Surabaya, waste is still found, including material, time, and process waste. In the material and process waste, nurse repeats the procedure of recording patient's condition in the report book and in the CPPT. This requires a material namely book, and a process in the recording duplication. While time waste is found when the nurse delivers BPJS claim files to the verifiers. Nurse must wait for the verification process to complete which causing main tasks of the nurse are reduced and nursing care to the patient are delayed.

Medical care to patients is carried out by doctors in charge (DPJP) by conducting a visit once a day. In addition, the doctor provides education to patients regarding their disease and prognosis. Furthermore, the doctor will prescribe medication if there is a change in therapy and documentation. The hospital policy states that doctor's visit cannot be more than 12 AM.

However, since many doctors in charge (DPJP) in the Islamic Hospital of Surabaya are contract doctors, there are still many doctors visit above 12 AM. As a result, many patients' services including patient discharge are delayed. The delay in discharging patients results in waste in the process of inpatient care.

Nutrition service is carried out by nutritionists by conducting nutritional assessments and counseling on patients about the types of foods which are allowed and those which are not, and then they document patient's status/medical records. In addition, inpatient will get a diet in accordance with the conditions and after a nutritional assessment. Waste in nutrition services occurs in the process of documentation of nutrition care and ready-to-eat leftovers which are not served because the patient has already been discharged. This can be possibly happened because the room officers do not confirm if the patient has already been discharged and can also be caused by the nutrition officers who do not see the patient billing. Thus, they do not know if the patient has left the hospital.

The pharmacy service in the inpatient ward conducted by pharmacists includes educating patients, especially those who take drugs from home and take medication for a long time. The pharmacy officer distributes the medicine to the patient and records the patient's status about the drug reaction and the type of drug given to the patient. If there is a new patient or additional drug and the pharmacy officer is not in his place, the distribution of the drug is carried out by the charge nurse.

Waste occurring in pharmacy services is the residual drug which is not used by patient. The drug will be returned to the pharmacy after the patient discharge, so that further sales are delayed.

Laboratory service for inpatients is carried out to support the patient's diagnosis and performed according to the patient's needs. Blood sampling for inpatients is carried out in the morning shift at 11 AM, afternoon shift at 3 PM, and night shift at 7 PM. When the examination order in the morning shift is more than 11 AM, the laboratory results are delivered to the room after 3 PM. Then, the further treatment to the patients is delayed.

In case that inpatients need radiology examination, nurse performs e-billing to request for radiology examination and confirm to the radiology department

by telephone room. If the examination does not need to involve a radiologist, then the patients can immediately be transferred to the radiology department for examination. However, if the radiology examination must be performed by a radiologist, then the examination must wait for the radiologist in charge to come. This will delay the examination and further action to the patient. Furthermore, reading the radiology results must wait for the radiologist. However, the standard time policy of the reading the results is 60 minutes. The delay in radiological reading includes time waste and will postpone further treatment.

The results above show that there are still many aspects of inpatient care which include to waste. Waste is everything which is not a value⁽⁸⁾. Value is anything consumers want to pay for a product⁽⁹⁾. Waste can be categorized as Value Added (VA), Non Value Added (NVA), and Non Value Added but Necessary (NNVA).

Waste in the process of inpatient care at A. Yani Islamic Hospital of Surabaya can be minimized by using lean method⁽¹⁰⁾. All waste must be eliminated or minimally reduced in order to reduce hospital costs, increase patient satisfaction, and improve patient and employee safety.

Grabam⁽⁸⁾ defines lean as 2 simple parts:

- 1. Total elimination of waste:** Waste is any activity which does not reflect assistance in the healing process of patients
- 2. Respect of people:** Respect in the lean context means to encourage employees to be motivated and do better work in a constructive way.

To minimize waste in nursing care, it is necessary to have clear arrangements regarding the duties of nurses and verifiers about BPJS Kesehatan claim files so that nurses do not need to wait for long time in the verifiers' office. In addition, to avoid duplication of recording the patient's condition, it is necessary to simplify the system of integrated patient development record (CPPT) that the charge nurse does not write the same notes in different forms. In the medical care, it is emphasized to the doctor in charge to conduct timely visit and make daily prescriptions according to the drugs needed in a day. It is suggested to consider reward and punishment policy to control the condition.

To minimize or eliminate waste in laboratory service, it is necessary to use technology that the results of the examination are immediately discovered, while waste in nutrition service can be minimized by increasing the coordination with the room related to each patient's nutritional needs and predicting the patient discharge.

CONCLUSION

From the above discussion it can be concluded that:

1. There are 8 waste found in the inpatient ward of A.Yani Islamic Hospital of Surabaya with 4 categories of waste including waste of over processing, waste of waiting time, waste of over production, and waste of motion
2. Lean method is applied as an effort to overcome waste occurred.
3. To minimize the occurrence of waste, some efforts are carried out including reviewing CPPT registration procedures, considering the existence of reward and punishment systems, utilizing technology, and increasing coordination among staff.

Ethical Clearance: Taken from Health Research Ethics Committee, Faculty of Public Health, Airlangga University

Source of Funding: Author

Conflict of Interest: There is no conflict of interest related to scientific research and publications

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Stirring Chamber Design Development to Increase the Potention of Chicken Egg Shells to Decrease Cadmium (Cd) Level in Blood Cockle (*Anadara Granosa*)

Narwati¹, Hadi Suryono¹

¹Department of Environmental Health, Health Polytechnic of Surabaya, Indonesia

ABSTRACT

A study about chicken egg shells as an adsorbent to decrease Hg level in blood cockle (*Anadara granosa*) has been done by Suryono in 2017, its results showed that chicken egg shells could decrease Hg level in blood cockle. The lowest level of Hg (0.545 ppm or 93.64%) was using 45 minutes of stirring process with 75 grams of chicken egg shells, there was a significant difference of Hg level in blood cockle before and after the process. The Hg level decrease from 0.582 ppm to 0.037 ppm. Those processes include the use of chicken egg shells as adsorbent cannot reduce all the level of Hg. This study used One Group pretest-posttest Design. Samples were blood cockle (*Anadara granosa*). Stirring chamber was a food sanitation tool, it had ability to decrease heavy metal level such as Cd in blood cockle using the stirring and adsorbent temperature principles. Samples were taken using purposive sampling. There were 9 treatments and 3 replications. The stirring process was done in 15 minutes using 50 rpm, 150 rpm, and 250 rpm of speed. The adsorbent temperature were 35°C, 50°C and 65°C, it used 50 grams of chicken egg shells (adsorbent) in 1 liter of water. The results showed that blood cockle (*Anadara granosa*) which was taken from Kenjeran coastal area, Surabaya contain 0.93 ppm of Cd level in average. The level of Cd in the control group was 0.82 ppm. While the average level of Cd in the blood cockle in the treatment groups were 0.15 ppm. The amount of Cd level decreasing in treatment groups were 82.1% (0.67 ppm). The stirring speed and adsorbent temperature were contributed to give significant difference of Cd level in blood cockle. From the results we could conclude that the intervention stirring and adsorbent temperature can decreased Cd level. We suggest that societies can use stirring and heating using chicken egg shells as an adsorbent to control food contamination of Cd.

Keywords: *Stirring chamber, Stirring speed, Adsorbent temperature, Chicken egg shells*

INTRODUCTION

Food quality that is not fulfil health requirements was a main problem of food safety. It needs awareness to understand that this was some parties responsibility. They were governments, food industries, food producer, and also consumer⁽¹⁾. The regulation in Indonesia (UU No.18, 2012) mention that farmers, fishermen, fish farmers, and food business actors are obliged to apply food safety norms, standards, procedures and criteria.

Food safety intend to prevent the possibility of biological, chemical and other contaminants that can interfere, harm and endanger human health. Seafood was potential to contaminate by heavy metal⁽²⁾.

Suryono et al. reported that blood cockle that was taken from Kenjeran coastal area in Surabaya contain 0.620 ppm of Mercury (Hg). Mercury contamination also was found in Asian green mussel (*Mytilus viridus*)⁽³⁾. Trisnawati mention that the level of Cadmium (Cd) in Asian green mussel was 50.23-70.39 pmm inside its gill, 31.08-44.53 pmm in its liver, and 6.73-7.37 ppm on the sea water⁽⁴⁾. Fransiska et al. also proved that there were 0.76073 mg/kg of lead (Pb) in blood cockle that was taken from Kenjeran coastal area, Surabaya⁽⁵⁾.

Corresponding Author:

Hadi Suryono
Department of Environmental Health,
Health Polytechnic of Surabaya, Indonesia
Pucang Jajar Tengah Street-56, Surabaya, Indonesia
Email: suryonohadi.2008@gmail.com

Simple and inexpensive efforts to decrease the level of heavy metal that can be done were using chicken egg

shells. Suryono found that the use of 75 grams chicken egg shells powder and 45 minutes of stirring process can decrease 93,64% of Hg level⁽³⁾. Aimi et al. mention that this due to chicken egg shells contains CaCO₃. It can absorb metals⁽⁶⁾.

Besides Hg, blood cockle also contain Cd. The level of Cd in blood cockle which was taken from Kenjeran, Surabaya was 0.93 ppm⁽³⁾. This level is still safe based on SNI No.7387, 2009. But consume food that is contaminated by Cd have potential to damage the organs or death due to the accumulation of Cd inside the body. The aim of this research is to analyse the difference of Cd level in blood cockle (*Anadara granosa*) after it is given a treatment by using the stirring speed and adsorbent temperature principles.

MATERIALS AND METHOD

This was experimental research using one group pretest-posttest design. Independent variables were the speed of stirring and adsorption temperature. We used 50 rpm, 150 rpm, and 250 rpm of speed. The adsorption temperature was 35°C, 50°C, and 65°C. The dependent variable was Cd level. Samples were blood cockle from Kenjeran coastal area, Surabaya.

The stages to make the chicken egg shells adsorbent were: 1) Washed the chicken egg shells then take the membrane and all the dirt, 2) Soaked with hot water in 15 minutes then let it dry, 3) The egg shells then be mashed using blender, 4) Sifted the chicken egg shells powder with 120 mesh sieve, 5) Put the powder in the oven for 15 minutes 100 °C, 6) Activated the powder using 0.1 M of HCl in 48 hours, 7) After 48 hours drain well and wash until the pH 7 or neutral, 8) Put the powder in oven again to make it dry for 30 minutes 100 °C.

If the chicken egg shells powder as adsorbent was ready, put 50 grams of the powder to a liter of water and 250 grams blood cockle inside the stirring chamber. Adjust the adsorbent temperature and stirring speed, then analyze the Cd level in blood cockle using Atomic Absorption Spectrophotometry.

FINDINGS AND DISCUSSION

The results of Cd level test in blood cockle (*Anadara granosa*) with 50 grams of chicken egg shells as adsorbent before and after the treatment using stirring speed and adsorption temperature can be seen below. We use three replication.

Table 1: The average Level of Cd in Blood Cockle (*Anadara granosa*) with 50 grams of chicken egg shells as adsorbent before the treatment

Samples Code	Stirring	Adsorption	Results
	Speed (rpm)	Temperature (°C)	Cd (ppm)
KAT1		35	0.93
KAT2	50	50	0.87
KAT3		65	0.75
KBT1		35	0.79
KBT2	150	50	0.80
KBT3		65	0.80
KCT1		35	0.82
KCT2	250	50	0.82
KCT3		65	0.79
Total			7.37
Average			0.82

Based on SNI (Indonesian Standard) No. 7387, 2009, the level of Cd in blood cockle after it soaked with adsorbent chicken egg shells powder was below the maximum allowable threshold value (1 ppm). But we need to consider the effect of blood cockle consumption continuously in short time.

The accumulation of heavy metal in seafood can be happen due to food chain cycle. Palar explained that in the body of aquatic biota, the amount of heavy metal will accumulated and continue to increase (biomagnification) in the food chain, where biota at the higher level in the food chain will experience more accumulation⁽⁷⁾.

Table 2: The average level of Cd in Blood Cockle (*Anadara granosa*) with 50 grams of chicken egg shells as adsorbent after the treatment

Samples Code	Stirring	Adsorption	Results
	Speed (rpm)	Temperature (°C)	Cd (ppm)
AT1		35	0.48
AT2	50	50	0.31
AT3		65	0.15
BT1		35	0.12
BT2	150	50	0.09
BT3		65	0.08
CT1		35	0.07
CT2	250	50	0.04
CT3		65	0.03
Total			1.37
Average			0.15

The average difference of Cd level in blood cockle before and after the treatment using stirring speed and adsorption temperature was 0.82 ppm in before treatment group and 0.15 ppm in after treatment group. While the amount of Cd level decreasing can be seen in table 3.

Table 3: The amount of Cd level decreasing in Blood Cockle (*Anadara granosa*) with 50 grams of chicken egg shells as adsorbent before and after the treatment

Samples Code	Stirring Speed	Adsorption Temperature	Cd Results (ppm)		Decreasing Total	Decreasing Total
	(ppm)	(°C)	Before	After	(ppm)	(%)
AT1		35	0.93	0.48	0.45	48.4
AT2	50	50	0.87	0.31	0.56	64.4
AT3		65	0.75	0.15	0.60	80.0
BT1		35	0.79	0.12	0.67	84.8
BT2	150	50	0.80	0.09	0.71	88.75
BT3		65	0.80	0.08	0.72	90.0
CT1		35	0.82	0.07	0.75	91.5
CT2	250	50	0.82	0.04	0.78	95.1
CT3		65	0.79	0.03	0.76	96.2
Total			7.37	1.37	6.00	739.2
Average			0.81	0.15	0.67	82.1

The difference of average Cd level before and after treatment was 0.67 ppm (82.1%). It indicated that there was Cd level decreasing that is caused by stirring speed and adsorption temperature. This is the graphic which shows the percentage of Cd level in blood cockle (*Anadara granosa*) after the treatment using 3 variations of stirring speed and adsorption temperature with 50 grams of chicken egg shells as adsorbent.

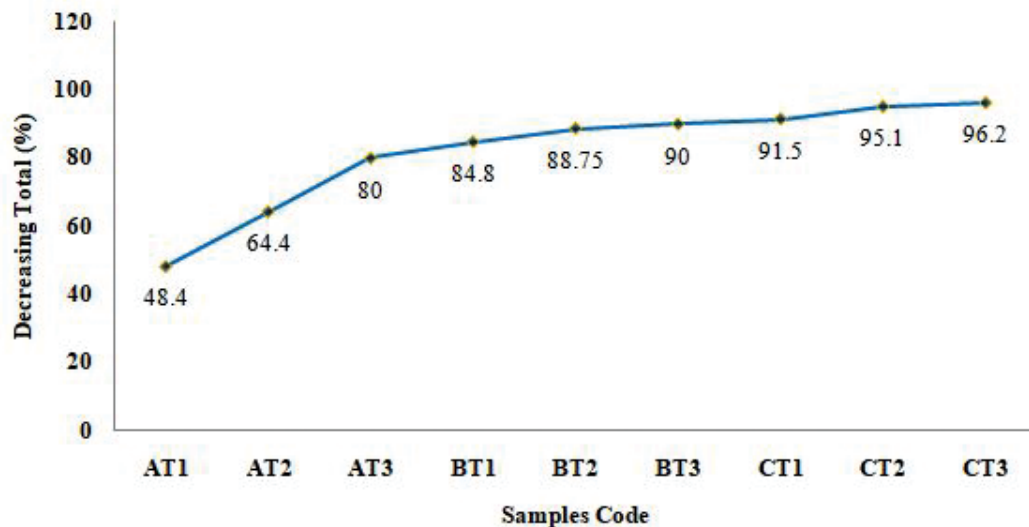


Figure 1: The Graphic of Cd Level Percentage in blood cockle (*Anadara granosa*) after the treatment using 3 variations of stirring speed and adsorption temperature with 50 grams of chicken egg shells as adsorbent.

From the Figure 1, we can understand that the highest decreasing total was CT3 sample using 250 rpm of stirring speed and 65°C. The total decreasing in sample CT3 was 96.2%.

Ancova test was used to assess the difference of each stirring speed and adsorption temperature variation. This test also was used to know the amount of difference of Cd level before and after the treatment. The decreasing

of Cd level has a positive correlation with the increasing of stirring speed and adsorption temperature. This means that the higher the speed of the stirring and adsorption temperature, will lead to the increasing of Cd level in blood cockle (*Anadara granosa*).

Table 4: Tests of Between-Subjects Effects

Dependent Variable: Cd Level After Treatments								
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^b
Speed	0.163	2	0.081	568.125	0.000	0.985	1136.250	1.000
Adsorption Temperature	0.084	2	0.042	293.468	0.000	0.972	586.937	1.000
Speed * Adsorption Temperature	0.072	4	0.018	125.149	0.000	0.967	500.595	1.000

a. R Squared = .995 (Adjusted R Squared = .993)

b. Computed using alpha = 0.05

Table 5: Pairwise Comparisons

Dependent Variable: Cd Level After Treatments						
(I) Stirring Speed	(J) Stirring Speed	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
50 RPM	150 RPM	0.222*	0.010	0.000	0.201	0.243
	250 RPM	0.272*	0.008	0.000	0.254	0.289
150 RPM	50 RPM	-0.222*	0.010	0.000	-0.243	-0.201
	250 RPM	0.049*	0.006	0.000	0.037	0.062
250 RPM	50 RPM	-0.272*	0.008	0.000	-0.289	-0.254
	150 RPM	-0.049*	0.006	0.000	-0.062	-0.037

Based on estimated marginal means

*. The mean difference is significant at the 0.05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

This test shows that chicken egg shells can be use as heavy metal adsorbent. Chicken egg shells can decrease Hg level in blood cockle. This indicates that activated chicken egg shells can absorb heavy metal. Napitapulu explain that physical activation can enlarge chicken egg shells pores. It happened due to chemical bonds breaking or surface oxidizing molecules so that the surface area increases and affects the adsorption potency⁽⁸⁾.

HCl as activator in chicken egg shells activation process can clean up the pores surface, remove impurities (non-carbon) compounds and rearrange the location of atoms exchanged. We can said that chemical

activation was a process to add certain reagents to clean and enlarge the surface of the chicken egg shell so that it can be used as an adsorbent.

Chemical activation method was the best way for adsorbent, in that research zeolite was used as adsorbent. It can adsorb water up to 13.77% after it is activated by chemical method⁽⁹⁾. Fitriyana & Safitri reported that chicken egg shells adsorbent potency test to ion, it results shows that non-activated chicken egg shells can adsorb 18.73% while physical activated chicken egg shells can adsorb 31%. This result indicated that activated chicken egg shells can adsorb ion better than non activated chicken egg shells⁽¹⁰⁾.

Aidha explained that activating adsorbent using HCl for 80 minutes can decrease up to 78.99% of calcium. Acid adding lead to cation exchange with H^+ thus enlarges the cavity in the adsorbent zeolite and increases the adsorbent power due to the increased porosity of the adsorbent⁽¹¹⁾.

Beside of that, stirring speed and adsorption temperature contribute to decrease Cd level in blood cockle. Statistic analysis shows that there was an influence of stirring speed and adsorption temperature to the Cd level decreasing. The increasing stirring speed and adsorption temperature lead a greater decrease of Cd level in blood cockle. Stirring causes turbulent liquids which is containing adsorbents. The faster the stirring will cause the greater movements so that it will make the film layer that surrounds the adsorbent particles thinner which makes the adsorption process run fast.

Webber explained that adsorption was limited by film diffusion and pore diffusion process, it depend on movements in the system. If the movements was slow, the film which is coating the particles will be thick so adsorption will be slow. If the stirring process was enough, the film diffusion process will run faster⁽¹²⁾.

Syauqiyah et al. explained that increased temperature causes the energy and reactivity of the ions to increase so that more ions are able to pass through the energy level to interact chemically with the active layer on the surface, so that more ions can be adsorbed on the surface. The heating treatment in this process can increase the adsorbent power to decrease Pb and Cd level in blood cockle⁽¹³⁾.

Heating or adsorbent activating would increase adsorbent power due to the adsorbent's pores will be larger. But if the temperature was too high it could damage the adsorbent⁽¹²⁾. Flores et al. stated that adsorption power in chicken egg shells will increase on 15-35°C due to endothermic process. The absorption of Cd (II) occurs mainly in the calcareous layer (which contains $CaCO_3$) and slightly in the membrane layer. This shows that the absorption of Cd (II) is irreversible and the main absorption mechanism is ion precipitation and exchange.

CONCLUSION

Stirring speed and adsorption temperature can increase the potenton of chicken egg shells to decrease Cd level in blood cockle by develop stirring chamber tool.

Source of Funding: Author

Ethical Clearance: Yes

Conflict of Interest: No

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Querying the Dataset from the Developed Ontology for Swineflu Disease

Radhika Pathi¹, Suresh Varma Penumathsa², Lakshmi Kalyani Neerukonda³, P. Rama Krishna³

¹Research Scholar, Rayalaseema University; India; ²Professor, Adikavi Nannaya University; India;

³Assistant Professor, VNR VJIE; India

ABSTRACT

Ontology design and querying the data set to obtain accurate results has been a topic of research. The aim of the paper is to represent ontological knowledge in the field of Medical Information Systems to store the knowledge about Swine flu disease and thereby querying the data and formalize the knowledge base development. The developed knowledge from RDF is converted to rules and then querying is done through different methods and performance analysis has been done on the retrieved query. The results predicted determine the suitability of the method where querying gives the accurate result for swine flu disease ontology.

Keywords: *Querying; Ontology; Swine-flu; Protégé; SPARQL;*

INTRODUCTION

Semantic Web a layer of existing web enables machines to operate better and share meaningful knowledge. Semantic Web provides technology stack where key part is standardized information exchange. As part of Semantic Web, Computers should have access to structured collection of documents and sets of inference rules so that they conduct automated reasoning. Semantic web can otherwise be referred as Linked Data. Aristotle defined the term Ontology^[1,8,9] in his Metaphysics. In 1998, Studer et al.^[2] defined the term Ontology as : “An ontology is a formal, explicit specification of a shared conceptualization.” Conceptualization denotes abstract model being representing some phenomenon identifying Knowledge in detail with individual relationships. In our paper, We present our application for searching on appropriate semantic information on Swine flu in respiratory disease ontology which is a domain ontology. This we have done using Classes and Objects and the inter individual relationships which gives the information to patient or any person searching the Web such as what drug is suitable for a patient given his symptoms. Explicit states that type, constraint and their use is explicitly stated. Shared echoes the perception that Ontology represents consensual knowledge refers to some group and not individual. Features are described by Classes and attributes are represented by data properties. Instances are represented by individual

classes and querying to retrieve semantic information is done with the help of SPARQL. The main purpose of the paper is to communicate information retrieval, querying through SPARQL and make an analysis of performance of web based applications to predict the query evaluation that gives accurate results when queried. The remaining part of the paper is organized as follows. Section 2 describes about the different tools used for Semantic Web and Section 3 describes about the framework for the development of swine flu ontology and section 4 presents analysis of NASA TLX INDEX^[3,4] on applying SPARQL^[5], OntoGraph^[6], SWRL^[7] Queries on the ontology that is retrieved and the evaluation is presented in the form of graph and Section 5 concludes our work.

Tools used for Semantic Web in our Case Study:

Respiratory diseases are the diseases caused due to the disorder of the air and lungs that affect the human respiratory system. These respiratory diseases may cause damage to the organs and the other internal structures that deal with the breathing, and may include nasal cavities, the throat, the bronchitis and many other organs present. Identification of these respiratory diseases and taking the correct predicate is a difficult task for a normal individual affected. Respiratory diseases cause the malfunction of the internal organs that block and cause damage to the lungs which may cause severe health issue. There are many diseases which are caused on the respiratory

system. Some of them namely, Asthma, Pneumonia, Upper respiratory tract infection, Infant respiratory distress syndrome, Cystic fibrosis, Shortness of breath, Obstructive lung disease, Bronchitis, Obstructive sleep apnea, Influenza-like illness, Acute severe asthma. These diseases may affect the human structures and organs directly. Knowledge of these diseases to the individuals is very much less rather than the experts in that domain. To get the knowledge about the diseases is very much difficult and that may happen only when the expertise help is provided to the user. To get the preventive measurements for a user without expertise help may end up in the wrong cause. To understand the content and to provide the better knowledge about the diseases ontologies provide an accurate representation to the user without the help of the expertise in that domain.

There may be various characteristics and different issues related to the diseases. Each of them are classified into the specific categories in the domain those are affecting different organs or the structures. Sufficient knowledge about the diseases and the corresponding precautions or about the diseases through the ontologies can help in removal of unnecessary damage and less spread of the wrong information through the web. Technologies that help to build a content oriented system is possible using semantic web^[10,11]. By using semantic web which provide information using the ontology help to show the related issues in the respiratory diseases, how it is caused and how it can be prevented. Much of the related information can be seen on the web rather than having the misguided information.

METHODOLOGY

Tools for Ontology Development

Protégé^[12,13]: Protégé is developed by Stanford University as a tool for Semantic Web and it is a framework for building Intelligent Web Systems. It can be adapted to build both simple and complex ontological applications where the concepts used are classes, objects and the inter individual relationships established among them. Protégé provides us meta modeling an the best part is that there is no syntax involved and domain ontologies can be developed easily with this.

Jena: Apache Jena is open source framework based on Java. It provides framework to extract data from and

write to RDF and graph which is represented as abstract model. Data can also be populated from databases, Files, URLs and also it has the API for creating and accessing RDF data.

RDF: A Resource Description Framework, is used as model for interchange of data on the Web. URIS are assigned to data objects and then RDF is used to create statements about them. RDF is used for serializing triples and RDF consists of Subject-Predicate-Object triple. This makes data easier to store and interchange.

SPARQL: An Acronym for SPARQL Protocol and RDF Query Language is used for querying, retrieving and manipulating data stored in RDF format. It allows us to search the Web and discover relationships among the classes and individual objects. SPAQRL takes text in the form of queries and return the results. SPARQL consists of SELECT queries which are similar to SQL thereby it is easy for the user to write if he has knowledge on the SQL queries. SPARQL produces results in three formats XML,JSON and CSV formats.

Ontograf: Ontograf provides support for navigating relationships of OWL ontologies. The various relationships that can be supported are subclass, individual, domain/range object properties, and equivalence. It provides zooming, spring layout, searchable relationship filters, configurable tooltips, pinning tooltips, OWL Imports View for better enhancement of views.

SWRL: SWRL rules can be executed through a tab in protégé SWRL Tab. It supports interoperating with other rule engines and there are other user-defined libraries and various built-in libraries are also provided mathematical, temporal and string operators. This language provide a powerful means extracting OWL Ontologies.

FRAMEWORK FOR SWINE FLU DISEASE ONTOLOGY

A framework for Swine Flu disease ontology is developed where ontology is created with the help of Protégé. Protégé helped in modelling of ontology classes. Classes used for development of Swine Flu disease are demonstrated in Fig. 1.

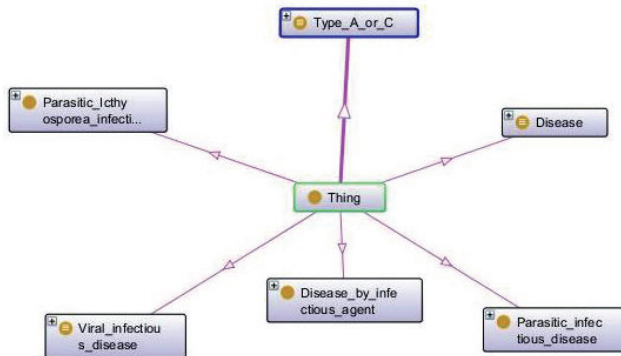


Fig. 1: Display of Term Candidates in an Unstructured List

Classes used are highest occurrence of Disease and its diagnosis, Symptoms of individuals, Causes of disease, Its prevention and Vaccines, Etiology. Relationships used are Named_Disease, Caused_By, Used_to_diagnose, Types, Has_severity, Managed_To, Disease_Name, Managed_by, Used_to_cure, Inter individual relationships are represented in the following Fig2.

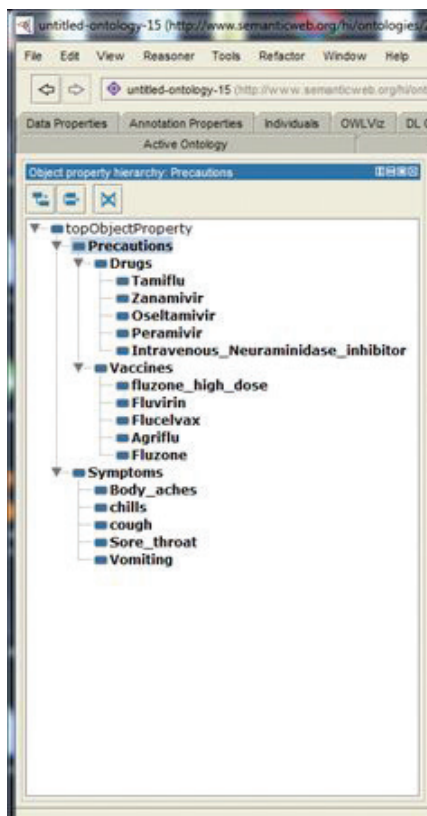


Fig. 2: Snapshot of inter individual relations in swine flu diseases

After SwineFlu disease ontology is developed, the next step is we evaluated our ontology using a Fact++ Reasoner which verified the ontology by executing each class and their properties.

RESULTS & DISCUSSION

Performance Evaluation: Our paper deals with SwineFlu ontology to disseminate knowledge to the user regarding SwineFlu the symptoms risk factors vaccines drugs Type_A/Type_c. we conducted one experiment to gather information regarding SwineFlu on two sets of users. One set of users has awareness on SwineFlu and the other does not have any awareness on SwineFlu. Taxonomy on SwineFlu ontology was shown in fig 1 where it comprised of classes, objects and instances. Various queries are posed on ontology and performance was evaluated as such which query gives the better performance. The type of queries used here are SPARQL Ontograf and SWRL.

1. User is asked to find the term “Fever” from Disease ontology

```

SPARQL query:
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX ab: <http://semanticweb.org/chandana/ontologies/2018/2/untitled-ontology-54#>
PREFIX ns: <http://semanticweb.org/chandana/ontologies/2018/2/untitled-ontology-54/swineflu#>
SELECT ?subject
WHERE {
  ?subject ?predicate ?object FILTER
  regex(str(?subject), "Fever", "i")
} order by ?subject
  
```

Fig. 3: Query 1

2. User is given the SwineFlu details and is asked to find the drug which is used to cure “Cough”.

```

SPARQL query:
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX ab: <http://semanticweb.org/chandana/ontologies/2018/2/untitled-ontology-54#>
PREFIX ns: <http://semanticweb.org/chandana/ontologies/2018/2/untitled-ontology-54/swineflu#>
SELECT DISTINCT ?object
WHERE {
  ?subject ?predicate ?object
  FILTER regex(str(?predicate), "curedBy", "i")
  FILTER regex(str(?subject), "Cough", "i")
} order by ?subject
  
```

Fig. 4: Query 2

3. Query for the user about the year of attack of disease like “In which year particular patient affected with swineflu disease”.

```

SPARQL query:
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX ab: <http://semanticweb.org/chandana/ontologies/2018/2/untitled-ontology-54#>
PREFIX ns: <http://semanticweb.org/chandana/ontologies/2018/2/untitled-ontology-54/swineflu#>
SELECT DISTINCT*
WHERE {
  ?subject ab:PatientID=50.
  ?subject ?predicate ns:hasSymptom swineflu
}
  
```

Fig. 5: Query 4

Different users tried to find out the information regarding swineflu disease on the basis of results retrieved by SPARQL, Ontograf, SWRL. There after NASA TLX(Task Load Index) As been used for query analysis and time need to perform execution. A comparative study on the results obtained by using different queries is done from this study. The SPARQL query has given higher efficiency and performance in retrieving the results when compared to other tools like ontograf, SWAL Query. This comparison states that SPARQL is far better suited than other tools in giving optimal results.

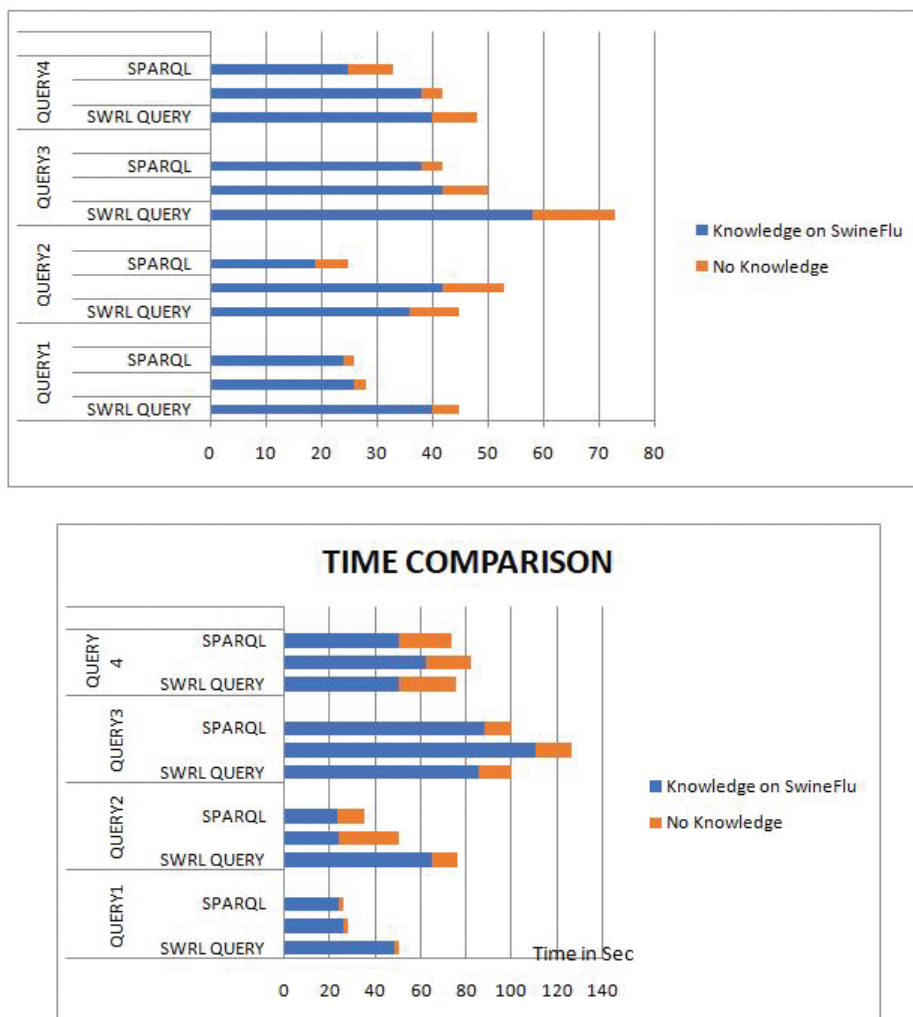


Fig. 6: SPARQL, Ontograf, SWRL Query TLX and Time Comparison

CONCLUSION

This paper gives knowledge on the creation of domain ontology for SwineFlu Disease and the queries are done using SPARQL. This gives performance analysis on ontological evaluation based on ontological tools. The analysis results state that SPARQL method is efficient method and it outperforms the other querying methods. Semantic web being intelligent web is used for developing ontology for swineflu that is useful for medical information systems that provides a linked data for the benefit of health care systems. This can be

extended with machine learning to train the patterns so that ontology for other respiratory diseases can be developed in future.

Ethical Clearance: This research was approved by the Research and Ethics Committee of the ESI Hospital, Pulmonology center, Chest Diseases, ESI, Hyderabad, India.

Source of Funding: This study was not funded by any Funding Agency.

Conflict of Interest: None declared

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Ventilation Analysis of EM-100, CSI-3000, OXY LIFE II and Bag-Valve Mask in Virtual Reality Ambulance Simulation

Sang-Gyun Roh¹, Jee-Hee Kim²

¹Department of Emergency Medical Services, Sunmoon University, 70, Sunmoon-ro, 221 beon-gil, Tangeong-myeon, Asan-si, Chungcheongnam-do, 31460, Korea; ²Include Department of Emergency Medical Services, Kangwon National University, 346, Hwangjo-gil, Dogye-eup, Samcheok, Gangwon-do, 25949, Korea

ABSTRACT

Background/Objectives: The purpose of the study is to investigate the effective ventilation delivery that affects the rate of resuscitation.

Method/Statistical Analysis: The National Fire Service Academy conducted Virtual Reality ("VR") based ambulance simulations from April 17, 2018 to April 28, 2018. The mean and standard deviations of mean ventilation and airway pressure were analyzed using descriptive statistics and ANOVA and SPSS software 12.0 (SPSS Ins., Chicago, IL, USA) program.

Findings: When VR-based intubation was performed, the ventilation was 427 ml from Oxylator EM-100, 458 ml from MicroVenT CSI-3000 and 305 ml from OXY-LIFE II. For the airway pressure, Oxylator EM-100 showed 10.623 cmH₂O, MicroVenT CSI-3000 showed 11.291 cmH₂O and OXY-LIFE II showed 6.965 cmH₂O. When tracheal intubation was performed on the VR base, Oxylator EM-100 and MicroVenT CSI-3000 showed adequate ventilation and airway pressure.

Improvements/Applications: This study suggests to use an oxygenator as an efficient ventilation method after intubation in ambulance during transport. Skilled practice and the method of use of rescuer is very important.

Keywords: *Virtual Reality, Oxylator EM-100, MicroVenT CSI-3000, OXY-LIFE II, RespiTrainer® Advance.*

Introduction

In addition to cardiac arrest, it is critical to provide airway maintenance and adequate ventilation for patients with very poor breathing or stopped breathing. Inadequate ventilation in a situation where airway maintenance is difficult and oxygen supply is unavailable is an important determinant of patient survival and normal function recovery and disability^[1]. The most commonly used equipment for artificial ventilation is a

back-valve mask when cardiopulmonary resuscitation (CPR) is performed in a cardiac arrest before arriving hospital, or when secondary respiration is needed due to poor respiration.

Airway maintenance, proper masking, and precise backpressure are required to deliver adequate ventilation volume using a bag-valve mask. Respiration varies depending on the ventilation method of the rescuer and is dependent on the ambulance movement or instability of the ambulance. Internal environment of the ambulance can also affect ventilation. According to recent guidelines, it is recommended that effective artificial ventilation in cardiac arrest should be maintained at a single ventilation of 500 to 600 ml (6 to 7 ml/kg)^[2].

Hyperventilation and artificial respiration of excessive volume interfere with blood flow into the heart due to increased intrinsic pressures, so cardiac output

Corresponding Author:

Jee Hee Kim

Professor,

Department of Emergency Medical Services,
Kangwon National University, Korea

Email: kjh1962@kangwon.ac.kr

decreases even though effective chest compression is performed. In addition, such decrease in cardiac output can reduce the blood flow of the brain and coronary arteries affecting the rate of revival and cause reflux of the gastrointestinal contents to induce reflux and inhalation complications^[3,4]. It is difficult to supply an adequate amount of oxygen in moving ambulance, and since the seat of the rescuer is located on the patient's side, it is difficult to apply the C-E technique when ventilation is performed using a bag-valve mask. In addition, ventilation with a bag-valve mask after intubation with a specialized tube is difficult to maintain a proper amount of one-time respiration due to improper posture of paramedic.

According to Act on 119 Rescue and Emergency Medical Services, the automatic oxygen supply is a must-have device for 119 ambulances, and three models are currently available: MicroVenT® CSI-3000, Oxylator® EM-100 and Oxy-Life® II^[5]. Automatic oxygen supply can assist ventilation either automatically or manually. Automatic oxygen supply is applied when patient's spontaneous breathing is irregular and auxiliary ventilation is needed while manual one can be applied to assist ventilation in patients who require CPR or artificial respiration. The manual oxygen supply is designed to deliver ventilation as long as the button or trigger is pressed or pulled, and there are two types of pressure and volume. The pressure type includes Oxylator EM-100 while volume type includes, MicroVenT CSI-3000 and OXY-LIFE II, and the ventilation and release pressure per hour are different by each product.

The oxygen supply supplies high pressure oxygen as long as the user presses the oxygen supply button or pulls the trigger, and the ventilation delivered to the lungs depends on the time the user presses or pulls. Oxylator, displayed in the existing ambulance vehicles, is based on the US Heart Association guidelines for 2000 and 2005, and is recommended to push or pull the oxygen supply button or trigger for 2 seconds. In the 2010 and 2015 American Heart Association guidelines, the artificial respiration method recommends respiratory assistance with a volume of 500 to 600 ml, which is equivalent to 1 second for adults to prevent over ventilation. However, the manual still introduces old ventilation method before 2005, so the user may cause over ventilation.

Previous studies related to oxygen supply include Comparison of one-time volume in demand valve and pocket mask ventilation^[6], Demand valve ventilation in pneumothorax model^[3], Comparison of bag-valve mask and demand valve ventilation^[4], Comparison of bag-valve mask and demand valve ventilation^[7], Comparison of ventilation and airway pressure using Oxylator EM-100^[8] and Comparison of Oxylator ventilation, etc^[9]. However, such previous studies have been limited to the comparison of oxygen supply with bag-valve mask ventilation in a situation where there is no moving.

This study compared the oxygen supply with ventilation using a bag-valve mask after endotracheal intubation in VR based ambulance. Since previous studies were conducted under fixed conditions, a comparison with VR-based studies is needed. Therefore, the purpose of this study is to provide basic data for efficient use of oxygen mask and bag-valve mask during transferring patient.

Materials and Method

Research Design and Data Collection: This study was a comparative analysis of ventilations of oxygen supply MicroVenT® CSI-3000, Oxylator® EM-100, Oxy-Life® II and back-valve masks with RespiTrainer® Advance in VR simulated ambulances. For this purpose, VR based simulation ambulance in the National Fire Service Academy was used and "Urban outside road scenario" was applied among the developed scenarios. Driving time was 60-80 km/h for 6 minutes. VR based simulation ambulance driving was conducted by the National Fire Service Academy's professor, and the same scenario was used.

Experiments compared the cases using MicroVenT® CSI-3000, Oxylator® EM-100, and Oxy-Life® II with a mask and the cases with a bag-valve mask. Also compared the cases using MicroVenT® CSI-3000, Oxylator® EM -100, Oxy-Life® II and the bag-valve mask after applying endotracheal intubation. The scenarios compared total 60 ventilations for 5 minutes.

For comparison of ventilations, endotracheal intubation was performed by one professor and one emergency first aid technician. Ventilation was performed by pressing and pushing Oxylator's oxygen supply button and trigger for 1 second and then collecting ventilation and airway pressure delivered to the lungs

using RespiTrainer® software (version 1.1, Ingmar, Pittsburgh, USA). The researchers used a stopwatch to practice the oxygen supply button and trigger for 60 seconds, followed by 60 times per each oxygen supply type[Figure 1]. During all ventilations, the investigator performed the test hiding the chest area so that the chest rising of RespiTrainer® Advance could not be seen. It was not easy to press the oxygen supply button for one second in a VR-based situation, although the preliminary experiment had enough practice to not exceed less than 0.9 seconds and more than 1.09 seconds.

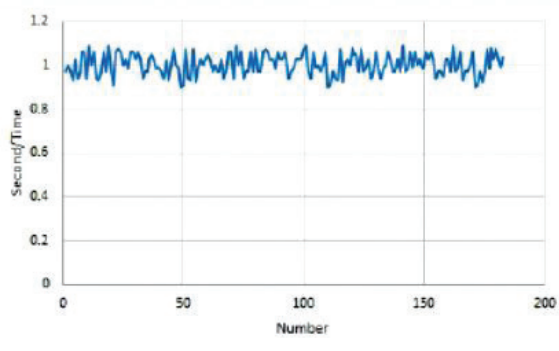


Figure 1: Pre-evaluation of Oxygen supply

Experimental tools

VR based Simulation Ambulance: The VR based ambulance designed to enable the education and training of emergency services in various road environments was developed as a fire research and development (R&D) project. VR based simulation ambulance implemented VR by applying Ambulance Driving Simulation S/W to computer controlled moving platform design[Figure 2]. Six scenarios have been developed to suit the surrounding environment, such as rural, urban and suburban environments, and are designed so that the rescuer can drive while monitoring scenarios set up outside the ambulance.

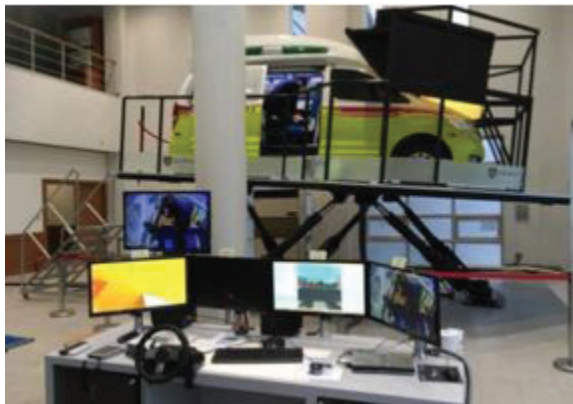


Figure 2: VR-based simulation ambulance

RespiTrainer: RespiTrainer® Advance (version 1.1, Ingmar, Pittsburgh, USA) is the equipment that is optimized for a wide range of special air intubation training and skills, and has realistic materials and anatomical structures. High-performance test lungs (QuickLung®) can achieve realistic lung capacity in adults, and software can be used to verify data such as ventilation and airway pressure. Airway resistance and compliance were set at 5 cmH₂O/L/s and 50ml/cmH₂O, which are the mean values of healthy persons without lung disease[Figure 3].

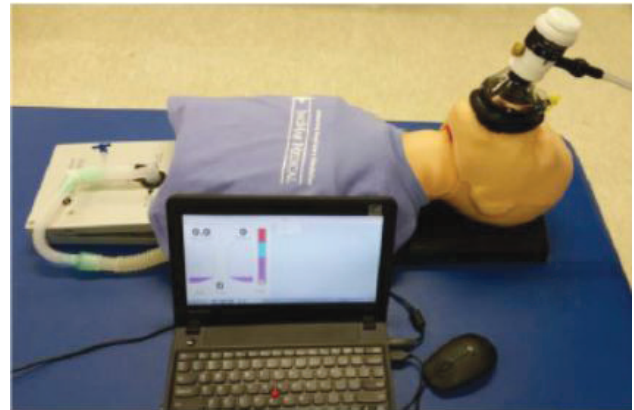


Figure 3: RespiTrainer® Advance

Automatic Oxygen Supply: The Oxylator EM-100 (Roswell, USA) has both automatic and manual pressure delivery methods and provides oxygen as long as the oxygen supply button is pressed while the airway pressure is set to 25-50 cmH₂O. In this experiment, the manual method was used. After connecting the tube of Oxylator EM-100 to the oxygen aspiration system (MEF-22), the supply pressure in the airway was set to 25 cmH₂O as recommended by the manufacturer. CSI-3000 (Chosun Instrument Inc., Korea) delivers compressed oxygen, which has both automatic and manual delivery methods. In passive mode, it can supply oxygen at a flow rate of 40 l/min and supplies oxygen as long as the oxygen supply handle is pulled. In this experiment, the manual method was used and the tube of CSI-3000 was connected to the oxygen aspiration system (MEF-22). OXY-LIFE II (SanCheong, Korea) is a product based on the 2000 guidelines of the American Heart Association. It delivers compressed oxygen in both the automatic and the manual modes and the oxygen is supplied as long as the manual button is depressed. In this experiment, the manual method was used, and the volume of respiration was set at 600 ml, and the tube of OXY-LIFE II was connected to the oxygen aspiration system (MEF-22).

Endotracheal Intubation: The tubes used for endotracheal intubation were Mallinckrodt® I.D. 7.5, and the depth of the intubation was fixed at 22 cm. The cuff was injected with 10 ml of air and fixed to the outside with a Thomas® Tube Holder to prevent loosening or moving.

Bag-valve mask (BVM): BVM was attached to a Laerdal® Silicone Resuscitator with a storage bag and the bag capacity was 1,600 ml.

Data Collection and Analysis

All experiments were conducted within a VR-based simulation ambulance and were conducted at the National Fire Service Academy from April 17, 2018 to April 28, 2018. All data were collected using respiTrainer® software (version 1.1, Ingmar, Pittsburgh, USA) to collect ventilation and airway pressure. The collected data were analyzed using SPSS software 12.0 (SPSS Inc., Chicago, IL, USA). The mean and standard deviation of ventilation and airway pressure were analyzed using descriptive statistics and ANOVA.

Results and Discussion

VR based endotracheal intubation was performed and the results of one-time respiration were analyzed. Back-Valve Mask showed ventilation of 380.750 ± 23.126 ml, with a minimum ventilation of 313 ml and a maximum ventilation of 436 ml. The Oxylator® EM-100 showed an average ventilation of 427.766 ± 21.643 ml, with a minimum ventilation of 380 ml and a maximum ventilation of 490 ml, which required an average of 1.011 seconds to press the oxygen supply button. CSI-3000 showed an average of 458.016 ± 28.978 ml ventilation, 370 ml minimum ventilation and 503 ml maximum ventilation, and it took 1.026 seconds on average to press the oxygen supply button. Oxy-Life® II showed an average ventilation of 305.833 ± 16.508 ml, with a minimum ventilation of 267 ml and a maximum ventilation of 353 ml, and an average of 1.014 seconds was required to press the oxygen supply button [Table 1].

Table 1: Comparison of Delivered Volume

Variables	Mean (ml)	Minimum	Maximum	Standard deviation	F	p	Scheffé
Bag-valve mask (a)	380.750	313.00	436.00	23.126	474.317	.000	a>d, a<bc
Oxylator EM-100 (b)	427.766	380.00	490.00	21.643			B<c, b>ad
MicroVenT CSI-3000 (c)	458.016	370.00	503.00	28.978			c>abd
OXY-LIFE®II (d)	305.822	267.00	353.00	16.508			d<abc

Table 2 shows the results of airway pressure analysis with VR-based endotracheal intubation. The back-valve mask showed an average airway pressure of 14.913 ± 1.151 cmH₂O, with a minimum airway pressure of 12.70 cmH₂O and a maximum airway pressure of 17.40 cmH₂O. The Oxylator® EM-100 showed an average airway pressure of $10.623 \pm .438$ cmH₂O, with a minimum airway pressure of 9.70 cmH₂O and a maximum airway pressure of 11.90 cmH₂O. CSI-3000 showed an average airway pressure of 11.291 ± 4.90 cmH₂O, with a minimum airway pressure of 10.0 cmH₂O and a maximum airway pressure of 12.20 cmH₂O. Oxy-Life® II showed an average airway pressure of $6.965 \pm .340$ cmH₂O, with a minimum airway pressure of 6.30 cmH₂O and a maximum airway pressure of 7.70 cmH₂O [Table 2].

Table 2: Comparison of Airway Pressure

Variables	Mean (cmH ₂ O)	Minimum	Maximum	Standard deviation	F	p	Scheffé
Bag-valve mask (a)	14.913	12.70	17.40	1.150	1357.863	.000	a>bcd
Oxylator EM-100 (b)	10.623	9.70	11.90	0.438			B>d, b<ac
MicroVenT CSI-3000 (c)	11.291	10.00	12.20	0.490			c>bd, c<a
OXY-LIFE®II (d)	6.965	6.30	7.70	0.340			d<abc

Effective oxygen delivery is recommended for 1 second at 5-6 ml/kg, but it is not easy to supply oxygen efficiently within a wavering ambulance. There are three kinds of oxygen supplies in the ambulance under the Act on Rescue and Emergency Service: Oxylator EM-100 which is pressure transmission system, MicroVent CSI-3000 which is volume system and OXY-LIFE II. In all three types, oxygen is delivered as long as the oxygen supply button is pressed or the trigger is pulled. Therefore, there is always a risk of over ventilation because the ventilation can be different according to the method used by the rescuer.

A previous study reports that ventilation using Oxylator EM-100, CSI-3000 and OXY-LIFE II after endotracheal intubation was 551 ml for Oxylator EM-100, 527 ml for CSI-3000, 369 ml for OXY-LIFE® II of ventilation [9]. In the two models, it was identified that 1 minute respiration (500-600 ml) could be delivered while holding the oxygen supply button for 1 second, and the other one showed insufficient ventilation. In this study, ventilations were compared using VR based “Urban outside road scenario”. Ventilations were average 427 ml for Oxylator® EM-100, 458 ml for CSI-3000 and 305 ml for OXY-LIFE II. In comparison with the previous study, the mean ventilation were identified to be lower than the previous studies with Oxylator by 124 ml, CSI-3000 by 69 ml and OXY-LIFE II by 64 ml respectively. In the minimum ventilation, it was identified to show lower than the mean ventilation with Oxylator EM-100 by 135 ml, CSI-3000 by 131ml and OXY-LIFE® II by 74 mL respectively.

On the other hand, the ventilation was 380 ml when using a bag-valve mask after endotracheal intubation. The mean ventilation of the previous studies ranged from 320 to 524 ml, and this study was conducted as a 1/3 bag compression method for delivering one-time volume based on the 2010 guidelines [10-13]. The reason for this is thought to be the difference depending on the degree of adhesion of the bag-valve mask and the degree of back-squeezing. In order to reduce hyperventilation and high volume and low volume, continuous education and quality control should be performed. On the other hand, in the case of intubation such as endotracheal intubation, manual ventilation using the oxygen supply is relatively easy to use compared with the ventilation with the bag-valve mask, especially, the oxygen could

be easily supplied in the moving space when transferring the patient to the hospital from the accident scene.

Airway pressure above 20-25 cmH₂O can lead to lung injury and reflux and inhalation complications [14,15]. Ventilation with VR based Oxylator EM-100 showed airway pressure of 10.623 cmH₂O and CSI-3000 of 11.291 cmH₂O. However, OXY-LIFE II showed 6.965 cmH₂O, indicating that ventilation is provided at relatively low pressure. In previous studies, the airway pressure to deliver 496 ml of volume through endotracheal intubation was 11.67 cmH₂O^[8] and the airway pressure to deliver a volume of 537.97 to 488.19 ml was 11.34 to 10.61 cmH₂O^[9]. Therefore, the Oxylator EM-100 (10.623) and CSI-3000 (11.291) shown in this study are considered to have adequate airway pressure.

This study is a comparative analysis of the ventilation and airway pressure of Oxylator EM-100, CSI-3000, and OXY-LIFE II when using manual mode of oxygen supply in VR based firefighting ambulance. On the VR basis, when oxygen was used to provide ventilation with endotracheal intubation, Oxylator EM-100 showed 427 ml, CSI-3000 showed 458 ml and OXY-LIFE II showed 305 ml respectively. Considering the average weight of adults in Korea, Oxylator EM-100 and CSI-3000 showed adequate ventilation, but OXY-LIFE II was found to have low respiratory rate.

Conclusion

In this study, the researcher compared the ventilation delivery of VR based oxygen supply, which is designated as an ambulance essential equipment by the Act on 119 Rescue and Emergency Medical Services and could deduct following conclusion: When endotracheal intubation was performed, the volume of ventilation was 427 ml for Oxylator EM-100, 458 ml for CSI-3000, and 305 ml for OXY-LIFE II. For airway pressure, Oxylator EM-100 showed 10.623 cmH₂O, CSI-3000 showed 11.291 cmH₂O, and OXY-LIFE II showed 6.965 cmH₂O. When endotracheal intubation was performed on VR base, Oxylator EM-100 and CSI-3000 showed mean ventilation and airway pressure.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Emotional Intelligence, Emotional Labor and Exhaustion of the Clinical Nurses

Jummi Park¹, Nayeon Shin²

¹Nursing Department, Namseoul University, 31020, Korea; ²Nursing Department, CHA University, Bundang CHA Hospital, 13497, Korea

ABSTRACT

Background/Objectives: This is the descriptive research study to grasp the emotional intelligence, emotional labor and exhaustion of the nurse clinician and using possibility of emotional intelligence in nurse organization by identifying their relationships.

Method/Statistical analysis: The data were collected from May till December 2013. The data were collected via structural questionnaires gathered by 230 hospital nurses who consented to take part in the study, and 215 of them were analyzed except for 15 incomplete questionnaires and male nurses. Descriptive statistics, independent t-test, one way ANOVA and Pearson's correlation were used for analysis.

Findings: There were significant negative correlations of emotional Intelligence with emotional labor ($r = -.55$, $p < .001$), and emotional intelligence and exhaustion ($r = .31$, $p = .311$), emotional labor and exhaustion ($r = .18$, $p = .002$) showed a positive correlation.

Improvements/Applications: This study concluded that emotional intelligence of clinical nurses reduce emotional labor and emotional labor increased the exhaustion. Nurses will expect the development of intervention programs to enhance the emotional intelligence of nurses.

Keywords: Emotional intelligence, Emotional Labor, Exhaustion, Nurse, Clinician

Introduction

There is a global efficiency of health care providers and the state of affairs is aggravating¹. The World Health Organization estimates the topic of the health care worker decline, in particular the deficiency of nurses, and the deficiency of nurses may interrupt international exertion by improving the well-being and health of the universal people². Consequently, most health-care associations are progressively undergoing emotional labor to regulate and suppress their emotions³.

Emotional labor stands for expressions for members of organization and the regulation of feeling. Emotional labor has various negative repercussions, including

increased turnover intention⁴ decreased job satisfaction⁵, and exhaustion⁶. More recently, this is confronting a rise in the turnover ratio of Korean nurses as a consequence of the labor movement, and strenuous workplaces⁵, which has caused shortage of experienced and skilled nurses. The current nursing shortage has been related to not only work, but also personal conditions, such as control over practice, hard work conditions, and poor collegial relationships⁷. There is multiplying proof that psychological variables, like emotional intelligence, emotional labor, and exhaustion function important role in multiple results in clinician nurses⁸.

Emotional intelligence is mainly described in terms of a useful ability to measure in practice nurses and cognitive process of social judgment⁹. Emotional intelligence may offer important new insights into efficiently reducing nurse stress, and improving their retention¹⁰. It is suggested that nurses are demanded to engage closely with their patients and comprehend patients' needs will benefit from having better levels of

Corresponding Author:

Nayeon Shin
Unit manager, Nursing Department,
Bundang CHA Hospital, Korea
Email: nabong78@hanmail.net

emotional intelligence. Distinctly, nursing profession contains the direct provision of care which can be adjured and emotionally exhausting¹¹.

Emotional labor is designated as an individual's capability to adjust to stress and adversity⁴. Nurses unavoidably go through emotional labor in being on their works, which contains sustained emotional rapport with patients¹². Therefore, it is inevitable to endeavor to inhibit emotional labor from leading to exhaustion. In accordance with some researches that get studied the correlation between emotional labor and exhaustion, such features of psychosocial variables can regulate the correlation between emotional labor and exhaustion^{5,6,10}. Exhaustion is a decline in personal accomplishment and related to feeling of emotional stress from contact with other people¹³. Nurse professions have been considered as one of the groups at risk of being affected emotional exhaustion due to the intensity of the stressors with regard to their job demands³. There is an actual distinction between nurses of the physiological and psychological strength of place of work stressors in each nurse and the nurses' opinions of these stressors¹⁴.

Thus, this research was to show the relationship among emotional intelligence, emotional labor and exhaustion of nurses in Korea. Currently, emotional intelligence, emotional labor and exhaustion have encountered as research problem in comparison with theoretical concepts, influencing various organizational components in the healthcare field². This study is purposed to examine the correlation among emotional intelligence, emotional labor, and exhaustion in nurse clinician in healthcare²⁴.

Methods

Design: This study is a cross-sectional research design that explored the relationships among emotional intelligence, emotional Labor, exhaustion of nurses in Korea.

Participants: The data was collected via structural questionnaires gathered by 230 hospital nurses who consented to participate in the study, and 215 of them were analyzed except for 15 incomplete questionnaires. The data was collected from May till December 2014. The data were analyzed with SPSS 23.0 statistical program. To investigate relationship in independent and dependent variables, correlation analysis was used.

Measurements

Emotional intelligence: The Wong and Law emotional intelligence scale, developed by Wong and Law¹⁵, was used to measure the nurses' emotional intelligence level. There were a total of 12 items, which included the feeling of understanding of self-emotion, understanding of other's emotion, emotional control, and application of emotion. The questionnaire were grounded upon a five point scale (1 = strongly disagree, 5 = strongly agree). Higher scores imply a higher emotional intelligence level. Cronbach's α for emotional intelligence in this research was .92

Emotional labor: Emotional labor scale, developed by Morris and Feldman¹⁷, was used to measure the emotional labor. Emotional labor developed Morris and Felaman¹⁶ was translated into Korean by Kim¹⁷. Emotional labor is consisted of 3 subscales which were composed of 9 questions of frequency, attentiveness, and dissonance. Overall 9 questions are grounded upon a 5-point scale (1 =strongly disagree, 5 =strongly agree). In this research, Cronbach's α of total questions was .90.

Exhaustion: MBI (Maslach Burnout Inventory) developed by Maslach and Jackson¹⁸ was translated into Korean by Choi and Chung¹⁹. Exhaustion is consisted of 3 subscales, they are emotional exhaustion, depersonalization, and lower sense of personal accomplishment. Job burnout has 9 questions of emotional exhaustion, 5 questions of depersonalization, and 8 questions of lower sense of personal accomplishment. Overall 22 questions are grounded upon a five point scale (1 =strongly disagree, 5 =strongly agree). When the scale was developed, Cronbach's α of total items was .76. In this research, Cronbach's α of total items was .92.

Data Analysis

Data analysis was performed using the SPSS(version 23.0). The collected data was made statistics for descriptive statistics, t-test, ANOVA, Pearson's correlation.

Ethical Consideration: Preparing for collecting the data, the decision of participating was made by unit manager in nursing department of hospital. Nurses also taken the notice of this study containing the benefits, potential risks and purpose of this study and data collection procedure. Nurses who were unwilling to take part in this research, they could decline for participation whenever.

Results

Demographic characteristics: The general characteristics of the participants are indicated in Table 1. The average age of the participants was 26.80 years. Of the 215 participants, 150 nurses (70.0%) were single. Regarding work department, most nurses worked in Medical ward (40.0%). Regarding religion, 97 nurses (45.0%) of the participants were Christianity. Average clinical career is shown in Table 1. One to five years, 130 nurses (60.4%); five to 10 years, 70 (32.5%); and more than 10 years per day, 15 nurses (7.1%).

Table 1: General characteristics (N = 215)

Variable	Category	Mean $\pm$ SD, n (%)
		29.80 $\pm$ 4.51
Age	20~29	140(65.1)
	30~39	66(30.6)
	$\geq$ 40 years old	9(4.3)
Marital state	Single	150(70.0)
	Married	65(30.0)
Work department	Medical ward unit	86(40.0)
	Surgical ward unit	65 (30.1)
	Intensive care unit	43(20.0)
	Emergency room unit	21(9.9)
Religion	Christianity	97(45.0)
	Catholic	30(14.0)
	Buddhism	8(3.7)
	None	80 (37.3)
Clinical career	1 to 5 years	130(60.4)
	5 to 10 years	70(32.5)
	$\geq$ 10 years	15(7.1)

Descriptive Statistics: Descriptive statistics for emotional intelligence, emotional labor, and exhaustion are demonstrated in Table 2. A score of emotional intelligence of the participants was mean 3.66 points out of 5.0 and when seeing by sub domains, understanding of self - emotion was 3.55 points, understanding of other's emotion was 3.40 points, emotional control was 3.15 points, and application of emotion was 3.30 points. Emotional labor of the participants was on average 25.32 points out of 45.0 and when seeing by sub domains, frequency of emotion labor was 8.42 points emotional attentiveness was 8.76 points, and emotional dissonance was 7.52 points. Exhaustions of

the participants was on average 3.40 points out of 5, and seeing by subdomains, emotional exhaustion 3.40 points, the depersonalization was 2.99 points and low sense of personal accomplishment was 3.55 points.

Table 2: Mean and SD of Emotional intelligence, Emotional labor, and Exhaustion (N = 215)

Variable	M $\pm$ SD	Range
Emotional intelligence	3.66 $\pm$ 0.63	1~5
Understanding of self-emotion	3.55 $\pm$ 0.67	
Understanding of other's emotion	3.40 $\pm$ 0.64	
Emotion control	3.15 $\pm$ 0.68	
Application of emotion	3.30 $\pm$ 0.51	
Emotional labor	25.32 $\pm$ 4.81	9~45
Frequency	8.42 $\pm$ 1.88	
Attentiveness	8.76 $\pm$ 2.75	
Dissonance	7.52 $\pm$ 1.35	
Exhaustion	3.40 $\pm$ 0.67	1~5
Emotional Exhaustion	3.35 $\pm$ 0.81	
Depersonalization	2.99 $\pm$ 0.87	
Lower sense of personal accomplishment	3.55 $\pm$ 0.77	

Correlations: Table 3 exhibits inter-correlations among major study variables. There were negative correlations between emotional intelligence and emotional labor ($r = -.55$, $p < .001$), and positive correlation between emotional intelligence and exhaustion ($r = .31$, $p = .311$) and emotional labor and exhaustion ($r = .18$, $p = .002$) significantly.

Table 3: Correlation among main variables (N = 215)

	Emotional intelligence	Emotional labor	Exhaustion
Emotional intelligence	1		
Emotional labor	-.55 ($p < .001$)	1	
Exhaustion	.31(.311)	.18(.002)	1

Discussion

The aim of this study is to investigate the correlation of emotional intelligence, emotional labor, and exhaustion of clinical nurses in Korea. Nursing is a strenuous work and clinical situation expand nurses at an early stage in their studies to the practices of working as a healthcare provider.

In this study, the average emotional intelligence score was 3.66 points of 5.00. Although it is hard to make a comparison with these results with that previous study because different scale was utilized, this points was higher than the 5.42 points noticed among nurses working in USA²⁰. These differences between these studies may be owing to differences in cultural properties because this research was implemented at tertiary teaching hospitals in Korea. This cause is assisted by a precedent research that identified that nurses doing a work at general hospitals in United States of America²⁰ intend to participate in less emotional labor than nurses doing their work at tertiary teaching hospitals.

In this research, the average score of emotional labor among subjects was 25.32 points. In the group of the three parts of emotional labor, attentiveness in the profession had the highest mean score, while dissonance had the lowest. Comparing previous study²¹, this score was lower. It is hard to make a comparison these two studies because the previous research studied 3466 Finnish participants who were could not verify their work ethic feasibility. Nevertheless, the higher than-mean emotional labor scores and high exhaustion scores indicate that high emotional labor is induced by Korean nurses' practice environment.

The mean exhaustion score in this study was 3.40 points (of 5), representing that subjects undergo a moderate level of exhaustion. This exhaustion score is higher in tertiary teaching hospitals nurses in Korea than that found in nurses doing their work in a hemodialysis unit in Turkey²². Because it is not the same working environment as that for estimating exhaustion, it is hard to make a comparison, the score, but the higher level of exhaustion in participants in this study would result in the impact of emotional labor, which can be brought about the comparatively more severity of patients admitted in tertiary care hospitals. In previous research, exhaustion scores were higher than that of nurses in Greece general hospital (2.51 of a possible 5), too²³. Therefore, there were obvious characteristics comparing national level, suggesting that Korean nurses reported higher levels of exhaustion than nurses in western countries. This study suggests that it is required to adjust factors related to exhaustion among Korean nurses.

This finding would represent that clinical nurses make plentiful effort into managing their emotions as healthcare providers to efficiently care patients. Whereas, it might imply that nurses are to manage their emotions

because of making decisions about nursing care. Accordingly, this finding insists that adequate nursing interventions are required to help reduce emotional distress in nurses while enhancing their capability.

Conclusion

This study is conducted to identify that the correlations among emotional intelligence, emotional labor and exhaustion of the clinical nurses. In order to reduce the emotional labor and exhaustion of the nurses, clinical nurses have to improve and utilize emotional intelligence. So that, the development of the nursing intervention programs which could enhance the emotional intelligence of the nurses are required. In case of education for clinical nurses, the implementation of nursing intervention programs should reduce the emotional labor and exhaustion. Accordingly, improving of emotional intelligence should be taken into account the positive effects on clinical nurses.

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Ethical Clearance: Not required

Source of Funding: Namseoul University

Conflict of Interest: Nill

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Nurses' Professional Quality of Life

Gyun-Young Kang¹, Jinju Kim¹

¹Kyungdong University College of Nursing, Wonju-si, Gangwon-do, Korea

ABSTRACT

Background/Objectives: This study is a descriptive research study to identify factors affecting quality of professional lives of nurses.

Method/Statistical Analysis: The subjects of this study were 177 nurses working in a general hospital in Korea, and the data collection was from February 01, 2018 to February 26, 2018. The collected data were analyzed by descriptive statistics, t-test, ANOVA, Pearson's correlation and multiple regression analysis.

Findings: As a result of the study, Quality of professional lives of nurses and Emotional labor($r=-.114$, $p=.016$) showed negative correlation, and Emotional intelligence($r=.274$, $p=.000$) showed significant positive correlation. Among emotional intelligence, self emotional appraisal($\beta=-.043$, $p=.000$) and the use of emotion($\beta=-.394$, $p=.007$) were found to affect the quality of professional lives of nurses.

Improvements/Applications: In conclusion, strategies for minimizing emotional labor and improving emotional intelligence are needed to improve the quality of professional life.

Keywords: Emotional Labor, Emotional Intelligence, Nurses, Professional, Quality of life

Introduction

Han et al.¹ studied and published about emotional labor occupational groups for a total of 5,667 workers in 203 Korean occupations. Of the 30 high emotional labor groups, nurses were included and nurses experienced a high average emotional labor of 4.33 points. Among the medical care workers, nurses are experiencing the highest emotional labor after emergency medical staff^[1], and emotional labor, emotional intelligence, and professional quality of life for nurses performing nursing at the forefront for the health of the subject need to be recognized.

Emotional labor refers to labor involving the suppression and control of emotions to express emotional expressions such as speech, facial expressions, and gestures as part of the job². Currently, workers' suicide

and high suicide accidents and stress caused by heavy and continuous emotional labor are becoming a big social problem. Recently, in Korea, an amendment to the Industrial Safety and Health Act called 'Emotional Laborer Protection Act' has been implemented in October 2018³ and legal protection against emotional laborers has been started. As the industry becomes more sophisticated and service workers are increasing, their access to emotional labor for mental and physical health is an important issue, and it is also important that they have an interest in their quality of life. Recently, emotional labor was recognized as a specific labor and it was recognized for its importance however, nursing of patients is recognized simply as a duty of a nurse, such as professional consciousness or service spirit, and the understanding of emotional labor that is experienced during provision of nursing is still lacking.

Since the emotional labor of a nurse can not be omitted during the performance of a job, the emotional labor of the nurse must be actively managed⁴. In many previous studies, emotional labor affected Exhaustion^{4,5,6}, Increased job stress⁷, Turnover intention⁶, and Job commitment⁸ of nurses and was reported to reduce the quality of nursing and the quality of professional life⁹.

Corresponding Author:

Jinju Kim

Associate Professor,

Kyungdong University College of Nursing,

Wonju-si, Gangwon-do, KOREA

Email: mhealth@kduniv.ac.kr

Emotional intelligence is an emotional tendency that is mentioned as a countermeasure against stress that has harmful effects on an individual or organization¹⁰, and it refers to the ability to recognize the emotions of oneself and others, synchronize oneself, and manage emotions well¹¹. In the nursing field, various stresses occur, but the nurses with high emotional intelligence think positively and rationally to resolve the conflict effectively, to control emotional labor¹² by controlling emotions, and are highly engaged¹³. Therefore, nurses who provide physical and mental care for all age groups need emotional intelligence to be able to cope effectively with their work¹⁴. Therefore, the research that confirms the emotional intelligence affecting the professional lives of nurses will be meaningful.

Nurses who are experiencing psychological stress and stress frequently are exposed to emotional labor, which can negatively affect the quality of professional life. Emotional labor has been reported to cause Exhaustion⁵ and to affect the quality of professional life⁹. Professional quality of life has been studied and applied to professionals in many industries^{15,16}, and in Korea, the quality of professional life is being studied in nurses such as emergency room nurse¹⁷, oncology nurse¹⁸, mental nurse¹⁹, community health practitioners²⁰. It is necessary to apply the concept of quality of professional life to understand how nurses nursing patients in various fields evaluate themselves and their work, and it is necessary to examine how emotional labor and emotional intelligence affect the quality of professional life.

Therefore, the purpose of this study is to investigate the effect of emotional labor and emotional intelligence on the quality of professional life for nurses. In addition, it was attempted to provide basic data for enhancing the understanding of nurses, alleviating the emotional labor of nurses, and establishing plans for adjusting and utilizing emotions.

Materials and Method

Design: This study is a descriptive study to investigate the effect of emotional labor and emotional intelligence of nurses on quality of professional life.

Subjects: The subjects of this study were 177 nurses working in a general hospital in Korea. The questionnaire was given to 200 subjects considering dropout rate, and of the collected questionnaires, 177 were used as the final analysis data, excluding 23 missing many responses.

Tool

Emotional Labor: The emotional labor measurement tool was based on the work of Morris and Feldman²¹ developed by Kim²². This tool has 9 total items including 3 items of Frequency of emotional display, 3 items of Attentiveness to required display rules, and 3 items Emotional dissonance. Each item was answered with Likert 5 point scale, and higher score represents higher emotional labor. In Kim's (1998) study, Cronbach's α was .86, and Cronbach's α was .89 in this study.

Emotional Intelligence: The emotional intelligence scale used was the WLEIS (Wong & Law Emotional Intelligence Scale) tool developed by Wong & Law²³. This tool consists of a total of 16 items including 4 items of self emotional appraisal, 4 items of others emotional appraisal, 4 items of use of emotion, 4 items of regulation of emotion. Each item is measured on a 5-point Likert scale, and higher score represents higher emotional intelligence. Cronbach's α was .87 at the time of tool development, and Cronbach's α was .94 in this study.

Quality of Professional Life: For Quality of professional life, Compassion satisfaction/Fatigue self test for Helpers developed by Figley²⁴ revised by Stamm²⁵ to ProQOL Version 5 was used. This instrument consists of empathy satisfaction and empathy fatigue, and empathy fatigue consists of exhaustion and secondary traumatic stress. It is measured in a 5 point Likert scale, and is composed of 10 questions for each area and total 30 items. The reliability of Cronbach's α =.84 was shown in this study.

Data Collection Method: The data collection period of this study was from February 01, 2018 to February 26, 2018, and the data collection place was a general hospital in Korea. The researcher visited the nursing departments of each hospital, explained the purpose of the research, and received permission from the head of department. After obtaining the consent of each ward nurse, only the data of nurses who agreed to participate in this study with written consent were collected. The completed questionnaire was put in an envelope and sealed by the researcher.

Data Analysis Method: Data were analyzed using SPSS/WIN 21.0. The relationship between the emotional labor, emotional intelligence, and quality of professional life of the subjects was analyzed using Pearson correlation coefficient and multiple regression analysis was used to determine the factors affecting the quality of professional life.

Results and Discussion

Results

General Characteristics of Subjects and Emotional Labor, Emotional Intelligence, and Quality of Professional Life according to General Characteristics: The general characteristics of the subjects are as follows. The average age of the patients was 26-30 years (43.5%), and most of them were female (88.7%). The most common marital status was unmarried (67.8%) and no religion (47.3%). And general nurses accounted for 88.7%, the majority. As shown in table 1.

The emotional labor, emotional intelligence, and quality of professional life according to general characteristics of the subjects are as follows. Emotional labor of the subjects showed differences in Gender($t=2.48$, $p=.000$), and Emotional intelligence showed significant differences in Age($F=3.266$, $p=.023$), Gender($t=-2.09$, $p=.000$), Marital status($F=3.330$, $p=0.38$), and Religion($F=1.014$, $p=.365$). Quality of professional life showed differences in Gender($t=-3.48$, $p=.000$) and Religion($F=3.688$, $p=.007$). As shown in table 1.

Table 1: General Characteristics of Subjects and Emotional Labor, Emotional Intelligence, and Quality of Professional Life according to General Characteristics

General Characteristics		N(%)	Emotional Labor			Emotional Intelligence			Professional Quality of life		
			Mean $\pm$ SD	t/F	p	Mean $\pm$ SD	t/F	p	Mean $\pm$ SD	t/F	p
Age	20-25	78(44.1)	32.04 $\pm$ 5.70	.746	.526	71.76 $\pm$ 12.40	3.266	.023	99.13 $\pm$ 9.47	.526	.665
	26-30	77(43.5)	32.62 $\pm$ 4.97			67.25 $\pm$ 9.33			99.43 $\pm$ 8.02		
	31-35	16(8.6)	33.50 $\pm$ 2.28			66.13 $\pm$ 5.82			97.06 $\pm$ 2.62		
	≥ 36	6(3.2)	34.50 $\pm$ 0.84			64.67 $\pm$ 1.03			96.67 $\pm$ 1.03		
Gender	Female	157(88.7)	32.84 $\pm$ 4.46	2.48	.000	68.45 $\pm$ 9.53	-2.09	.000	98.23 $\pm$ 6.67	-3.48	.000
	male	20(11.3)	29.90 $\pm$ 8.17			73.7 $\pm$ 16.81			104.85 $\pm$ 14.90		
Marital status	Unmarried	120(67.8)	32.51 $\pm$ 5.25	.358	.699	69.15 $\pm$ 9.53	3.330	.038	98.30 $\pm$ 8.17	2.885	.059
	Married	55(31.1)	32.40 $\pm$ 4.76			69.51 $\pm$ 12.05			8.02 $\pm$ 1.09		
	Other	2(1.1)	35.50 $\pm$ 2.12			50.00 $\pm$ 25.46			13.44 $\pm$ 9.50		
Religion	Christian	30(16.9)	32.30 $\pm$ 5.77	3412	.800	72.30 $\pm$ 11.79	2.209	.070	100.07 $\pm$ 7.27	3.688	.007
	Buddhist	20(11.3)	31.35 $\pm$ 5.95			72.55 $\pm$ 12.05			103.30 $\pm$ 9.50		
	Catholic	31(16.7)	32.42 $\pm$ 4.46			68.10 $\pm$ 8.11			97.27 $\pm$ 6.53		
	No	88(47.3)	32.78 $\pm$ 4.51			67.18 $\pm$ 9.46			97.68 $\pm$ 7.64		
	Other	8(4.3)	33.50 $\pm$ 8.28			72.25 $\pm$ 18.90			105.13 $\pm$ 14.14		
Current position	Head nurse	7(4.0)	34.57 $\pm$ 0.79	1.101	.335	64.86 $\pm$ 1.07	1.014	.365	96.86 $\pm$ 1.07	.247	.781
	Charge nurse	13(7.3)	33.77 $\pm$ 2.45			71.92 $\pm$ 10.46			99.33 $\pm$ 3.39		
	Staff nurse	157(88.7)	32.31 $\pm$ 5.30			68.99 $\pm$ 10.89			99.06 $\pm$ 8.68		

Relationship between Emotional Labor, Emotional Intelligence, and Quality of Professional Life: Relationships between emotional labor, emotional intelligence, and job stress are as follows. As shown in table 1.

Quality of professional life had negative correlation with Emotional labor($r=-.114$, $p=.016$) and significant positive correlation with Emotional intelligence($r=.274$, $p=.000$). As shown in table 2.

Table 2: Relationship between Emotional Labor, Emotional Intelligence, and Quality of Professional Life (N = 177)

	Emotional Labor	Emotional Intelligence	Quality of Professional Life
Emotional Labor	1		
Emotional Intelligence	-.114(.129)	1	
Quality of Professional Life	-.181(.016)	.274(.000)	1
* $p<0.05$, ** $p<0.01$			

3.1.3 Factors Affecting the Quality of Professional Life of Subjects: Emotional intelligence factors affecting the quality of professional life were self emotional appraisal ($\beta = -.043$, $p = .000$) and use of emotion ($\beta = -.394$, $p = .007$), and these variables were found to have an explanatory power of 19.7% for Quality of professional life. As shown in table 3.

Table 3: Factors Affecting the Quality of Professional Life of Subjects (N = 177)

Variables		β	t	p
Emotional Labor	Frequency of Emotional display	-.079	-.841	.401
	Attentiveness to required display rules	-.126	-1.150	.252
	Emotional dissonance	.092	.771	.442
Emotional Intelligence	Self Emotional Appraisal	.688	4.523	.000
	Other's Emotional Appraisal	-.043	-.373	.710
	Use of Emotion	.033	.266	.791
	Regulation of Emotion	-.394	-2.746	.007
		$R^2 = .197$, $F = 5.858$, $p = .000$		

Discussion

This study was attempted to determine the effect of emotional labor and emotional intelligence of nurses on quality of professional life.

In this study, the quality of professional life had a negative correlation with emotional labor and a positive correlation with emotional intelligence. This means that the higher the emotional labor, the lower the quality of professional life, and the higher the emotional intelligence, the higher the quality of professional life. Kim & Kim⁹ also stated that the emotional satisfaction is lowered and the exhaustion is higher as the emotional labor is higher. Nurses experience negative emotions of emotional labor and are not satisfied with their work. This may affect the quality of nursing care for the nurses, and the nurses' own job satisfaction, quality of life, and exhaustion. Therefore, nurses need a variety of approaches to improve the quality of life related to their occupation with pride in their professional role. It is necessary to periodically check the emotional labor level¹⁹ and develop a program for intervention. If emotional labor is not managed, physical and mental reactions such as anger, physical symptoms, and depression may appear in response to job stress, and at the organizational level, there may be neglect of work, an increase in mistakes, and thoughts of turnover, so emotional labor in nurses is an important issue that needs constant attention and resolution.

Emotional intelligence is the ability to recognize the emotions of oneself and others, synchronize oneself, and manage emotions well¹¹. Satisfaction of empathy in the

quality of professional life refers to getting satisfaction by helping others as professionals. As the results of this study, the higher the emotional labor level, the lower the degree of satisfaction obtained through professionally helping others. However, since emotional intelligence is the ability to recognize the emotions of oneself and others, emotional intelligence is expected to be a very important factor for emotional labor relaxation and quality of professional life improvement in nurses. It was found that emotional intelligence has a correlation with job satisfaction²⁶, and there should be a policy support and management plan for emotional intelligence improvement of emotional laborers such as nurses.

Among Emotional intelligence, Emotional self-understanding and Emotion utility were found to affect the quality of professional life. Emotional intelligence is the ability to accurately understand the emotions of oneself and others in various situations, and to control and utilize their own emotions as appropriate behaviors²³. In particular, nurses are professionals who provide human-centered nursing care and should take appropriate action and cope with various stress situations, and they need high emotional intelligence to assess positively and respond in the right direction under any circumstances²⁷. In a previous study²⁸, it was found emotional intelligence regulates the negative emotions experienced in the overall process of life, leading to positive emotions, and it was stated that higher emotional intelligence lead to higher life satisfaction and emotional stability. McQueen²⁹ also noted that emotional intelligence can be used to control emotional disharmony and emotional

labor in interpersonal relationships, because emotional intelligence can understand and manage emotions of oneself and others. One of the first things a nurse should understand in order to understand patients and others is self-understanding. Among the measures to improve emotional intelligence, the self-understanding process needs to be continually handled by nurses themselves and on an organizational level, and this is thought to be the most important basis for nurses to help them balance their work and life.

In summary, it was found that emotional self-understanding and emotional utility of emotional intelligence influence the quality of professional life of nurses.

This implies that emotional intelligence has a significant explanatory power in the quality of professional life of nurses. Therefore, it is necessary to improve the quality of professional life through education, training, and programs to improve the emotional intelligence of nurses. This study was meaningful in that the factors of emotional labor and emotional intelligence affecting the quality of professional lives of nurses were identified and the relationship between variables was attempted.

Conclusion

The purpose of this study was to investigate the effect of emotional labor and emotional intelligence of nurses on quality of professional life, and was attempted to provide basic data for enhancing the understanding of nurses, reducing the emotional labor of nurses, and establishing plans for adjusting and utilizing emotions. As a result, it was found that Emotional labor of nurses had a negative correlation with Quality of professional life, and Emotional intelligence was found to have a positive correlation. In addition, emotional intelligence and emotional utility among emotional intelligence were factors influencing quality of professional life. Based on the above results, the following is proposed. In order to improve the quality of professional life of nurses, it is necessary to develop emotional training programs that enhance the emotional intelligence of nurses.

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Conflict of Interest: Nil

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A Study on Empathy Ability, Communication Efficacy and Self-Directed Learning Ability of Nursing College Students: Before and After Education in Clinical Practice

Bo-Yun Huh¹, Jae-Woo Oh¹

¹Department of Nursing, Konyang University, Korea

ABSTRACT

Background/Objectives: This study was attempted to provide the basic data for developing the effective teaching and learning strategies by identifying the difference in the empathy, communication efficacy and self-directed learning ability of nursing students according to subject education experience status which is experienced during clinical practice.

Method/Statistical Analysis: The subjects of this study were the third graders of nursing students attending the nursing department of a university in D city. The period of data collection was from Oct 1 to Oct 30, 2017. With the collected data, using SPSS/Win Program.

Findings: As a result, the scores of empathy, communication efficacy and self-directed learning ability were higher in the group which had subject education experience than that which had none. It is thought that as a method to improve the empathy, communication efficacy and self-directed learning ability of nursing students, it is necessary to have an experience with which they can identify the problems of the subjects through the direct interaction with them during clinical practice, and conduct the education necessary to them.

Improvements/Applications: It is necessary to develop and organize the programs so that nursing students can apply the contents which they learned to nursing practice effectively and constantly.

Keywords: *Empathy Ability, Communication Efficacy, Self-directed Learning Ability, Nursing Students, Education Experience, Clinical Practice*

Introduction

Nurses should give a trust to the subjects and caregivers by respecting and sympathizing with them as well as have the expertise and skills of nursing^[1]. In addition, nurses should have competencies in communication, conflict management, and professional attitudes as well as theoretical knowledge and good nursing skills in nursing and family dynamics^[2]. Among them, empathy is an important factor which has an effect on forming, maintaining and developing the emotional ties with a therapist who can consider in the patients'

side and see the world from their point of view. The empathy, a positive emotion, is the ability to understand the world which the other person understands, and the true value of empathy is not only an understanding of the patients' physical needs but also a psychological reaction to them, which is very important to the nurses who should care them in the special circumstances. And the nurses should constantly develop and utilize their internal resources^[3]. Furthermore, nurses should constantly have a therapeutic communication with the patients from hospitalization to discharge, and play a role of consulting and educating patients and caregivers as well as assess the patients' health in the clinical spot. Individual beliefs and conviction that one has the ability to communicate more successfully make a facilitating therapeutic relationship established in the process of consultation with the patient, influence the patients' positive change and lead the successful therapeutic process, so that a nurse becomes able to get rewards

Corresponding Author:

Jae-Woo Oh
Professor, Department of Nursing,
College of Nursing, Konyang University, Korea
Email: ojw77@konyang.ac.kr

for nursing. Especially, there are study results that as the communication efficacy of the nurses gets high, the empathy does high as well, so that the effective and therapeutic communication becomes possible^[4]. That is, it is considered that the communication experienced during clinical practice is a good opportunity to improve the communication efficacy as a nurse who should constantly have a therapeutic communication with the patients from hospitalization to discharge.

Self-directed learning ability means an ability that a learner leads and manages the planning, execution, and evaluation process of learning for himself or through interaction with learning collaborators in a learning situation, and evaluates the process and results of his own learning by setting the learning goals and by deciding the progress speed. This self-directed learning is especially necessary for nursing education curriculum which emphasizes clinical practice education as well as for school education, and the continuous learning is demanded in the clinical practice fields because of the characteristics of work even after nursing students graduate from undergraduate course^[5]. That's because the nurses who are well trained for self-directed learning know and assess their current level of knowledge and skills, and by acquiring the information they need, they can have a problem-solving ability to solve the problems for themselves and enlarge themselves^[6]. Therefore, it can be said that the self-initiative cultivation on learning is requested so that students can smoothly solve the problems with experienced nursing practice and communication in a very complicated nursing situation, and can grow constantly and professionally^[7].

Today, as a medical environment has changed into a complex type which requires decision making ability, critical thinking and professional skills in order to solve the problems and decide at once in the clinical spots, it is necessary to establish a new role for nursing as a profession^[8]. The reason why this role establishment is required is that nursing is a profession based on nurse practice. As a nursing profession is a special knowledge body which can be obtained through theory and clinical practice education, the nursing students must be educated so that they can create a nursing profession as a living nursing knowledge body by integrating and applying the knowledge, technology and attitude which they get to learn in a lecture room in clinical spots^[9]. In order to accomplish the purpose of nursing education like this, the experience and ability of nursing students should be maximized.

Therefore, this study was attempted to provide the basic data for developing the effective teaching and learning strategies by identifying the difference in the empathy, communication efficacy and self-directed learning ability of nursing students according to subject education experience status which is experienced during clinical practice.

Materials and Method

Design of Study: This study is a descriptive survey study for identifying the difference in the empathy, communication efficacy and self-directed learning ability of nursing students according to subject education experience status during clinical practice.

Subjects of Study: The subjects of this study were the third graders of nursing students attending the nursing department of a university in D city.

Study Tools

Empathy Measuring Tool: The tool which Park SeongHee(1997) adapted with Interpersonal Reaction Index which Davis(1980) constructed was used. This tool consists of two sub-factors, cognitive empathy and emotional one, with 28 questions in total, and the response of each question does 5- point Likert scale of 'not at all'(1 point) to 'very agree'(5 points), where the higher the score, the higher the empathy.

Communication Efficacy: In order to measure the communication self-efficacy of subjects, based on a total of 37 questions of Counseling Self-Estimate Inventory(COSE), the counsellor self-evaluation questionnaire, which Larson, et al.(1992) developed and Hong Soo Hyun(2001) adapted for psychotherapists, the communication efficacy scale which Park HyangJin(2013) retranslated into Korean was used. It is a 5-point Likert-type scale, where the higher the score, the higher the communication efficacy. The Cronbach's α value in this study was .78.

Self-directed Learning Ability: For self-directed learning ability, self-directed learning ability measuring tool for university students/adults among the lifetime ability measuring ones developed by Korean Educational Development Institute(KEDI)(Lee Seok Jae, et al., 2003) was used. This tool is composed of 3 ability elements and 8 sub-factors. It is meant that the higher the score, the higher self-directed learning ability. As for

the reliability of a tool, Cronbach's α value was .93 when it was developed, and that in this study was .92.

Method of Data Collection: The period of data collection was from Oct 1 to Oct 30, 2017. As for data collection method, after a researcher visited the subjects and explained the purpose and method of the study to them, a questionnaire was distributed to them who agreed to participate in the study, and the survey was conducted after explaining precautions and how to respond. After the purpose of study, privacy security, and that the survey would not be used for the purpose other than the study according to study ethics were explained to the subjects before collecting data, those who agreed on that took part in the survey.

How to Analyze Data: With the collected data, using SPSS/Win Program, the general characteristics of the subjects were analyzed with real number and percentage, the level of empathy, communication efficacy, and self-directed learning ability according to education experience during clinical practice were done with mean and standard deviation, and the difference according to the general characteristics were done with T-test, and ANOVA.

Results and Discussion

General Characteristics of Subjects: The general characteristics of the subjects are like [Table 1]. In the group which had no education experience during clinical practice, the average age was 21.48 years, 44(88%) were females, for the question of major satisfaction, those who answered "normal" were 20(40%), and those who answered "satisfied" were 20(40%), for that of the department selection motive, those who answered "high employment rate" were 18(76%), and for that of direct nursing performance experience status during practice, those who answered "yes" were 44(88%), which was highest.

In the group which had education experience during clinical practice, the average age was 22.0 years, 44(88%) were females, for the question of major satisfaction, those who answered "normal" were 14(28%), and those who did "satisfied" were 18(36%), for that of department selection motive, those who did "high employment rate" were 24(48%), for the period of clinical practice, those who worked for 3 months to under 6 months were 36(72%), and for that of direct nursing performance experience status during practice, those who answered "yes" were 48(96%), which was highest.

Table 1: General Characteristics of Subjects N = 100

Variables	Categories	Education Experience(No) Group	Education Experience(Yes) Group
		No(%)	No(%)
Age		21.48(.918)	22.0(1.500)
Sex	Male	6(12.0)	6(12.0)
	Female	44(88.0)	44(88.0)
Major Satisfaction	Very dissatisfied	2(4.0)	-
	dissatisfied	8(16.0)	8(16.0)
	Mean	20(40.0)	14(28.0)
	Satisfied	20(40.0)	18(36.0)
	Very Satisfied	-	10(20.0)
Department Selection Motive	Grade	6(12.0)	6(12.0)
	Aptitude and Hobby	12(24.0)	12(24.0)
	High Employment Rate	18(36.0)	24(48.0)
	Recommendation	10(20.0)	6(12.0)
	Others	4(8.0)	2(4.0)
Clinical Practice Period	Under 3 months	2(4.0)	2(4.0)
	3 months to under 6 months	38(76.0)	36(72.0)
	More than 6 months	10(20.0)	12(24.0)
Clinical Practice Organization	Advanced General Hospital	50(100.0)	48(96.0)
	General Hospital	-	2(4.0)

Conted...

Direct Nursing Performance Experience Status	Yes	44(88.0)	48(96.0)
	No	6(12.0)	2(4.0)
Direct Nursing Performance Type which is considered necessary	Nursing Skills	34(68.0)	36(72.0)
	Education	8(16.0)	4(8.0)
	Nursing Assessment	8(16.0)	6(12.0)
	Nursing Record	-	4(8.0)
	Others	-	-

Relationship between Empathy, Communication Efficacy and Self-directed Learning Ability: Examining the correlation between the variables, it was revealed that empathy had a net correlation with communication efficacy($r=.025$, $p<.001$), and communication efficacy had a net one with self-directed learning ability($r=.283$, $p<.05$ [Table 2].

Table 2: Relationship between Empathy, Communication Efficacy and Self-directed Learning Ability

Variables	Empathy	Communication Efficacy	Self-directed Learning Ability
Empathy	1		
Communication Efficacy	.525***	1	
Self-directed Learning Ability	.153	.283*	1
* $p<.05$, ** $p<.01$, *** $p<.001$			

Difference in Empathy, Communication Efficacy and Self-directed Learning Ability According to the Subject Education Experience Status Experienced During Clinical Practice: As a result of examining the difference in empathy, communication efficacy and self-directed learning ability according to the subject education experience experienced during clinical practice, it is like [Table 3]. In the group which had no subject education experience during clinical practice, it was revealed that empathy was average rating 3.59 out of 5, communication efficacy was average rating 3.18 out of 5, and self-directed learning ability was average rating 3.36 out of 5. In the group which had subject education experience during clinical practice, it was indicated that empathy was average rating 3.75 out of 5, communication efficacy was average rating 3.32 out of 5, and self-directed learning ability was average rating 3.50 out of 5. As a result, the scores of empathy, communication efficacy and self-directed learning ability were higher in the group which had subject education experience than that which had none.

Table 3: Difference in the Level of Empathy, Communication Efficacy, and Self-directed Learning Ability by Groups

Variables	Categories	No Having Education Experience Group	Having Education Experience Group	t(p)
		Mean $\pm$ SD	Mean $\pm$ SD	
Empathy Ability		3.59 $\pm$ 0.39	3.75 $\pm$ 0.35	-1.574(.122)
Communication Efficacy		3.18 $\pm$ 0.22	3.32 $\pm$ 0.46	-1.286(.205)
Self-directed learning ability		3.36 $\pm$ 0.33	3.50 $\pm$ 0.40	-1.382(.173)
	Diagnosing Learning Desire	3.26 $\pm$ 0.39	3.28 $\pm$ 0.56	-.117(.907)
	Setting Learning Objectives	3.32 $\pm$ 0.67	3.77 $\pm$ 0.77	-2.194(.033)
	Grasping the Resources for Learning	3.46 $\pm$ 0.55	3.64 $\pm$ 0.75	-.985(.330)

Conted...

	Basic Self-management Ability	3.39 ± 0.55	3.61 ± 0.41	-1.576(.122)
	Selection of Learning Strategies	3.56 ± 0.44	3.65 ± 0.63	-.571(.598)
	Persistence of Learning Execution	3.27 ± 0.45	3.19 ± 0.61	.531(.122)
	Effort attributes for results	3.30 ± 0.48	3.30 ± 0.36	.000(1.000)
	Self-reflection	3.41 ± 0.51	3.80 ± 0.63	-2.404(.020)

Therefore, this study was attempted to provide the basic data for developing the effective teaching and learning strategies by identifying the difference in the empathy, communication efficacy and self-directed learning ability of nursing students according to subject education experience status which is experienced during clinical practice. The major results are as follows.

First, empathy score was higher in the group which had subject education experience during clinical practice than that which had none. As there are no prior studies which have examined empathy according to subject education experience status during clinical practice, it is difficult to compare with them directly. However, it is thought that this result came because they considered from the perspective of the subjects in the process of grasping and assessing the needs of the subjects in order to make education materials.

As empathy is a process that one not only feels the emotion and experience which the other person feels from his point of view but also expresses them positively, it can be said that empathy is nurses' ability that they can see the world in patients' place and from patients' point of view. This empathy is a factor which has an important influence on forming, maintaining and developing the emotional ties with the subjects, and the empathic attitude which respects the others personally, getting out of self-centered thinking and experiences their emotion in their behalf is a required ability to nurses as well. As the empathy score of nursing students who had subject education experience experienced during clinical practice was high in the result of this study, it could be identified that the education experience through interaction with the subjects during clinical practice is a teaching and learning method that can improve the empathy of nursing students.

Second, the group which had subject education experience during clinical practice showed communication efficacy score higher than that which had none.

Although it is difficult to compare with prior studies directly as there were none which have examined the communication efficacy according to subject education experience status during clinical practice, it is thought that this is a result of interaction in the process of forming trust relationship with subjects and caregivers for making parent education material during clinical practice period and of educating the caregivers of subjects. Communication efficacy refers to a belief that a counselor can effectively consult a client, and a self-confidence that he can help the client using the skills which he has. In the study of Jo Yin Yeong^[10], as a result of examining the needs of the communication education, it was indicated that nursing students preferred the performance - based communication education. In addition, the role play was the most effective educational strategy for communication, which indicates that it is important to do a role directly in the education for improving communication based on the results of the prior studies and this one. As it was indicated that the communication experienced through a learning contract can improve the communication efficacy of nursing students, make them communicate with the patients effectively, and promote the therapeutic relationship, it could be identified through this study that clinical practice education which has subject education experience is a teaching and learning method which can improve the communication efficacy.

Third, the group with subject education experience during clinical practice had a higher self-directed learning ability score than that without it. Though as there are no prior studies which have examined the self-directed learning ability according to subject education experience status during clinical practice, it is difficult to compare with them directly, in the prior study^[11] which examined the change in self-initiative, it is reported that a learning contract had a positive influence, such as the improvement of self-directed learning ability and understanding. In

addition, it was said that the nurses who are well trained for self-directed learning can know and assess their current level of knowledge and performance, and that by acquiring information necessary to them, they can solve the problems for themselves, and enlarge themselves^[6].

This self-directed learning can improve the professional nursing skills of students in the first clinical practice education through the education which enhances the self-confidence of students and improves the independent learning ability of them. In the result of this study, it is considered that as the group having subject education experience had a high score of the self-directed learning ability, the clinical practice of nursing students utilizing the self-directed learning contract enhances self-initiative in the practice as a motive through contract and the proper application period is a teaching and learning strategy suitable for clinical practice education.

Conclusion

Given those results, it is thought that as a method to improve the empathy, communication efficacy and self-directed learning ability of nursing students, it is necessary to have an experience with which they can identify the problems of the subjects through the direct interaction with them during clinical practice, and conduct the education necessary to them. Especially, it is necessary to develop and organize the programs so that nursing students can apply the contents which they learned to nursing practice effectively and constantly. Therefore, various educational activities should be conducted in order to enhance these learning outcomes in nursing education course. Furthermore, it is considered that it is necessary to develop the systematic and effective clinical practice education programs which reflect the learning needs related with the clinical practice of nursing students and the training needs of the clinical field.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nill

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Study on Listening to White Noise of Nursing College Students and Improvement of Concentration

Mi- Kyung Jeon¹, Jae-Woo Oh²

¹Department of Nursing, Munkyoung College, Korea; ²Department of Nursing, Konyang university, Korea

ABSTRACT

Background/Objectives: This study was conducted to provide the basic data for improving the learning environment of nursing students by grasping the effect which the white noise positively influencing like this has on the improvement of the concentration of nursing students.

Method/Statistical Analysis: The subjects of this study were 284 nursing students in first and second grade of a university located in M city. Data collection was conducted from May 1 to May 15, 2018. With the collected data, using SPSS Program.

Findings: AS a result, White noise listening concentration showed a statistically significant difference in the sounds which are helpful to concentration($p=.000$), care about the noise environment creation($p=.004$), and white noise listening experience($p=.001$).

Improvements/Applications: In conclusion, It is thought that it is necessary to create the environment and develop the programs which can arouse the positive change in the learning attitude of nursing students by actually using white noise.

Keywords: *White Noise, Listening, Study Method, Nursing Students, Concentration Improvement*

Introduction

Human beings live interacting with the environment surrounding the individuals, the effect of the environment on them is extensive, and all the behaviors of them are the result of the effect. Sound is one of the elements of environment which surrounds an individual as well. The noise among the types of sounds is a sound which makes people unpleasant as it is noisy, which takes up more and more of our lives as a society develops recently. That's why the noise is called an invisible pollution, the problem of noise pollution which causes people to experience the psychological and physical disabilities has arisen, and the concerns and complaints of people about the noise increase. With the interest in the noise increased recently, white noise, a positive noise, receives attention.

White noise, which refers to the noise with a special spectrum, has a constant continuous spectrum regardless of frequency, and is a constant noise that the intensity of a component which is included per 1 octave within a scope of a set frequency emerges regardless of the location of frequency^[1].

Listening to the white noise, the emission of α -wave increases in the brain, however, β -wave gets decreased. That is, it can be assumed that when one is psychologically, emotionally unstable, the white noise can arouse the positive change in learning ability by enhancing the concentration through the stability of mind. The white noise shows the uniform and constant frequency range on the whole, which rather covers the surrounding noise^[1] and makes us get used to it. That is, it plays a role of a 'good' noise which doesn't interrupt with the work as it is considered natural sound always heard, and which brings about psychological stability and concentration^[1].

Concentration is a behavior that makes an organism lean towards a receptor with the input of special stimulus, and a process of center processing in which the input is

Corresponding Author:

Jae-Woo Oh

Professor, Department of Nursing,
College of Nursing, Konyang University, Korea
Email: ojw77@konyang.ac.kr

transfigure^[2]. Concentration becomes a base of all task learning as one concentrates one's consciousness so that one may complete the given task within a limited time which is given to one, and depending on the degree of acceptance of the learning contents within a specific time, there happens difference between when one concentrates well or when one doesn't^[2]. Thus, it can be known that for learning, one should pay attention, focusing on the demand related with the handling of major tasks where the input of task learning is transfigured^[2]. When one who has a high concentration is given a task or conducts one's work, one can get a positive result due to a high efficiency as one concentrates in order to complete the task within a given time^[3]. In addition, one who has a good concentration can receive a positive assessment in a school and a society due to high efficiency whatever one does, which instills confidence, helps one grow emotionally smoothly, and makes one lead a life as a sound member of a society^[4]. The higher concentration is, the higher the efficiency of learning is, which helps one have confidence in school life, form a positive emotion, and accomplish the purpose of other activities^[3]. A method to cultivate concentration is to strengthen lower abdomen through brain education programs including brain gymnastics and meditation and to improve strength by controlling a brain wave^[5]. If strength, which makes us endure a tough situation, is improved, as motivation to learn emerges naturally, and as it is easy to reach learning objectives, a self-directed learning attitude is formed^[5]. In addition, when the class was given using a mental concentration training, after through mental concentration training, self-control ability was formed, concentration was strengthened, and the hydraulic power, understanding, and memory which influence the learning ability were improved, a brain wave became an alpha wave status, which increased concentration and improved academic achievement^[6]. Thus, it can be known that the improvement in learning ability enhances confidence of learners with a formation of self-control ability, brings voluntary participation in learning, and improves learning achievement. When making one concentrate on the stimulus better, not distracting attention by repeating simple stimulus of light and sound, it is helpful to improve attention concentration^[7].

According to the studies of Korean Industry Psychological Association, it was indicated that the white noise brings about the effect of concentration

improvement(47.4%) and memory improvement(9.6%)^[1]. As it has an effect that it can reduce the stress by 27.1% and learning time by 13.63% as well, the usefulness of it is widely known to studying students^[1]. In reality, some celebrities, such as Ernest Hemingway who used to write novels at a regular cafe 'La Closerie des Lilas', Joanne Rowling who wrote Harry Potter wandering several cafes in Edinburgh, Jon Favreau who wrote the inaugural address of Barack Obama at Starbucks, used to go to cafes where they could hear the white noise in order to perform the writing work which needs concentration, which proves that.

Therefore, this study was conducted to provide the basic data for improving the learning environment of nursing students by grasping the effect which the white noise positively influencing like this has on the improvement of the concentration of nursing students.

Materials and Method

Design of Study: This study is a correlation survey research for grasping whether or not listening to white noise improves the concentration.

Subjects of Study: The subjects of this study were 284 nursing students in first and second grade of a university located in M city.

* The selection criteria of subjects: those who were highly available as subjects were conveniently sampled.

* The exclusion criteria of subjects: those who didn't take part in the survey were excluded.

Study Tools: As for a measuring tool for concentration, the questions in the questionnaire used in 'A Study on Learner Recognition Exploration of Environmental Sound of White Noise as a Learning Environment Element' by KoDaeWon(2015) were modified, supplemented, and used. It is meant that the higher a total score is the more effective white noise is in the improvement of concentration.

Method of Data Collection: Data collection was conducted from May 1 to May 15, 2018. As for data collection method, after a researcher visited the subjects and explained the purpose and method of the study to them, a questionnaire was distributed to those who

agreed to participate in the study, and the survey was conducted after explaining precautions and how to respond. After the subjects were explained about the purpose of study, privacy security, and that the survey would not be used for the purpose other than the study according to study ethics, the subjects who agreed on that took part in the survey.

How to Analyze Data: With the collected data, using SPSS Program, the general characteristics of the subjects were analyzed with real number and percentage, concentration level was done with mean and standard deviation, and the difference between the improvement of concentration according to the general characteristics of the subjects was done with T-test and ANOVA.

Results and Discussion

General Characteristics of Subjects: The general characteristics of this study are like Table 1. As for gender, there were 202 females(86%) and as for age, those who were over 20 years of age were 206(87.7%), and as for residence type, those who lived in a dormitory were 95(40.4%), which was highest. For the question of main study place, those who answered that it is the house, a quiet environment, were 104(44.3%), for that of how to study, those who did that they study 'Alone' were 136(57.9%), and for that of what sound helps the concentration, those who did that it is silence were 125(53.2%). In addition, for that of what sound interferes with concentration, those who did that it is the sound of babbling were 159(67.7%).

Table 1: General Characteristics of Subjects

Variables	Categories	No(%)	Mean $\pm$ SD
Gender	Male	33(14.0)	
	Female	202(86.0)	
Age	≤ 20	206(87.7)	19.44 $\pm$ 1.707
	21 $\leq$	29(12.3)	
Residence Type	Living with Parents	70(29.8)	
	Living apart from Family	68(28.9)	
	Dormitory	95(40.4)	
	Others	2(0.9)	
Main Study Place	School	70(29.8)	
	Reading Room	37(15.7)	
	Home(Road side)	14(6.0)	
	Home(Around Downtown)	19(4.3)	
	Home(quiet place)	104(44.3)	
How to Study	Alone	136(57.9)	
	With Friends	6(2.6)	
	Library	77(32.8)	
	Cafe	13(5.5)	
	Others	3(1.3)	
Sounds which are helpful to concentration	Silence	125(53.2)	
	Sound of rain	42(17.9)	
	Sound of Motorway	9(3.8)	
	Babble	20(8.5)	
	A book flipping sound	39(16.6)	
Sounds which interfere with concentration	Silence	14(6.0)	
	Sound of rain	4(1.7)	
	Sound of Motorway	25(10.6)	
	Babble	159(67.7)	
	Don't care	33(14.0)	

Conted...

Care about Noise Environment Creation	Care a lot	38(16.2)	
	Care a little	133(56.5)	
	Don't care	64(27.2)	
White Noise Perception	Yes	155(66.0)	
	Only Listened	70(29.8)	
	Have no Idea	10(4.3)	
White Noise Listening Experience	Yes	116(49.4)	
	No	119(50.6)	

White Noise Listening Concentration Level of Nursing Students of Japanese University: The white noise listening concentration level of nursing students showed average rating 3.15 out of 5[Table 2].

Table 2: White Noise Listening Concentration Level of Nursing Students of University

Variables	Mean $\pm$ SD	Range
White Noise Listening Concentration	3.15 $\pm$ 0.61	1-5

Difference in White Noise Listening Concentration Level according to General Characteristics of Nursing Students of University: The difference in white noise listening concentration level according to the general characteristics of nursing students is like Table 3. White noise listening concentration showed a statistically significant difference in the sounds which are helpful to concentration($p=.000$), care about the noise environment creation($p=.004$), and white noise listening experience($p=.001$).

Table 3: Difference in White Noise Listening Concentration Level according to General Characteristics of Nursing Students of University

Variables	Categories	N	White Noise Listening Concentration	
			Mean $\pm$ SD	t or F(p)
Gender	Male	33	3.39(.446)	6.379(.012)
	Female	202	3.11(.624)	
Age	≤ 20	206	3.14(.606)	0.143(.706)
	$21 \leq$	29	3.19(.648)	
Residence Type	Living with Parents	70	3.06(.565)	0.801(.494)
	Living apart from Family	68	3.22(.717)	
	Dormitory	95	3.16(.560)	
	Others	2	3.18(.441)	
Main Study Place	School	70	3.13(.557)	0.890(.471)
	Reading Room	37	3.12(.525)	
	Home(Road side)	14	3.40(.643)	
	Home(Around Downtown)	19	3.32(.502)	
	Home(Quiet environment)	104	3.12(.673)	
How to Study	Alone	136	3.13(.648)	3.682(.006)
	With Friends	6	3.56(.920)	
	Library	77	3.06(.489)	
	Cafe	13	3.67(.471)	
	Others	3	3.02(.157)	

Conted...

Sounds which are helpful to cocentration	Silence ^a	125	2.91(.589)	15.437(.000) a(b,c,d,e)
	Sound of Rain ^b	42	3.48(.454)	
	Sound of Motorway ^c	9	3.86(.467)	
	Babble ^d	20	3.44(.501)	
	Sound of Turning Over Pages of a Booke	39	3.24(.528)	
Sounds which interfere with con centration	Silence	14	3.29(.419)	0.802(.525)
	Sound of Rain	4	2.98(.369)	
	Sound of Motorway	25	3.24(.658)	
	Babble	159	3.11(.626)	
	Don't care	33	3.24(.579)	
Care about Noise Environment Creation	Care a lot ^a	38	2.89(.738)	5.541(.004) a(b)
	Care a little ^b	133	3.25(.583)	
	Don't care ^c	64	3.10(.534)	
White Noise Perception	Yes	155	3.19(.663)	1.136(.323)
	Only Heard	70	3.06(.510)	
	Don't know	10	3.08(.237)	
White Noise Listening Experience	Yes	116	3.28(.640)	10.567(.001)
	No	119	3.02(.553)	

This study was conducted to provide the basic data for improving learning environment of nursing students by grasping the effect which the white noise positively influencing learning has on the improvement of the concentration of nursing students. The main results are discussed as follows.

First, the white noise listening concentration level of nursing students was average rating 3.15 out of 5, which was above-average. As there are no prior studies which have identified the concentration level after listening to white noise, direct comparisons are difficult. Kim SeongCheol^[8] said that it can be expected that if white noise is used in performing tasks, it can shield the source of noise which affects the performance of tasks, and it can bring about the improvement of performance by enhancing the ability of adapting to the tasks. White noise worked as a factor which had a positive effect on language ability and numerical ability, which can be said a result that supported the prior studies that white noise condition had a valid effect especially in reasoning power. Therefore, as the performance ability of human beings can be increased by reducing the effect of white noise and noise selectively according to the characteristics and environment of learning, it is thought that the physical, mental health of learners can be improved.

Second, white noise listening concentration showed a statistically significant difference in the sound which is helpful to concentration($p=.000$), caring about the noise environment creation($p=.004$), and the experience of white noise listening($p=.001$). Although this result is difficult to compare with that of prior studies directly, which can be said that this result supports the study of KoDaeWon^[9]. who said it was identified that listening to white noise environmental sound forms the psychological response, arouses the tension of learning, can improve the learning motive level of learners, and plays a role which is helpful to learning by blocking the crucial noises, the elements which interfere with the attention concentration of learners.

Lee SeungHee^[4]said that as natural sound meditation music programs contribute to increasing a learning attitude test score and improve the learning attitude, they can be positively used, there was the significant change in the attitude toward themselves, friends, and schools of subjects, and all these changes remained constant. Kwak Sang Dong^[10]said that natural sound meditation music had a significant effect on improving the overall concentration, In addition, it can be said that the results of study have something to do with those of

KoDae Won^[9]who said it was identified that listening to the environmental sound of white noise forms the psychological response, arouses the tension of learning, can improve the learning motive level of learners, and plays a role which is helpful to learning by blocking out the crucial noises, the elements which interfere with the attention concentration of learners. which is a result that has something to do with the study results that natural sound meditation music significantly affected the improvement of a selective attention, self-control, and a persistent attention, the sub-items of attention concentration.

Given these results, it is thought that it is necessary to create the environment and develop the programs which can arouse the positive change in the learning attitude of nursing students by actually using white noise, which is an ordinary sound, such as the sound of rain, that of a car, and that of turning over the pages of a book, surrounding the environment for improving concentration in educational spots.

Conclusion

This study was conducted to identify the relationship between white noise listening study method positively influencing learning and concentration improvement and to provide the evidence data for creating the environment for improving the concentration of nursing students. As it was identified through the results of this study that white noise environmental sound is an element which can produce effective results for learning free from negative perception that it is just a noise, it is considered that the method, environment creation, and programs which can make white noise listening study method be applied

Ethical Clearance: Not required

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The Effect of Quality of Life and Hope on the Suicide Ideation of the Elderly: The Moderated Mediation Effect of Participation in Lifelong Education

Chang-Seek Lee¹, Eun-Kyung Ryu², Yang-Jin Choi²

¹Professor, Dept. of Health, Counseling and Welfare, Hanseo University, 31962, Korea; ²Doctoral Student, Dept. of Child and Adolescent Counseling and Psychology, Hanseo University, 31962, Korea

ABSTRACT

Background/Objectives: The purpose of this study was to investigate the moderating mediation effect of lifelong education on the mediation effect of hope on suicide ideation in the elderly. The subjects of this study were 280 elderly people living in S city of Chungnam-do, Korea.

Method/Statistical analysis: The collected data are analyzed using correlation analysis, frequency analysis, and moderating mediation effect.

Findings: First, the correlation analysis showed a positive correlation between quality of life and hope, but there was a positive correlation between quality of life and suicide ideation, hope and suicide ideation. Second, the hope of the elderly mediated the relationship between the quality of life and suicide ideation. Third, participation in lifelong education of the elderly moderated the relationship between quality of life and hope. Fourth, participation in lifelong education of elderly people moderated the mediating relationship of hope between quality of life and suicide ideation.

Improvements/Applications: Finally, based on the results of this study, it was suggested that a lifelong education program should be developed to lower the suicide intention of the elderly. In addition, we discussed regional comparisons through nationwide sampling, research on various age groups, and directions for research targeting only vulnerable groups.

Keywords: *Quality of Life, Hope, Suicide Ideation, Participation in Lifelong Education, Moderated Mediation Effect*

Introduction

In modern society, the average life span of humans is increasing due to the development of medical technology, and it is rapidly becoming an aging. There are various social problems such as pension and medical expenses increase, aged support, economic recession due to population aging, and we are looking for measures

to solve this problem^[1]. However, it is not enough to solve complex and rapid changing problems, which eventually leads back to the problems of the elderly^[2]. In the case of the elderly, there are various reasons such as economic hardship after retirement, depression due to role loss, physical and mental pain due to chronic illness. For these reasons, there is a growing tendency to lead to suicide after failing to find a solution for these issues^[3].

A suicide ideation is an act that voluntarily or intentionally takes to take one's life, and is meant to include all attempts to do or to have such an idea^[4]. In particular, the suicide ideation of the elderly is more likely to lead to the attempt and it is more serious in the elderly groups than the other age groups^[5]. The suicide rate of the elderly in Korea is increasing every year^[6], and the social interest is increasing, because of being

Corresponding Author:

Eun-Kyung Ryu
Doctoral Student,
Dept. of Child and Adolescent Counseling
and Psychology,
Hanseo University, Korea
Email: yek0444@hanmail.net

aware of the seriousness of the problems that they are facing in their elder years^[7]. However, there is still a lack of research on the elderly problem, and it is necessary to continuously examine the factors that influence the suicide ideation of the elderly.

Recently, various studies have been carried out on the effect of quality of life on suicide ideation, and the results of the study showed that the lower the quality of life, the higher the suicide ideation^[8]. In this respect, the quality of life is the value of life that is felt in the process of living, and has implications and comprehensive.

Satisfaction with the quality of life is a goal that individuals pursue throughout their lives and a criterion for judging the success of an individual^[9]. The satisfaction of quality of life is very important to influence the life of an individual. In particular, the elderly are a more important population demographic, because they reflect both physical satisfaction and psychological state of mind.

In recent years, research on the impact of quality of life on hope has been on the rise, and it has been found that the higher the quality of life, the more positive the hope is^[10]. Hope is the driving force of life and a force that allows a human being to have meaning^[11]. Specifically, the higher the level of economic, social, and cultural aspects, the higher the hope of life for the elderly^[12]. However, in old age, because of various problems, the hope of life is lowered in this age group, and the meaning of existence as a human being is lost^[13]. Hope is the power to overcome these human mental limitations and serves to buffer suicide ideation in desperate situations^[14]. Recently, according to the articles published in the elderly in Korea, the most important factor affecting the suicide of the elderly is no hope^[15].

Thus, hope has a negative effect on the suicide ideation of the elderly, thereby reducing the incidence of suicide in this population. In this regard, lifelong education for the elderly is emerging as a countermeasure that is being discussed recently^[16]. A variety of lifelong education programs centering on municipalities are becoming one of the ways to improve the quality of life of the elderly at all ages^[17]. The proportion of lifelong education is increasing in order to meet these needs. However, support programs related to lifelong education have been steadily increasing, but the participation rate of lifelong education for the elderly is still poor. This is because the ages of the elderly are widespread, but it is only a uniform educational program and mere information delivery to meet the needs of various age

groups. As the average life span of humans is extended, and the range of older people is widening, it will be the elderly's greatest concern how to spend this period of time. Recent research on lifelong education has shown that an educational strategy that can vigorously help the elderly in their long-term rather than short-term measures improves the quality of life of the elderly^[18].

Based on the above studies, participation in lifelong education affects quality of life, and quality of life affects hope. Therefore, participation in lifelong education will have a significant effect on the relationship between quality of life and hope. As we have seen, hope is also influenced by quality of life and serves to reduce suicide ideation^[19]. Through these relationship, the purpose of this study was to investigate the mediation effect of hope between the quality of life and suicide ideation among the elderly, to identify the moderating effect of lifelong education between quality of life and hope, and to investigate the moderating mediation effect of lifelong education on the mediation effect of hope on suicide ideation in the elderly.

Therefore, this study set up the following research questions.

First, what is the correlation between the main variables in this study?

Second, does the hope of the elderly mediate the relationship between quality of life and suicide ideation?

Third, does participation in lifelong education of the elderly moderate the relationship between quality of life and hope?

Fourth, does participation in lifelong education of elderly people moderate the mediating relationship of hope between quality of life and suicide ideation?

This study examines the positive effects of participation in lifelong education on the elderly, and examines whether it affects the lowering of suicide ideation by increasing quality of life and hope. These findings may have implications for policy recommendations to lower the suicide rate of the elderly.

Method

Research Model: Based on the previous research, the research model for the mediating effect of hope and the moderating mediation effect of lifelong education participation in the relationship between the quality of life and suicide ideation, was established in Figure 1.

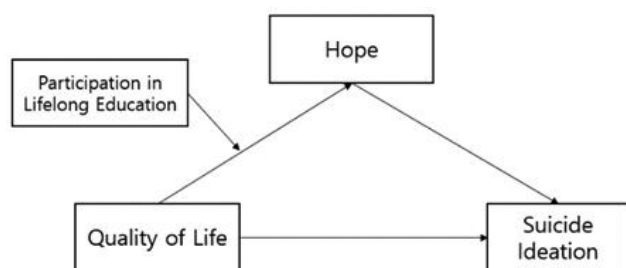


Figure 1: Research Model

Study subjects: The subjects of this study were 280 elderly people living in S city of Chungnam-do, Korea. The survey was conducted from July to October, 2017. A total of 266 copies of the collected questionnaires were used for the final analysis, except for those who responded unfairly.

There were 80 males (30.1%) and 186 females (69.9%) among all of the subjects participating in this study. The age was distributed in 149 subjects (56.1%) in the 70s and 117 subjects (44%) in the 80s or older. There were 142 (53.4%) who had a spouse, and 124 (46.6%) who did not have a spouse. The highest portion of education was noted in 109 subjects (41 percent) who had no schooling, and 103 subjects (38.7 percent) who had graduated from primary school, 24 subjects (9 percent) who had graduated from middle school, and 29 subjects (11.9%) who had graduated from high school.

Research Tools

Quality of life: The quality of life scale of the elderly was modified and supplemented by the researchers according to the scale of Heintzman^[20], Lee^[21], Kim^[22] and Ahn^[23]. This scale consists of 20 questions, which included the following examples: “I am satisfied with my appearance these days” and “I am satisfied with my position in my home.” Each item is a Likert 5-point scale ranging from “Not at all (1 point)” to “Very well (5 points).” The higher the score, the higher the quality of life. In this study, the reliability of this scale was Cronbach’s $\alpha=0.957$.

Hope: We used hope scale which was developed and supplemented by Snyder et al.^[24] and validated to suit the Korean situations by Choi et al.^[25]. This scale consists of a total of 8 items, which include the following statements: “I can think of many ways to get out of trouble” and “I follow my own goals.” Four of the items are a pathway

thought, and four items are an agency thought. Each item is a Likert 5-point scale ranging from “not at all (1 point)” to “very well (5 points).” The higher the score, the higher the hope. In this study, the reliability of this scale was Cronbach’s $\alpha=0.947$.

Participation in lifelong education: To measure participation in a lifelong education program, the researcher produced the scale through the facial validity of one expert. First, the lifelong education is divided into four areas: health education programs (elderly health maintenance, geriatric disease prevention, hand acupuncture, gymnastics, yoga, hypogastric breathing, gateball, dancing, climbing, etc.), hobby and cultural education programs (gardening, artificial flower, dyeing, cooking, song, Korean dance, movie appreciation, calligraphy, Korean music, flower arrangement, travel, instrumental farm music, baduk, etc.), social education programs (computer, Korean, Chinese text, human relations, writing, self-expression, living law, pension, property management, inheritance, remarriage, etc.) and professional knowledge programs for employment. In this respect, then each of these was measured by a Likert 5-point scale ranging from “not at all (1 point)” to “always very strongly (5 points).” The higher the score, the higher the participation in a lifelong education program.

Suicide ideation: The Suicide Ideation Scale developed by Harlow et al.^[26] and translated into Korean by the Kim^[27] was used in this study. Each item was measured using a Likert 5-point scale ranging from “not at all (1 point)” to “very well (5 points)”

The higher the score, the higher the suicidal ideation. The reliability of this scale, Cronbach’s α , was 0.905.

General characteristics: Gender, age, family type, living conditions, and health status of the subjects were measured.

Data Analysis

The collected data were analyzed using a SPSS Win 23.0 and SPSS Macro PROCESS. Correlation analysis was performed to identify correlations among the main variables used in the study. The Models 7 of the SPSS Macro PROCESS proposed by Hayes were used to identify the moderating mediation effect.

Results and Discussion

Correlation of Main Variables

Table 1: The correlation coefficients and descriptive statistics

	1.	2.	3.
1. Quality of life	1		
2. Hope	.768**	1	
3. Suicide ideation	-.453**	-.454**	1
M	3.71	3.80	1.45
SD	.81	.90	.70

** P<.01

The results of the correlation analysis between the main variables are shown in Table 1. The results showed that quality of life and hope were positively correlated ($p < .01$), but correlations between quality of life and suicide ideation, and between hope and suicide ideation were negatively correlated ($p < .01$). Among them, quality of life and hope showed the highest correlation ($r = .768$, $p < .01$), followed by hope and suicide ideation ($r = -.454$, $p < .01$), and by quality of life and suicide ideation ($r = -.453$, $p < .01$). The overall correlation coefficient ranged from $-.454$ to $.768$, and it was judged that there was no multi - collinearity of major variables. The results were that the quality of life and hope have a positive effect, and the quality of life and hope have a negative impact on suicide ideation. The quality of life of the elderly is a result of subjective satisfaction in the whole life in psychological, physiological and environmental factors. In order to lower the suicide ideation of the elderly, a plan should be prepared to adapt to the aging process, and increase the quality of life, by various and specific methods.

Moderating mediation effect of participation in lifelong education on the relationship between quality of life and suicide ideation: In order to examine whether participation in lifelong education moderated the mediation effect of hope in the relationship between

quality of life and suicide ideation in the elderly, we analyzed by using a Model 7 of the SPSS macro process proposed by Hayes. The results were shown in Table 2.

According to the results of the analysis, the quality of life had a significant positive impact on hope ($\beta = .8614$, $p < .001$), and hope had a negative impact on suicide ideation ($\beta = -.2043$, $p < .01$). In addition, quality of life had a significant negative impact on suicide ideation ($\beta = -.2193$, $p < .01$). Quality of life has a significant effect on hope, and hope has a significant effect on suicide ideation, indicating that hope plays a mediating role between quality of life and suicide ideation of the elderly. This is consistent with previous research that if quality of life increases and then hopes increase, thereby reducing suicide ideation in the elderly. Therefore, it is necessary to find ways to improve the quality of life through an adequate aging preparation process, before entering old age and to increase hope by solving the anxiety old age.

On the other hand, according to the moderating effect of participation in lifelong education, quality of life has a significant effect on hope ($\beta = .8614$, $p < .001$), and the interaction effect of quality of life (independent variable) and participation in lifelong education (moderating variable) has a significant effect on hope (mediating variable) ($\beta = .1199$, $p < .05$). This means that the higher the participation in lifelong education, the greater the effect of quality of life on hope.

The quality of life of the elderly has a very important effect on how to spend the elder years and discover what to do. Those elderly citizens who know how to improve their own quality of life will have hope for their old age, and the importance of lifelong learning for seniors to find relevant duties, responsibilities, hobbies or interests is increasing in importance day by day, which will stave off feelings of hopelessness in the elderly and provide them with more positive feelings of usefulness and hope in their elder years. In the present study, there was no direct effect of participation in lifelong education on hope, but the interaction term between quality of life and participation in lifelong education was found to have a significant effect on.

Table 2: The moderating mediation effect of participation in lifelong education on the relationship between quality of life and suicide ideation

Variables				β	SE	t	p
Mediating variable model(dependent variable: hope)							
Constant				3.7806	.0364	103.9503	.0000
quality of life	→	hope		.8614	.0464	18.5681	.0000
participation in lifelong education	→	hope		.0359	.0529	.6792	.4976

Conted...

quality of life x participation in lifelong education	→	hope	.1199	.0499	2.4014	.0170
Dependence variable model(dependent variable: suicide ideation)						
Constant			2.2300	.2545	8.7625	.0000
quality of life	→	suicide ideation	-.2193	.0734	-2.9898	.0031
hope	→	suicide ideation	-.2043	.0662	-3.0879	.0022

The conditional effect of the effect of quality of life on the hope, according to the specific value of participation in lifelong education, is shown in Table 3. As a result, the simple slope between quality of life and hope was significant in the range of participation in lifelong education from $-.7040$ ($M-1SD$) to $.7040$ ($M + 1SD$).

Table 3: The conditional effects according to participation in lifelong education

Participation in lifelong education	Effect	se	t	p	LLCI*	ULCI**
-1SD($-.7040$)	.7770	.0532	14.6143	.0000	.6723	.8817
M(.0000)	.8614	.0464	18.5681	.0000	.7701	.9528
+1SD(.7040)	.9459	.0629	15.0486	.0000	.8221	1.0696

*LLCI=The lower limit of the indirect effect within the 95% confidence interval

**ULCI=The higher limit of the indirect effect within the 95% confidence interval

The effect of quality of life on hope was found to be significant in the overall range of participation in lifelong education. This implies that participation in lifelong education moderates the relationship between quality of life and hope in all areas.

In order to confirm the form of moderating effect of participation in lifelong education, is presented as a graph as Figure 2. Participation in lifelong education as a moderating variable was divided into three groups: high, medium, and low. And then the change of hope depending on the increase of quality of life is observed. In all groups participating in lifelong learning programs, hope increased, as the quality of life increased. Particularly, in a high group of participation in lifelong education, the rate of increase of hope increases with the increase of quality of life higher than in a low group of participation in lifelong education.

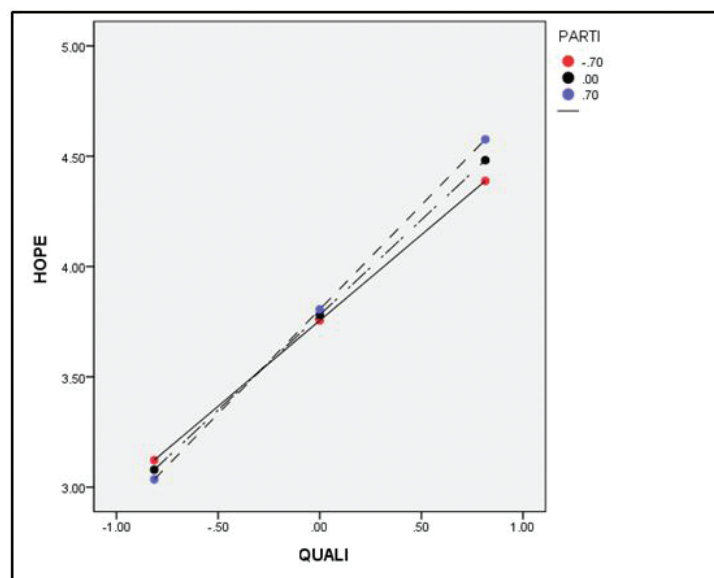


Figure 2: The moderating effect of participation in lifelong education on the relationship between quality of life and hope

Conclusion

The aim of this study was to determine whether the participation in lifelong education moderates the influence of increased hope through quality of life on suicide ideation. As a result, hope mediates the relationship between quality of life and suicide ideation, and participation in lifelong education shows the moderating mediation effect when hope affects suicide ideation while moderating the relationship between quality of life and hope. Based on the results of this study, it was discussed to lower the suicide ideation of the elderly by making lifelong education programs available to them, therefore improving their interest in life, and lowering their incidence of suicide ideation.

Based on the limitations of this study, the identified and reviewed suggestions for future research on this issue are as follows. First, this study has regional limitations in that it only covers participants who are elderly people, residing in the Chungnam province. In the future, a nationwide sampling will be necessary and then a regional comparison will be possible to determine comparisons and identify variances in the data. Second, as the average life expectancy of the human population increases, the age of the elderly should also increase. There is also a need for research that targets a wide range of ages in line with the increasing trend of more humans in the population living to old age. It is also necessary to study the effect of participation in lifelong education programs on the reduction of suicide ideation for vulnerable groups of people who may consider suicide, based on their lowered or reduced quality of life, such as in elderly populations. Third, this study has only studied regarding the participation of the elderly in overall lifelong education programs, but it should also be studied in the future to determine the differences according to the purpose, type and activities of possible lifelong education programs. Despite these limitations, this study was the first to elucidate the moderating mediation effect of participation in lifelong education programs, in relation to the suicide ideation of the elderly. Therefore, it is meaningful that this study provided new basic data in the development and system of the use of a lifelong education program to reduce the suicide ideation of the elderly.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nill

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Influences of Mindfulness on Career Exploration Behaviors: Exploration of Mediating Role of Career Worry and Procrastination

Seongsso Lee

Professor, Department of Counseling Psychology and Social Welfare, Sun Moon University, 70 Sunmoon-ro 221Beon-gil, Tangjeong-myeon, Asan-si, Chungcheongnam-do, 31460, Republic of Korea

ABSTRACT

Background/Objectives: The purpose of this study is to investigate whether the effects of mindfulness on career exploration behaviors are mediated by personal tendency of career worry and procrastination.

Method/Statistical analysis: To accomplish this research purpose, we surveyed four hundred and forty-four students of a university in Asan, Chungnam, Korea. They were asked to indicate their level of mindfulness, career worry, procrastination, and career exploration behaviors on a seven-point Likert-type scale. First, the validities of each measure was examined by performing exploratory factor analysis. Next, mediated moderation analysis was performed using Model 4 of the SPSS Process macro developed by Hayes.

Findings: The results of the analysis showed that the direct effect of mindfulness on career exploration behaviors was not significant. And the indirect relationships mediated by career worry and procrastination were significant. Intuitively, mindfulness was expected to have a direct impact on career exploration, but the results of this study did not confirm such an impression. The result of this study can be deduced that mindfulness represents a comprehensive psychological state, while career exploration represents a behavioral state in a limited domain of career.

Improvements/Applications: One of the main implications of this study is that college students can improve their career exploration behaviors by receiving a mindfulness training program.

Keywords: *Career anxiety, Career exploration, Career worry, Delayed behavior, Mindfulness, Procrastination*

Introduction

Many scholars in the career field have long emphasized the importance of career exploration ^[1]. However, the fact that many college students are not actively pursuing career exploration is also a long-standing problem ^[2]. There will be many factors that promote or inhibit career exploration behaviors.

The exploration for career is an activity that plans for future employment and practices actions related to it. Therefore, it is expected that some negative psychological states will act to suppress career exploration. One is career worry. Because career exploration behaviors are actions to prepare for the future, college students will have to feel uncertainty. Therefore, although there may be differences in that degree, college students will feel worried about their career. Studies of anxiety show that

the higher the level, the weaker the cognitive, emotional, and behavioral problem-solving abilities ^[3]. However, except for Lee & Woo ^[4], it is difficult to find a study on the effects of career worry on career exploration. Another psychological state is procrastination. Although the behavior of exploring for one's own career is triggered by self-motivation, attitude variables such as an individual's will may play an important role in maintaining such behavior. Therefore, failing to set goals and plan to achieve them properly can be seen as a lack of self-regulation. From this point of view, it is necessary to deal with procrastination as a factor that can negatively affect career exploration, but it is difficult to find a study that examines the relationship between these two variables.

Researches on career exploration show that this variable consists of two attributes: exploration for oneself and

exploration for environment ^[5]. To do this exploration, they should be able to perceive their current situation as it is. The related constructive concept is mindfulness ^[6]. However, no studies have examined the relationship between mindfulness and career exploration.

As a result, the purpose of this study is to determine the relevance of mindfulness, career anxiety and procrastination to career exploration.

Literature Review

Mindfulness and Career Exploration: Mindfulness is a term from the Buddhist tradition and is a translation of 'sati' in the Pali language of ancient India. Sati has the meaning of full awareness (sampajanna). The full awareness here means that the mind recognizes clearly and correctly about the object without missing the attention to that. Modern researchers define mindfulness in a variety of ways. For example, by Kabat-Zinn [6p145], "An operational working definition of mindfulness is: the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment." Based on this definition, he proposed the Mindfulness-Based Stress Reduction (MBSR) program. In addition, Baer et al. ^[7] conducted a psychometric study integrating five existing mindfulness questionnaires. The results showed that the factors of mindfulness were 'Nonreactivity to inner experience', 'Observing/noticing/attending to sensations/perceptions/thoughts/feelings', 'Acting with awareness/automatic pilot/concentration/nondistracted', 'Describing/labeling with words', and 'Nonjudging of experience.'

Thus, due to the awareness that is the goal of mindfulness, we are able to have the ability not to be caught up in our internal experience by stopping the automatic and reflexive reactions triggered by our current experience and by having a psychological space to choose new reactions. This characteristic of mindfulness will enable college students to prevent themselves from reacting automatically to their needs in the present situation, to be aware of their own needs, and to make intentional and conscious decisions. As a result, it can be expected that the higher the level of mindfulness, the less anxious mind to capture in the chaos of uncertainty, the more disappearing the mind will be to delay action until you feel uncomfortable, and the career exploration behaviors will increase.

The influence of career worry and mindfulness on career exploration: The career worry in this study is conceptualized by limiting general worry to the field of career. The most common definition of worry is a series of thoughts and images that are somewhat uncontrollable related to negative emotions ^[8]. Thus, career worry can be referred to a series of uncontrollable thoughts and images associated with negative emotions within the boundaries of the career domain.

According to Borkovec ^[9], worried people tend to cognitively avoid problems rather than confront them, not only because they feel threatening and make a cognitively distorted assessment about external factors, but also because they perceive that they cannot exercise proper control when dealing with incidents. Lee & Woo ^[4] showed that the higher the level of career worry, the lower the career exploration. However, except for these studies, it is difficult to find a study on the role of career worry on career exploration.

On the other hand, mindfulness allows people to see the difference between 'objective reality' and 'self-constructed reality' by making a step back from experiences that induce immediate reactions, and let them observe that they are intervening in the process of constructing the experience. Mindfulness enables these cognitive processes to distance themselves from negative thoughts and emotions without identifying them with oneself ^[10]. Therefore, mindfulness can be assumed to be a negative relationship with anxiety. However, it is still difficult to find a study that directly proves the relationship between mindfulness and career worry. And if there is a negative relationship between mindfulness and career worry, career worry is expected to serve as a mediator in the process from mindfulness to career exploration. However, it is difficult to find a research that directly proves whether career worry plays such a role.

Procrastination and career exploration: Procrastination means self-defeating behavior that has difficulty in achieving the goal by failing to start or complete the task within the required timeframe due to the failure of self-regulation ^[11]. Considering that the chronic procrastination of college students may be a function of motivational as well as intentional factors and that some researchers suggest that procrastination is contrary to the characteristics of a high self-regulated learner, we can predict the relationship between procrastination and career

exploration. In general, self-regulated learners adjust their goal-setting process by setting self-initiated goals, motivating oneself, and evaluating progress information toward the goal. On the other hand, procrastinators are known to invest less time in preparing tasks for success, underestimate the total time spent completing tasks, and invest less time in finding the information they need ^[12]. These characteristics ultimately explain the dysfunctional relevance of procrastination in career exploration behaviors. Therefore, it can be expected that the higher the level of procrastination, the lower the level of career exploration.

On the other hand, as mentioned above, mindfulness stops the automatic and reflexive reactions induced by the current experience so that people do not depend on internal experience. During goal-striving activities, people experience not only the desire to achieve the initial goal, but also additional needs. Mindfulness not only keeps you from paying attention to your initial goals, but also makes you realize that your mind is moving from one desire to another. In other words, when people are tempted to move away from their initial career exploration behaviors and try to postpone it, mindfulness will recognize such a mind and bring it back to its initial behavior. Therefore, mindfulness will play a role in lowering the level of procrastination. It will also serve as a mediator in the process from mindfulness to career exploration. However, it is difficult to find a study that examines this relationship.

Method

Participants: Four hundred forty-four students from a university in Asan, South Korea responded to a self-report questionnaire. The distribution of the participating students is as follows: male 228(51.4%), female 210(47.3%), no response on sex 6(1.4%), the minimum age 18 years, the highest age 29 years, the mean age 21.2 years (SD=1.91).

Measures

Mindfulness: For the measure of mindfulness, this study used the scale that Park ^[13] produced for Koreans. This is a 20-item measure consisting of four dimensions of present-moment awareness, concentration, acceptance without judging, and decentered attention.

Career worry: The PSWQ (Penn State Worry Questionnaire) with 16 items of Molina & Borkovec ^[14]

was modified to measure career worry. We measured the level of career worry by adding 'career' to each of the items.

Procrastination: The measure of Lay ^[11] was used to measure procrastination. This measure only includes items that measure behavioral aspects of delayed behavior. That is, it does not include questions related to academic procrastination, and cognitive reasons or emotional consequences of delayed behaviors. Therefore, this scale is effective to measure delayed behavior stably in various scenes.

Career exploration behaviors: In order to measure career exploration behaviors, the 28-item scale of Choi ^[15] was used that was applied to Koreans by combining several previous studies. This measures the frequency of various career exploration behaviors of college students. However, some of the items are not frequently performed by college students, and it will be unreasonable to ask for the level of such behaviors on a Likert-type scale. Therefore, we selected 16 questions and asked how often they have done career exploration behaviors that correspond to the contents of the question in past 12 months.

Seven-point Likert-type scale (1 = strongly disagree, 7 = strongly agree) was used to measure all the concepts used in this study.

Results

Validation of scales: Because mindfulness and career exploration behaviors consist of multidimensional scales, it was necessary to confirm whether or not to maintain such a structure in this study. Career worry levels of respondents were measured by adding 'career' to each item in the measure of Molina & Borkovec ^[14], which was designed to measure general worry. Since this measure was originally produced as a single-dimensional scale, it was necessary to confirm whether the same structure was maintained in this study as well. In the case of career exploration, this study only adopted a part (16 items) of the 28 items in the original scale of the Choi ^[15] a result, exploratory factor analysis was conducted to examine the dimensionality of the variables (mindfulness, career worry, and career exploration) used in this study. The principle axis factoring was used the factor extraction method and the number of factors was determined using scree plot and eigenvalues (> 1.0). The extracted factors were rotated using the Varimax method.

Factor analysis results of mindfulness scales show that four factors are appropriate as well as the original scale. The four factors accounted for 49.86% of the total variance. The percentage of variance of individual factors are as follows: decentered attention 16.59%, acceptance without judging 11.97%, concentration 11.09%, present-moment awareness 10.21%.

The factor analysis of career worry showed that 11 items of single factor were appropriate. Coincidentally, in Molina & Borkovec's PSWQ [14], all reverse items were removed. The single factor accounted for 50.95% of the total variance.

Factor analysis of career exploration behaviors shows that three factors are appropriate. The original

scale of Choi [15] was composed of two factors (self-exploration and environment-exploration). However, the results of this study show that it is appropriate to divide self-exploration into two factors, self-seeking and advice-seeking. As a result, the three factors accounted for 48.41% of the total variance, and the percentage of variance of individual factors are as follows: information-seeking 25.58%, self-seeking 12.84%, and advice-seeking 1.60%.

Table 1 shows the basic statistics and Pearson correlation coefficients of the main variables used in this study. Unlike the initial expectation, career exploration did not have a significant correlation with career worry ($r=.088$, n.s.) as well as mindfulness ($r=.024$, n.s.).

Table 1: The basic statistics and Pearson correlation of the main variable

	M(SD)	A	B	C	D
A. mindfulness	4.506(1.032)	.920			
B. career worry	3.831(1.231)	-.565***	.915		
C. procrastination	3.994(.801)	-.461***	.230***	.843	
D. career exploration	3.651(.972)	.024	.088	-.214***	.869

Note: Italics are Cronbach's α coefficients. *** $p < .001$

The relationships among variables: The purpose of this study is to investigate whether career worry and procrastination function as mediating variables in the relationship between mindfulness and career exploration. For this, mediated moderation analysis was performed using Model 4 of the SPSS Process macro developed by Hayes [16].

Table 2 shows the results of mediated regression analysis for career exploration. First, regression model ($R=.565$, $F(1, 442)=206.874$, $p < .001$) with career worry as a dependent variable and regression coefficient ($B=-.674$, $SE=.047$, $t=-14.383$, $p < .001$, $LLCI=-.766$, $ULCI=-.582$) of mindfulness on career worry were significant. Second, regression model ($R=.461$, $F(1, 442)=119.249$, $p < .001$) with procrastination as a dependent variable and regression coefficient ($B=-.358$, $SE=.033$, $t=-10.920$, $p < .001$, $LLCI=-.422$, $ULCI=-.293$) of mindfulness on career worry were significant.

Third, regression model ($R=.257$, $F(1, 440)=10.337$, $p < .001$) with career exploration as a dependent variable was significant. The effect of the individual regression coefficient on the career search and the influence of the anxiety on career search was significant.

When we examine the effect of individual regression coefficients, the influences of career worry ($B=.108$, $SE=.044$, $t=2.458$, $p < .05$, $LLCI=.022$, $ULCI=.195$) and procrastination ($B=-.307$, $SE=.063$, $t=-4.864$, $p < .001$, $LLCI=-.431$, $ULCI=-.183$) on career exploration were significant. However, the effect of mindfulness on career exploration ($B = -.014$, $SE = .058$, $t = -.249$, n.s., $LLCI = -.128$, $ULCI = .099$) was not significant.

Table 2: Mediated regression analysis on career exploration

IVs	B	SE	t	LLCI	ULCI
DV = career worry					
Mindfulness	-.674	.047	-14.383***	-.766	-.582
DV = procrastination					
Mindfulness	-.358	.033	-10.920***	-.422	-.293
DV = career exploration					
Mindfulness	-.014	.058	-.249	-.128	.099
Career worry	.108	.044	2.458*	.022	.195
Procrastination	-.307	.063	-4.864***	-.431	-.183

Note: * $p < .05$; *** $p < .001$

The above results only provide information about each step from mindfulness through career worry to career exploration. This does not say whether the relationship between mindfulness and career exploration is direct or indirect. Therefore, we examined the direct effect and indirect effect of mindfulness on career exploration. First, the direct effects of mindfulness on career exploration were not significant (direct effect=-.014, SE=.058, $t=-.249$, n.s., LLCI=-.128, ULCI=.099). On the other hand, indirect effects (i.e, mindfulness → career worry or procrastination → career exploration) were significant, and the results are shown in Table 3. In summary, mindfulness influences career exploration indirectly through career worry and procrastination, but the direct effect of not mediating these two variables is not significant.

Table 3: Indirect effect of mindfulness on career exploration

Mediators	Indirect effect	Boot SE	LLCI	ULCI
Career worry	-.073	.032	-.136	-.010
Procrastination	.110	.027	.058	.166

Discussion

The purpose of this study was to investigate whether the effects of mindfulness on career exploration behaviors were mediated by career worry and procrastination. The results of the analysis show that mindfulness does not directly affect career exploration. In other words, the effect of mindfulness on career exploration was significant only in the indirect effect of career worry or procrastination. Intuitively, mindfulness is expected to have a direct impact on career exploration, but the results of this study did not confirm such an impression. The result of this study can be deduced that mindfulness represents a comprehensive psychological state, while career exploration represents a behavioral state in a limited domain of career.

This study will have theoretical implications in some aspects. First thing is that the effect of mindfulness on career exploration was verified. Second thing is that the effect of procrastination on career exploration was examined. Although some variables were identified that could influence career exploration, no research has yet revealed the effect of mindfulness or procrastination on

career search. Third, it is that the effect of mindfulness on career exploration was only indirect effect mediated by two variables, career worry and procrastination. In other words, the state of mind that focuses on the present state shows the fact that it increases the level of career exploration behaviors by lowering the worry and making any action at the same time.

This theoretical implications will provide the following practical implications. First of all, it is possible to implement a program to raise the level of mindfulness to college students. In this study, mindfulness has been treated as a trait, but it can be also conceptualized as a state that can be changed to some extent through a program such as MBSR. Therefore, it will be necessary to prepare mindfulness training to improve college students' career exploration behaviors by lowering the levels of their career worry and procrastination. This study will serve as a basic study to understand why college students who take their first steps into society do not actively pursue career exploration behaviors.

Limitations of this study suggest some future studies. The first limitation of this study is that measure of an existing general worry was applied to the career domain. Though this scale can measure one side of the career anxiety, elaborate measurement will be difficult. Future research is needed to make a measure that enables sophisticated measurement of career worry. The second limitation is that only students at one university participated in the study. Therefore, it is difficult to completely rule out that the results of this study reflect the characteristics of the students attending the university. In the future, it will be necessary to engage university students from various universities in different regions.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Affecting Factors on Social Problem-Solving Ability of University Students

Hye-gyeong Cha¹

¹Assistant Professor, Department of Nursing, Namseoul University, Korea

ABSTRACT

Background/Objectives: This study is a descriptive research to identify the factors influencing university students' ability to solve social problems.

Method/Statistical analysis: From November 18 to December 16, 2017, 250 university students in Korea were surveyed and data was collected. Data was pulled from 213 questionnaires as 37 questionnaires were inappropriately responded. SPSS Win 22.0 Program was used for data analysis.

Findings: The social problem-solving ability of university students showed a positive correlation with social support ($r = .377, p < .001$) and self-efficacy ($r = .613, p < .001$), and negative correlation with fatigue ($r = -.311, p < .001$). As a result of stepwise multiple regression with general characteristics and major variables as independent variables the study identified the factors affecting the social problem-solving ability of university students. The most influential factors in the social problem-solving ability of university students were self-efficacy ($\beta = .498, p < .001$), fatigue ($\beta = -.210, p < .001$) and emotional support ($\beta = .325, p = .007$), indicating a total explanatory power of 42.8% ($F = 50.172, p < .001$).

Improvements/Applications: It is necessary to develop a program to improve the problem-solving ability of university students in the future, and further study additional variables and mediating factors affecting problem-solving ability.

Keywords: Social problem-solving ability, self-efficacy, fatigue, emotional support, university, student

Introduction

Social problem-solving skill is a self-directed cognitive-behavioral process that seeks to find effective solutions to everyday problems [1].

Not only does social problems refer to problems in certain areas of society, but it also uses the term social problems to emphasize the importance of social context that can be applied in all kinds of social situations as well as interpersonal and personal problems that occur in real life [2]. The higher the ability to solve social

problems, the more likely it is to choose an efficient solution. Korean students usually live passive and dependent in a university-oriented environment until university admission, but after entering university, they are in a situation where they have to choose, decide, and be responsible for themselves, and experience great difficulties such as the appropriate academic and interpersonal methods and lifestyles in the newly required educational environment [3,4]. In addition, recent deterioration in the job market caused by the difficulty of employment and rising youth unemployment led to various problems such as postponement of graduation or abandonment of jobs [5,6]. University students are getting ready to leave their adolescence and go out to society, and their ability to solve problems will have a great impact on shaping a healthy and healthy society in the near future.

Many studies show that social problem-solving skills can effectively cope with various problems and

Corresponding Author:

Hye-gyeong Cha
Assistant Professor,
Department of Nursing,
Namseoul University, 91 Daehakro, Seonghwan-eup,
Seobuk-gu, Cheonan-si,
Chungcheongnam-do, 331-707, Korea
Email: hgcha@nsu.ac.kr

stresses, thus eliminating psychological stress and behavioral maladjustment [7-9]. [10] said that having the ability to solve social problems naturally builds up the ability to solve tasks, including personal problems, interpersonal problems, or intergroup problems. On the other hand, the lack of coping skills necessary to solve the problem is related to psychological maladjustment and mental illness [11]. Therefore, rational problem solving is an important task that needs to be improved through university education to adapt to new changes and solve the problems faced by university students [12].

In the previous studies, most of the factors that affect the social problem-solving ability of university students were analyzed from one aspect such as personal internal factors, physical factors, social relations factors, and there are few studies that have identified the factors that affect problem solving in complex aspect such as internal personal, external, physical factors, social relations. In this study, we examined the self-efficacy [13] in personal internal factors, which is a value judgement that indicates a person's attitude toward him or herself and a subjective experience of being delivered to others and examined the fatigue symptoms in physical factors and social support in social relationship factors. We will try to find out which factors affect the problem-solving ability of university students.

Study Method

Study Design: This study is a descriptive survey study to identify the factors affecting the social problem-solving abilities of university students living in Korea.

Subjects and data collection: The participants of this study were university students of Korea, and the data was executed from 18 November to 16 December, 2017. G*Power 3.1.2. Program was used to get a sample size for this study. The required sample size was 138 with the significant level (α) 0.05, Power of test ($1-\beta$) 0.95, effect size (p) 0.3, and the number of predictors 5. In considering the dropout rate, 225 university students participated in the survey after informed consent. However, 23 questionnaire had missing values and improper response, thus a total of 202 questionnaires were used for the data analysis of this study.

Measurements

Social problem-solving ability: The social problem-solving skills scale used in this study used the social

problem-solving ability (SPSI-R) scale that was revised by the [14], translated by [15]. It consists of a total of 52 questions and a Likert 5 points scale. In this study, the tool reliability Cronbach's α was found to be .913.

Self-efficacy: The self-efficacy test used in this study used a self-efficacy scale developed by [16] that was translated and modified by [17].

It consists of a Likert scale with a total of 25 questions. In this study, the tool reliability Cronbach's α was found to be .926.

Social support: The social support measure used in this study, a Likert scale with a total of 25 questions, was developed by [18]. The subcomponents consist of seven questions about emotional support, six questions about information support, six questions about evaluation support, and six questions about tool support. In this study, the tool reliability Cronbach's α was found to be .962. In this study, the tool reliability Cronbach's α was found to be .962.

Fatigue: The fatigue measurement tools used in this study used a translation of the Subjective Symptom of Fatigue Test by [19], which was standardized by the Industrial Fatigue Research Committee of the Japan Society of Industrial Health. This tool consists of a Likert 5 points scale with 30 questions, 10 questions of physical symptoms, 10 questions of mental symptoms, and 10 questions of neurological symptoms.

Data Analysis

This study used SPSS/WIN 22.0 program for statistical analysis of the data, conducted descriptive statistics for the general characteristics, t-test and One-way ANOVA for difference analysis of variables according to the general characteristics, and analyzed the relation between variables with Pearson correlation coefficients. This study used stepwise multiple regressions for finding affecting factors on social problem-solving ability of university students.

Ethical Consideration: Prior to data collection, this study considered the ethical aspects by providing participants with the purpose and method of research, utilization of research results, survey data to be used only for the study purpose, anonymity and confidentiality of research participants, and a description of stopping during the creation of the questionnaire, and by receiving the consent from participants.

Results and Discussion

General characteristics (N = 202): As shown in table 1, the general characteristics of the subjects were female 150 (74.3%), male 52 (25.7%) and their mean age was 21.07 ± 1.72 . There were 101 people (50.0%) who identified as religious, 101(50.0%) were non-religious, 76(37.6%) were the second born, 75(37.1%) were the first born, and 37(18.3%) were the third or more, and 14(6.9%) were the only ones. The final education level of the father was the most with 98 university graduates (48.5%), while the final education level of the mother was the most with 108(53.5%) high school graduates. The most common economic level was ‘middle-class’ with 106 students (52.5%). Father’s job status was the most with 178(88.1%) ‘Yes’, and mother’s job status also was the most with 139(68.8%). 88 respondents (43.6%) answered that they had education experience related to problem-solving. Among the types of education practice for problem-solving, 29 respondents named practical training (32.9%), 27 people named discussion (30.9 percent), 14 people named Simulation (15.9 percent), 13 named PBL (14.7 percent) and 5(5.6%) named counseling and reviewing opinions.

Table 1: General Characteristics (N = 202)

Characteristics	Categories	N (%), M $\pm$ SD
Gender	Male	52(25.7%)
	Female	150(74.3%)
Age(year)	Average	$21.07 \pm 1.72(18-26)$
Religious status	Yes	101(50.0%)
	No	101(50.0%)
Rank among sibling	Only one	14(6.9%)
	First born	75(37.1%)
	Second born	76(37.6%)
	Third or more	37(18.3%)
The final education level of the father	Below middle school	9(4.5%)
	High school graduate	78(38.6%)
	College/ University graduate	98(48.5%)
	Graduate school and higher	17(8.4%)

Conted...

The final education level of the mother	Below middle school	5(2.5%)
	High school graduate	108(53.5%)
	College/ University graduate	79(39.1%)
	Graduate school and higher	10(5.0%)
The economic level	High	3(1.5%)
	Upper middle	51(25.2%)
	Middle	106(52.5%)
	Lower middle	37(18.3%)
Father’s Job status	Low	5(2.5%)
	Yes	178(88.1%)
Mother’s Job status	No	24(11.9%)
	Yes	139(68.8%)
Education experience status related to problem-solving	No	63(31.2%)
	Yes	88(43.6%)
The types of education related to problem solving	No	114(56.4%)
	PBL	13(14.7%)
	Simulation	14(15.9%)
	Discussion	27(30.9%)
	Practical training	29(32.9%)
	Others	5(5.6%)

Descriptive Statistics for variables: As shown in table 2, the social problem-solving abilities of the study subjects averaged 182.46 ± 24.09 points out of the total score of 52–260 and were 3.51 ± 0.46 points in terms of 1–5 points. Self-efficacy averaged 81.37 ± 13.49 points in the 24-120 points range, and social support averaged 103.51 ± 13.73 points on the 25-125 points, and fatigue scored 51.13 ± 13.02 points on average from the total core range of 30-120 points.

Table 2: Descriptive Statistics for Variables (N = 202)

Variables		Total Score Range	M $\pm$ SD (Min-Max)	Grade Range	M $\pm$ SD (Min-Max)
Social Problem-Solving Ability	Positive problem solving-orientation	5-25	19.24 $\pm$ 2.89 (10-25)	1-5	3.85 $\pm$ 0.58 (2.00-5.00)
	Negative problem solving-orientation	10-50	32.23 $\pm$ 7.89 (11-49)	1-5	3.22 $\pm$ 0.79 (1.10-4.90)
	Rational problem-solving skill	20-100	72.31 $\pm$ 10.64 (39-98)	1-5	3.62 $\pm$ 0.53 (1.95-4.90)
	Impulsive-careless response	10-50	34.30 $\pm$ 6.11 (20-49)	1-5	3.43 $\pm$ 0.61 (2.00-4.90)
	Avoidance response patterns	7-35	24.19 $\pm$ 5.15 (8-35)	1-5	3.46 $\pm$ 0.74 (1.14-5.00)
	Total Score	52-260	182.46 $\pm$ 24.09 (113-236)	1-5	3.51 $\pm$ 0.46 (2.17-4.54)
Self-efficacy		24-120	81.37 $\pm$ 13.49 (47-119)	1-5	3.39 $\pm$ 0.56 (1.96-4.96)
Social Support	Emotional support	7-35	29.57 $\pm$ 4.24 (14-35)	1-5	4.22-0.61 (2.00-5.00)
	Evaluation support	6-30	24.96 $\pm$ 3.76 (11-30)	1-5	4.16 $\pm$ 0.63 (1.83-5.00)
	Information support	6-30	24.58 $\pm$ 3.56 (12-30)	1-5	4.10 $\pm$ 0.59 (2.00-5.00)
	Instrumental support	6-30	24.49 $\pm$ 3.62 (12-30)	1-5	4.08 $\pm$ 0.60 (2.00-5.00)
	Total Score	25-125	103.51 $\pm$ 13.73 (50-125)	1-5	4.14 $\pm$ 0.55 (2.00-5.00)
Fatigue	Physical fatigue	10-40	18.72 $\pm$ 5.18 (10-32)	1-4	1.87 $\pm$ 0.52 (1.00-3.20)
	Mental fatigue	9-36	15.95 $\pm$ 4.90 (9-39)	1-4	1.77 $\pm$ 0.54 (1.00-4.33)
	Neurotic symptoms	11-44	16.47 $\pm$ 4.59 (11-34)	1-4	1.50 $\pm$ 0.42 (1.00-3.09)
	Total Score	30-120	51.13 $\pm$ 13.02 (30-96)	1-4	1.70 $\pm$ 0.43 (1.00-3.20)

Social problem-solving ability related to education experience: As shown in table 3, analysis of differences between the social problem-solving ability and its subcomponents according to the general characteristics of this study showed that the differences in education status related to the problem resolution are different.

The social problem-solving ability of university students is higher ($t=2.611$, $p=.010$) for those who receive problem solving education. Among the sub-factors, there was a significant difference in negative problem orientation ($t=2.233$, $p=.027$) and rational problem-solving skills ($t=2.132$, $p=.034$). In other words, university students with problem-solving training had higher scores for negative problem-solving orientation. However, this could be interpreted as lower for reverse conversion. Reasonable problem-solving skills also showed higher scores for university students with training related to problem-solving.

Table 3: Social problem-solving ability related to education experience (N = 202)

Variables	Education	M ± SD	t(P)
Social problem-solving ability	Yes	187.45 ± 22.03	2.611(.010)*
	No	178.59 ± 24.99	
Positive problem-orientation	Yes	19.63 ± 2.64	1.684(.094)
	No	18.94 ± 3.04	
Negative problem-orientation	Yes	33.63 ± 7.24	2.233(.027)*
	No	31.15 ± 8.23	
Rational problem-solving skill	Yes	74.11 ± 10.08	2.132(.034)*
	No	70.90 ± 10.90	
Impulsive-careless responses patterns	Yes	34.88 ± 6.10	1.172(.242)
	No	33.86 ± 6.11	
Evasive response pattern	Yes	24.75 ± 4.90	1.353(.178)
	No	23.76 ± 5.32	

*p<.05

Correlation among main variables: As shown in table 4, the correlation between study variables, the social problem-solving ability of university students was positively correlated with self-efficacy ($r = .613, p < .001$) and social support ($r = .377$). Fatigue ($r = -.311, p < .001$) was found to have a significant negative correlation.

Table 4: Correlation among Main Variables (N = 202)

	Social problem-solving ability	Self-efficacy	Social Support
Self-efficacy	.613**	1	
Social Support	.377**	.368**	1
Fatigue	-.311**	-.243**	-.161*

*p<.05, **p<.01

Factors influencing on social problem-solving: In order to identify the factors affecting the social problem-solving ability, which is a dependent variable of the study subjects, a stepwise multipurpose regression analysis was conducted with the self-efficacy, emotional support, evaluation support, information support, material support, physical fatigue, mental fatigue, neurotic fatigue, educational experience related to problem solving, age, and gender as independent variables.

As shown in table 5, problem solving education experience and gender were included in the regression equation after treating variable numbers. And the multiple regression analysis was carried out by satisfying the results of testing the normality and homoscedasticity of residuals. Multiple regression analysis showed that self-efficacy ($\beta=.498$) had the greatest effect on university students' ability to solve social problems. Mental fatigue($\beta=-.210$) and emotional support($\beta=.155$) were added to have an explanatory power of 42.8%($F=50.172, p<.001$).

Table 5: Factors Influencing on Social Problem-Solving (N = 202)

[illegible]

Discussion

In this study, A regression analysis shows that among many input independent variables, the most influential factor in solving a university student's social problems was his or her sense of self-efficacy. Next, mental fatigue negatively affected and emotional support positively affected problem-solving abilities. In other words, the higher the self-efficacy, less mental fatigue, and more emotional support, the higher the ability of solving social problems.

The analysis that higher the self-efficacy, the higher the problem-solving ability is supported by many papers. In a study to identify factors that influence the self-efficacy of university students on dealing with stress and solving social problems, [20] said that university students who have high self-efficacy tend to use various coping strategies for stress to define problems and focus on problem-oriented coping mechanisms that analyze problems objectively and help solve social problems. This is the same for high school students [21], middle school students [22], and troubled teenagers [23].

Although the study by [20] stated that there were gender differences in the emotional domain, which is a lower area of social problem resolution, in this study, there were no differences in social problem resolution ability related to gender, sibling order, religion, economic level, and education level of parents, etc. There were only significant differences in the general characteristics of subjects correlated to education related problem resolution. This suggests that social problem-solving skills can be improved by increasing the self-efficacy of problem-solving by education rather than by conditions and circumstances. According to the participants, the types of education that helped solve social problems were action learning 32.9%, discussion 30.9%, simulation 15.9%, and problem-based learning 14.7%. Through education related problem resolution, university students can improve their self-efficacy by practicing and discussing practical issues related to problem resolution, and thus improve their social problem-solving ability. Therefore, considering the importance of social problem-solving ability of university students, it is necessary to apply various teaching methods focusing on practice and discussion to improve social problem-solving ability.

The second most influential factor in university students' ability to solve social problems was mental

fatigue among other sub - factors of fatigue. Youth unemployment has become one of the serious social problems of Korean society [8] as, university students to work harder than before to get a satisfactory job and have high stress in preparation for employment. In addition, various mental fatigue is accumulated due to financial problems such as university adaptation, interpersonal relationship, tuition and living expenses. [24] also found that mental health such as somatic symptoms, anxiety, insomnia, and severe depression were significantly associated with social problem-solving based on the fact that physical activity affects problem-solving abilities [25], and those who learn problem-solving skill are more effectively able to cope with stress [9], in addition to the improvement of physical activity, improvement of problem solving ability by improving coping ability of mental fatigue through the education related to problem-solving can be a practical solution. In addition, among the sub-factors of social support, emotional support rather than evaluation, information, and material support appears to be a factor influencing university students' social problem solving. When university students have problems, it was found that they needed to support in solving problems on their own rather than giving advice on assessments or results.

Conclusion

This study is a descriptive survey to identify the factors affecting the social problem-solving abilities of university students living in Korea.

The study is meaningful in that it provided basic data on how university students can improve their social problem-solving skills by identifying factors affecting their ability to solve social problems in Korean society. However, since this study is a result of convenience extraction of some university students in Korea, it is necessary to be cautious in applying the extension, and it is recommended to repeat research that can confirm and extend the results of this study.

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Smartphone Addiction, Self-Control, and Learning Flow of Nursing Students

Sunsook Sim¹, Miran Bang²

¹Department of Nursing, Kyungdong University, Korea; ²Hallym University Dongtan Sacred Heart Hospital, Korea

ABSTRACT

Background/Objectives: This study is a descriptive correlation study that investigated the relationship of smartphone addiction, self-control, and learning flow among nursing students.

Method/Statistical Analysis: The data was collected for 5 days from December 4 until December 8, 2017. In this study, 181 first-year students attending a nursing college in W city were convenience-sampled.

Findings: In this study, the smartphone addiction score of the nursing students was 2.27 out of 4, self-control 3.84 out of 5, and learning flow 2.91 out of 5. Analysis of the correlation among smartphone addiction, self-control, and learning flow showed that smartphone addiction and learning flow had negative correlation ($r = -.357, p < .001$); self-control and learning flow positive correlation ($r = .408, p < .001$); and self-control and smartphone addiction negative correlation ($r = -.511, p < .001$).

Improvements/Applications: Therefore, development and application of manuals to prevent smartphone addiction are required and various practical programs which can be evaluated and improve learning flow must be applied.

Keywords: Smartphone, Addiction, Self-Control, Learning Flow, Nursing

Introduction

Now, we live in the society that we feel various and positive changes with smartphones. But, as the use of smartphones increased rapidly and became common, its negative consequences cannot be ignored, either. Smartphones have been common as we first find them as soon as wake up in the morning and look at them before we go to sleep. We have led a convenient life based on the smartphones which provide all kinds of information utilizing applications for us as their right function and share them in real time, but side effects including decreases in our ability to function in daily life due to the risk of addiction such as tolerance, withdrawal symptoms, loss of control function are also serious^[1,2].

The study on university students' smartphone use motivation by Yang and Lee^[3] has found that smartphones are used in various ways as factors of information acquisition, communication, service integrity, fashion and ostentation, permanent information activities, habituation, and usage convenience were extracted. On the other hand, Diana et al^[4] argued that people who tend to identify themselves with cellular phones and think of them as their means of entertainment and pleasure have an effect on cellular phone addiction. It has found that the overuse of smartphones have a bad effect on university life, interpersonal relations, mental health, functions of fingers, and nerve learning flow as university students' use of time is free^[5,6].

For nursing students, self-control can be an important ability when doing activities such as correct judgements, time utilization, exact information acquisition in dealing with patients' health problems in nursing fields. Self-control has an effect on smartphone addiction^[7] and there are mediating effects among them^[8]. The study of Cho^[9] has found that there is a negative correlation between

Corresponding Author:

Miran Bang Nurse,
Hallym University,
Dongtan Sacred Heart Hospital, Korea
Email: kjbmr@hallym.or.kr

smartphone addiction and self-control. And Park et al^[10] argued that the amount of time to use smartphones per day and self-control are the factors which explain smartphone addiction. However, it is impossible that smartphones are not allowed to be used in modern times because they are the very important communication means. Therefore, smartphones must wisely be used by adjusting the amount of time to use them.

Universities of the health and medical treatment field have run performance-oriented curriculums to cultivate talented persons with ability and expertise required for medical institutions and led students to learning flow by developing various teaching methods. It's because learning flow is the important factor which boosts learning performance^[11]. University students' behavior which interrupts learning flow these days can be the overuse of smartphones. The students who are overdependent on their smartphones including using them or replying to text messages immediately even during class and always keeping them in their hands are often founded. And it is difficult for them to make face-to-face conversation with their families or friends even though they are with them. The study of Han^[6] has found that there is a inverse correlation between smart addiction and learning flow and a positive correlation between learning flow and academic achievement. Obsession and overuse of smartphones cause maladjustment even in terms of physical, psychological, social, and interpersonal relationships^[12,13]. In the precedent studies, studies on smartphone addiction and learning flow were conducted in regard to cognitive domains and there are few studies on nursing students' relationships between smartphone addiction and learning flow. Various studies which consider environmental, physical, and emotional factors need to be conducted.

Accordingly, this study tries to examine correlations among smart addiction, self-control, and learning flow targeting nursing students and provide base line data for program development which can prevent smart addiction and improve learning flow by strengthening self-control.

Materials and Method

Research Design: This study is a descriptive correlation study that investigated the relationship of smartphone addiction, self-control, and learning flow among nursing students.

Subjects: In this study, 181 first-year students attending a nursing college in W city were convenience-sampled. This study distributed questionnaires to 191 persons, and then total 181 questionnaires were used for analysis after excluding 10 questionnaires with insufficient responses.

Research Tools

Smartphone Addiction: In this study, to measure the level of smartphone addiction, the standardized adult smartphone addiction scale developed by National Information Society Agency^[14] was used. This tool is the Likert 4-point scale, composed of total 15 questions. Cronbach's α value of this tool was 0.87.

Self-control: Self-control was measured by using the scale developed by Park^[15]. This tool is the Likert 5-point scale, composed of total 28 questions. Cronbach's α value of this tool was 0.90.

Learning Flow: In this study, to measure learning flow of university students, the 'Learning Flow Scale for Adults' developed and validated by Kim et al^[16] was used. This tool is the Likert 5-point scale, composed of total 29 questions. Cronbach's α value of this tool was 0.94.

Data Collection: The data was collected for 5 days from December 4 until December 8, 2017.

Results

Characteristics of the subjects: Subjects' smartphone addiction levels have found that most of nursing students are 'a general user group' as 81.8%, 'a potential risk group' is 10.5%, and 'a high risk group' is 7.7%. The amount of time to use smartphones has found that more than 3 years is 91.7% and the amount of time to use smartphones per day has found that 'more than 3 hours' is 51.9% [Table 1].

Smartphone addiction, self-control, and learning flow of nursing students: In this study, the smartphone addiction score of the nursing students was 2.27 out of 4, self-control 3.84 out of 5, and learning flow 2.91 out of 5 [Table 2].

Nursing students' smartphone addiction, self-control, and learning flow according to the general characteristics: The variables which show significant differences in smartphone addiction according to nursing students' general characteristics have found to be academic grade ($F=7.63, p<.01$), smartphone addiction levels ($F=73.49, p<.001$), and the amount of time to use smartphones per day ($F=6.22, p<.001$). The variables

which show significant differences in self-control have found to be college life satisfaction ($F=7.29, p<.01$), academic grade ($F=6.88, p<.01$), and smartphone addiction levels ($F=16.11, p<.001$). The variables which show significant differences in learning flow have found to be college life satisfaction ($F=7.57, p<.01$), academic grade ($F=37.22, p<.001$), and smartphone addiction levels ($F=6.02, p<.01$) [Table 3].

Table 1: Characteristics of the Subjects (N = 181)

Variables	Categories	N (%)
College life satisfaction	Satisfied	67 (37.0)
	Moderate	107 (59.1)
	Dissatisfied	7 (3.9)
Academic grade	High	36 (19.9)
	Middle	121 (66.9)
	Low	24 (13.3)
Level of smartphone addiction	General user group	148 (81.8)
	Potential risk group	19 (10.5)
	High risk group	14 (7.7)
Amount of time to use smartphone (years)	<1	5 (2.8)
	1-2	4 (2.2)
	2-3	6 (3.3)
	≥ 3	166 (91.7)
Amount of time to use smartphone per day	<1	2 (1.1)
	1-2	26 (14.4)
	2-3	59 (32.6)
	≥ 3	94 (51.9)

Table 2: Smartphone Addiction, Self-Control, and Learning Flow in Nursing Students (N = 181)

Variables (range)	M $\pm$ SD
Smartphone Addiction(1-4)	2.27 $\pm$ 0.45
Self-Control(1-5)	3.84 $\pm$ 0.49
Learning Flow (1-5)	2.91 $\pm$ 0.52

Relationship of smartphone addiction, self-control, and learning flow: Analysis of the correlation among smartphone addiction, self-control, and learning flow showed that smartphone addiction and learning flow had negative correlation ($r=-.357, p<.001$); self-control and learning flow positive correlation ($r=.408, p<.001$); and self-control and smartphone addiction negative correlation ($r=-.511, p<.001$) [Table 4].

Table 4: The Relationship between the Smartphone Addiction, Self-Control, and Learning Flow in Nursing Students (N = 181)

	Learning flow r(p)	Smartphone addiction r(p)
Smartphone addiction	-.357 (<.000)	
Self-control	.408 (<.000)	-.511 (<.000)

Table 3: Smartphone Addiction, Self-Control, and Learning Flow in Nursing Students according to General Characteristics (N = 181)

Variables	Categories	Smartphone Addiction				Self-control				Learning flow			
		M $\pm$ SD	t/F	P	Scheffe'	M $\pm$ SD	t/F	P	Scheffe'	M $\pm$ SD	t/F	P	Scheffe'
College life satisfaction	Satisfied ^a	2.18 $\pm$ 0.47	2.24	.110		4.01 $\pm$ 0.46	7.29	.001	b<a	3.10 $\pm$ 0.53	7.57	.001	b<a
	Moderate ^b	2.33 $\pm$ 0.42				3.74 $\pm$ 0.47				2.79 $\pm$ 0.49			
	Dissatisfied ^c	2.34 $\pm$ 0.61				3.67 $\pm$ 0.57				2.95 $\pm$ 0.49			
Academic grade	High ^a	2.09 $\pm$ 0.47	7.63	.001	a,b<c	4.07 $\pm$ 0.49	6.88	.001	b,c<a	3.44 $\pm$ 0.46	37.22	.000	b,c<a, c<b
	Middle ^b	2.27 $\pm$ 0.42				3.81 $\pm$ 0.43				2.84 $\pm$ 0.45			
	Low ^c	2.54 $\pm$ 0.43				3.63 $\pm$ 0.61				2.52 $\pm$ 0.39			
Level of smartphone addiction	General user group ^a	2.14 $\pm$ 0.36	73.49	.000	a,b<c, a<b	3.92 $\pm$ 0.45	16.11	.000	c<a,b	2.97 $\pm$ 0.51	6.02	.003	c<a
	Potential Risk group ^b	2.74 $\pm$ 0.08				3.65 $\pm$ 0.37				2.74 $\pm$ 0.51			
	High risk group ^c	3.09 $\pm$ 0.19				3.25 $\pm$ 0.53				2.53 $\pm$ 0.53			
Amount of time to use smartphone (years)	<1	2.23 $\pm$ 0.46	0.39	.757		3.74 $\pm$ 0.59	0.12	.948		2.74 $\pm$ 0.45	0.24	.865	
	1-2	2.08 $\pm$ 0.43				3.90 $\pm$ 0.69				2.95 $\pm$ 0.17			
	2-3	2.17 $\pm$ 0.36				3.79 $\pm$ 0.56				3.00 $\pm$ 0.50			
	≥ 3	2.28 $\pm$ 0.45				3.84 $\pm$ 0.48				2.92 $\pm$ 0.53			

Conted...

Amount of time to use smartphone per day	<1 ^a	2.60 ± 0.28	6.22	.000	b<d	3.71 ± 0.61	0.93	.428	2.22 ± 0.66	1.97	.121	
	1-2 ^b	2.02 ± 0.46				3.80 ± 0.53			3.00 ± 0.42			
	2-3 ^c	2.19 ± 0.42				3.93 ± 0.45			2.98 ± 0.52			
	≥3 ^d	2.39 ± 0.42				3.80 ± 0.49			2.87 ± 0.54			

Discussion

The study was tried to examine correlations among smart addiction, self-control, and learning flow targeting nursing students and provide base line data for program development which can prevent smart addiction and improve learning flow by strengthening self-control.

The average of nursing students' smartphone addiction 2.27 points out of 4, which is higher than 1.96 points of Kim and Kim^[17] investigated by the same scale targeting nursing students and is lower than 2.53 points of Park et al^[18]. Therefore, various methods including exchanging opinions about maleficence of the overuse of smartphones, setting time and places to refrain them from using smartphones, doing activities or hobbies to be able to be with families except using smartphones, installing applications to help them use smartphones wholesomely are thought to be sought.

In the study, nursing students' self-control 3.84 points out of 5, which is higher than 3.42 of Kim and Son^[19] even though the same tool was not used in it. The study of Son^[20] which was intended for general university students reported that self-control has an effect on learning performance. Therefore, the intervention program which can improve university students' self-control is required to be applied.

Nursing students' learning flow in the study has found to be 2.91 points out of 5, which is lower than 3.46 of Kim^[21] that measured learning flow by using the same tool targeting general students. These results are thought that learning flow was measured to be low as the subjects of the study are the freshmen who did not complete their majors and it is judged that the importance of liberal arts is low by itself. The curriculums of the freshmen of the departments of nursing science mostly consist of liberal arts. And when they become sophomores, they are supposed to learn their majors in earnest. But, it is thought that more detailed and flexible curriculums need to be run by utilizing video lectures with smartphones and organizing basic subjects in majors from freshmen to lead nursing students to enthusiasm for and immersion in their studies.

Nursing students' smartphone addiction and learning flow showed a negative correlation and their self-control and learning flow did a positive correlation, and their self-control and smartphone addiction did a negative correlation. These results coincided with the research results of Han^[6] and Kim^[22] targeting nursing students. As for these results, it is thought that the higher self-control of students who use smartphones is, the better they can control temptation of smartphone addiction and remove and overcome the factors which interrupt learning. And the research results of Kim^[23] targeting nursing students argued that the factors which have an effect on learning flow are self-leadership and academic self-efficacy and there is a positive interrelationship among the three factors. Therefore, it is thought that educational programs which can prevent nursing students from getting addicted to smartphones and improve their ability to control themselves are required. For this, programs which improve self-leadership to be leaders of themselves, control, and behave to improve learning flow ability, educational intervention programs which can increase academic self-efficacy need to be developed and educational environment which can support them are much needed. And the bedrock of social support including self-help groups as well as universities needs to be prepared. Therefore, development and application of manuals to prevent smartphone addiction are required and various practical programs which can be evaluated and improve learning flow must be applied.

Conclusion

The research results of the study have found that smartphone addiction and learning flow show the negative correlation, self-control and learning flow do the positive correlation, and self-control and smartphone addiction do the negative correlation. Therefore, guidelines for preventing smartphone addiction and programs which can improve smartphone addiction and self-control need to be developed and various plans which can enhance learning flow must be applied. However, the study has the limit in generalizing the research results because it was intended

for nursing students in a region. In the follow-up studies, the studies which develop practical guidelines for using smartphones and preventing smartphone addiction and verify the applied effects are required.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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The Relationship between College Students' Perceptions of Colleague Education, Major Satisfaction and Employability

Soonyoung Yun¹, Shinhong Min¹

¹Baekseok University, Nursing department, 76, Munam-ro, ASI|KR|KS002|CHEONAN, Korea

ABSTRACT

Background/Objectives: This study aimed to investigate the relationship between college students' perceptions of colleague education, major satisfaction and employability.

Method/Statistical analysis: The survey was conducted from December 1 to 20, 2017 in the subjects of the students who were informed of the study goals and contents, and agreed. First for the sociodemographic characteristics, they were set including sex, religion, entrance type, type of admission, a native high school, living environment, family economic status, study level perceived by him or her. And we surveyed the data of perceptions of colleague education, major satisfaction and employability.

Findings: Upon the study results among 121 freshman, they showed mean values of perceptions of colleague education, major satisfaction and employability with 50.73 ± 5.82 points, 35.87 ± 5.34 points and 85.10 ± 12.38 points, respectively. When looking at correlations to look at relationships between perceptions of colleague education, major satisfaction, and satisfaction employability, there is a significant amount of correlation between the three variables.

Improvements/Applications: It is intended to help develop interventions that can look at the current state of students and increase their degree satisfaction and employment potential.

Keywords: *Adolescents, Competence, Narcissism, Resilience, Youth activity.*

Introduction

Today's college education faced a variety of social needs in a rapidly changing society, and the overall problems of university education have been highlighted and it can be predicted that there are very significant structural problems behind it. The structural problem here relates to the situation in which a choice between the pursuit of knowledge and learning and the pursuit of market value is required. In such a situation, conflicts between the role of university education and social demands are inherent. In other words, university education is part of a social network, preparing for a new leap forward, as well as requiring the qualitative improvement of college education, which is specialized through university education¹. Therefore, universities

are in a situation where students and customers, or businesses or global markets are required to produce and sell knowledge in a knowledge-based society by the principle of supply and demand². However, today's college education has been heard everywhere as well as the voice that it fails to foster professionals despite many self-reliance efforts and concerns about the decline in the quality of college education³. Those who believe that university education should accept social needs point out that universities today do not properly teach the practical knowledge that society requires, and that many college graduates are not getting a job⁴. While Korea, which has a high rate of higher education benefits, was expected to play a key role in fostering high-quality human resources, critics say that universities do not reflect recent social changes and do not perform sufficient human resources training functions⁵. The Korea Institute for Proficiency and Development conducted a study that found 68 percent of college graduates with four-year college education, reflecting that university education does not meet the needs of society well⁶.

Corresponding Author:

Shinhong Min

Department of Nursing, Baekseok University, Korea

Email: shmin@bu.ac.kr

If so, it is necessary to find out what college education students think and what purpose they want to receive. The expectations of college education and the quality of university life will vary depending on changes and needs of society. This capacity-based education recognizes all learning experiences in schools as preparation for the professional world and is based on two assumptions. One is that the whole purpose of education is ultimately to prepare students to participate actively in the job market and society, and the other is that the core of learning in school is training for the talent that businesses want⁷. Depending on the value, purpose, and motivation a college student has in mind, their college life will also look different, depending on the purpose or importance of their college life.

Meanwhile, the satisfaction level of a college student's major is very important because the more satisfied he or she is with his or her major, the better he or she can adapt to school life and have a positive effect on his career after graduation. College engineering satisfaction is the product of a judgment process that assesses one's current major against the standards set by an individual for career path or job⁸. In particular, it is reported that the college degree satisfaction level is lower in selecting majors based on the recommendation of others without sufficient information⁹ because universities must play an important role in fostering professionals as well as well as well as well as well as well as well as a nation or society. Such a degree will have a positive impact on individual employment potential¹⁰, which means individual belief or belief in the possibility of finding a new job or job, and generally highly available members are recognized as competent individuals. In other words, the more likely a member is to be hired, the more knowledge, skills and abilities the labor market requires¹¹. In addition, the possibility of employment is high when external factors of labor market demand and economic situation policy support are well combined¹².

The final purpose of the current college education is to find a successful job. Considering that employment is not a short-term gratification but a lifelong workplace, satisfaction with a job is paramount, and that satisfaction with a major is very important. Therefore, a university's education officer should be the basis for students' choice when choosing a university and students should use it to see if it conforms to their education officer.

Universities are required to make diverse efforts to achieve expectations for and high satisfaction with their majors, which could lead to employability and efficient operation of national resources. Therefore, this research is intended to help the development of interventions that can improve positive results by identifying the degree to which the relationship between the university education center, the degree satisfaction level, and the potential for employment is related.

Materials and Method

Research Subjects: A survey was conducted to investigate the relationship among college students' perceptions of colleague education, major satisfaction and employability in the freshman in the subjects with the students who go to a university in Choong chung Provinces in this study.

Research Period: The survey was conducted from December 1 to 20, 2017 in the subjects of the students who were informed of the study goals and contents, and agreed.

Measurement Tools: First for the sociodemographic characteristics, they were set including sex, religion, entrance type, type of admission, a native high school, living environment, family economic status, study level perceived by him or her. The tools investigated on perceptions of colleague education, major satisfaction and employability were as follows.

The "student's perception of College Education" is the value of education that university students want to gain through college education. The value of education is defined as 'the sum of the intrinsic value of being immersed and rewarding in play, and the functional value of value that it contributes to the development of the rest of the world'. Therefore, a university education center can mean an individual's thoughts, intentions, or purpose about a university education by a college education consumer, or an educational institution, which is a subjective meaning of education. In this study, it was defined as the meaning of value or purpose for a university education that college students think is subjective. The tools used in this study used a university education center tool, four questions of culture and civic awareness, three questions of interpersonal skills, and three questions of professional development¹³. It

consisted of a total of 16 questions with a four-point scale with a reliability of Cronbach's $\alpha = 0.885$

Major satisfaction is a concept that is formed by individual characteristics and interactions with the environment and encompasses cognitive and defined aspects such as thoughts and attitudes that are achieved through this process. In this study, we combined the concept of a degree satisfaction with concept of career path and defined the definition of a psychological process for assessing one's department. The measure of the degree satisfaction used in this study is based Kang¹⁴. The questions used in this study are whether a major fits well with aptitude, whether you like your major, whether you think your major matches your career, whether your major matches your values, and whether your major is organized as a major is interesting. The question-and-answer format is a six-point scale from "not at all" to "very well" (6 points), and the higher the score, the more the major matches one's mental aptitude or career path. The overall reliability factor of the last major satisfaction scale constructed in this study is Cronbach's $\alpha = 0.901$.

Employability refers to the capacity required by individuals to obtain employment while flexibly responding to changes in the working environment and to enable professional success, and is a concept that addresses cognitive dimensions of employment readiness. In this study, we intend to apply the concept of 'awareness of the possibility of obtaining new employment stability independently in the labor market' and the sub-factories include job response, job description, job description, four elements. Job response means job-related interpersonal skills, job processing ability, knowledge sharing, etc. The job description refers to the ability to adapt to changes in job environment. The measure of employability used in this study was used by Kang¹⁴. The overall reliability factor of the employment feasibility scale that was finally configured in this study is Cronbach's $\alpha = 0.946$

Results and Discussion

Sociodemographic characteristics of subjects: The sociodemographic characteristics of subjects are shown in Table 1. According to the survey, 14 percent of male and 86 percent of female students answered that there were more female students, 52.1 percent said religion was Christian, and only 42.1 percent answered that they had no religion.

Table 1: Sociodemographic characteristics of subjects

	Category	N	%
Gender	Male	17	14.0
	Female	104	86.0
Religion	Christians	63	52.1
	Buddhism	2	1.7
	Catholic	5	4.1
	No religion	51	42.1
Entrance type	New school	106	87.6
	Transfer	15	12.4
Type of admission	Non scheduled admission	68	56.2
	Regular admission	38	31.4
Native high school	General high school	96	79.3
	Special purpose high school	2	1.7
	Specialization high school	10	8.3
	Autonomous high school	5	4.1
	Qualification examination	8	6.6
Living environment	Living with one's parents	38	31.4
	Dormitory	47	38.8
	Live apart from one's own family	36	29.8
Family economic status perceived by him or her	High	5	4.1
	Medium	101	83.5
	Low	15	12.4
Study level perceived by him or her	Good	24	19.8
	Medium	70	57.9
	Poor	27	22.3

Mean value on perceptions of colleague education, majorsatisfactionandemployability: The averagescore of the candidate's perceptions of colleague education, major satisfaction and employability is shown in Table 2. The perceptions of colleague education was 50.73 ± 5.82 points, culture and citizenship was 11.48 ± 1.94 points, interpersonal skills was 9.33 ± 1.58 points, self-reliance was 9.64 ± 1.48 points, professional development was 10.45 ± 1.34 points and social recognition was 9.80 ± 1.59 points. The major satisfaction level was 35.87 ± 5.34 points, and employability was 85.10 ± 12.38 points. The job response which was sub-region of employability was 40.18 ± 6.02 points, job skills was 19.90 ± 3.62 points, job information 12.64 ± 2.01 points, and mental health was 12.38 ± 2.63 points.

Table 2: Mean value on perceptions of colleague education, major satisfaction and employability

	M	SD	Minimum	Maximum
Perceptions of colleague education	50.73	5.82	39	72
Culture and citizenship	11.48	1.94	6	17
Interpersonal skills	9.33	1.58	6	14
Self-reliance	9.64	1.48	7	15
Professional development	10.45	1.34	7	15
Social recognition	9.80	1.59	6	12
Major satisfaction	35.87	5.34	21	45
Employability	85.10	12.38	53	120
Job response	40.18	6.02	27	54
Job skills	19.90	3.62	9	30
Job information	12.64	2.01	9	18
Mental health	12.38	2.63	6	18

Differences in perceptions of colleague education according to sociodemographic characteristics: The results of differences in perceptions of colleague education according to sociodemographic characteristics are shown in Table 3. The perceptions of colleague education are found to have no difference depending on gender, religion, entrance type, admission type, high school background, living environment, home economics, and study level.

Table 3: Differences in perceptions of colleague according to sociodemographic characteristics

	Category	M	SD	t/F	p
Gender	Male	50.52	5.86	-.157	.876
	Female	50.76	5.84		
Religion	Christians	51.41	6.57	.595	.620
	Buddhism	50.50	.70		
	Catholic	50.20	1.78		
	No religion	49.96	5.11		
Entrance type	New school	50.66	5.68	-.376	.707
	Transfer	51.26	6.89		
Type of admission	Non scheduled admission	51.22	6.03	1.362	.176
	Regular admission	49.65	4.91		
Native high school	General high school	50.55	5.37	1.239	.298
	Special purpose high school	54.00	12.72		
	Specialization high school	53.40	7.01		
	Autonomous high school	47.00	2.34		
	Qualification examination	51.12	8.65		
Living environment	Living with one's parents	50.57	5.78	.182	.834
	Dormitory	51.12	6.22		
	Live apart from one's own family	50.38	5.42		
Family economic status perceived by him or her	High	49.60	3.20	.101	.904
	Medium	50.80	5.92		
	Low	50.66	6.00		
Study level perceived by him or her	Good	51.58	6.76	.331	.719
	Medium	50.45	5.35		
	Poor	50.70	6.23		

Differences in major satisfaction according to sociodemographic characteristics: Table 4 shows the results of comparing major satisfaction levels according to demographic characteristics. There were no differences in gender, admission type, school of origin, living environment, home economics of one's own and study level, and there were differences in degree satisfaction level depending on religion and entrance type. In religion, Christian students were more satisfied with their majors than their unschooled counterparts, and in their admission patterns, they were more satisfied with their majors than their new students.

Table 4: Differences in major satisfaction according to sociodemographic characteristics

	Category	M	SD	t/F	p
Gender	Male	36.52	5.20	.542	.589
	Female	35.76	5.38		
Religion	Christians	37.25	4.85	3.160	.027 (a>d)
	Buddhism	34.50	2.12		
	Catholic	33.20	7.39		
	No religion	34.49	5.45		
Entrance type	New school	35.50	5.29	-2.085	0.39
	Transfer	38.53	5.12		
Type of admission	Non scheduled admission	36.25	5.19	1.978	.051
	Regular admission	34.15	5.27		
Native high school	General high school	36.05	5.04	.512	.727
	Special purpose high school	33.50	16.26		
	Specialization high school	36.70	4.29		
	Autonomous high school	35.20	5.40		
	Qualification examination	33.75	7.59		
Living environment	Living with one's parents	36.68	4.47	1.019	.364
	Dormitory	35.95	5.20		
	Live apart from one's own family	34.91	6.29		
Family economic status perceived by him or her	High	33.20	3.63	.733	.483
	Medium	36.06	5.48		
	Low	35.46	4.80		
Study level perceived by him or her	Good	37.54	5.41	1.491	.229
	Medium	35.38	5.38		
	Poor	35.66	5.08		

Differences in employ ability according to sociodemographic characteristics: The results of comparing employment possibilities according to demographic characteristics are shown in Table 5. According to the survey, gender, religion, admission type, high school of origin, living environment, family economic strength of one's own, and study level, the possibility of employment of new students is higher.

Table 5: Differences in employ ability according to sociodemographic characteristics

	Category	M	SD	t/F	p
Gender	Male	88.11	11.61	1.082	.282
	Female	84.61	12.49		
Religion	Christians	87.58	12.70	2.616	.054
	Buddhism	81.50	3.53		
	Catholic	90.40	5.85		
	No religion	81.66	11.90		

Conted...'

Entrance type	New school	84.22	11.89	-2.110	.037
	Transfer	91.33	14.35		
Type of admission	Non scheduled admission	84.30	12.43	.095	.925
	Regular admission	84.07	11.01		
Native high school	General high school	85.36	11.48	.301	.877
	Special purpose high school	89.00	38.18		
	Specialization high school	85.30	13.84		
	Autonomous high school	85.20	9.57		
	Qualification examination	80.75	17.46		
Living environment	Living with one's parents	85.36	12.17	.399	.672
	Dormitory	83.93	11.37		
	Live apart from one's own family	86.36	13.99		
Familyeconomic status perceived by him or her	High	82.20	17.29	.149	.862
	Medium	85.17	11.92		
	Low	85.60	14.48		
Study level perceived by him or her	Good	87.58	10.90	.596	.552
	Medium	84.44	11.77		
	Poor	84.62	15.10		

Relation between perceptions of colleague education, major satisfaction and employability: Table 6 shows the correlation between perceptions of colleague education, degree satisfaction, and employability. It was found that there was a significant positive correlation between major satisfaction and employability, perceptions of colleague education and employability, and the major satisfaction and perceptions of colleague education.

Table 6: Relation between perceptions of colleague education, major satisfaction and employability

	Perceptions of colleague education	Major satisfaction	Employability
Perceptions of colleague education	1		
Major satisfaction	.394**	1	
Employability	.478**	.540**	1

*p<0.05, **p<0.01

Conclusion

There was a difference in the degree of satisfaction with a major depending on the type of admission, but the degree of satisfaction was higher than that of new students. This is due to the fact that the student who was studying other subjects came back to the subject he wanted. In religious differences, Christianity was higher than an unsociable student because the academic characteristics of nursing make it clear that the basic qualities and personalities of nurses should be based on their attitude of serving and love for humans.

The possibility of employment was shown to vary depending on the type of admission, and the student who transferred was higher than the new student. The transfer

students experienced their worries about the job ahead of their freshmen counterparts, including part-time jobs and job experience, and they prepared more with desire for employment, which makes them more adaptable and more flexible to think about themselves.

There is a significant correlation between the university education center, the satisfaction with a major and the possibility of employment. In the lower variables of the university's education centers, there was a correlation between the degree satisfaction level and the social recognition level, in order to develop aptitude and qualities and to develop professional skills, subjectivity, interpersonal skills, and civic awareness. The purpose of studying is to find out that many students study their majors with professional skills in mind related to the job

of hope and that the purpose of university selection is to find a job. Also, putting interpersonal skills, culture and citizenship for educational purposes should not be forgotten as a core value of college education to ensure that it is well-rounded and mature adult who performs well and does their part as a reserve society. Among the possibilities of employment, the company displayed correlation with the degree satisfaction level in the order of job response, job information, mental health, and job skills. In other words, job-related response strategies and a lot of information provision or customized guidance from students for employment in a major department could have a significant impact on their satisfaction. Employment possibilities showed correlation among university education centers by grade of professional development, interpersonal skills, self-reliant skills, culture and citizenship, which students want to develop in order to develop knowledge and skills. In addition, it should be included in the curriculum as it can be seen that a major education on interpersonal skills, which is required for social adaptation, is necessary. College education centers have shown a correlation among job feasibility by job responsiveness, mental health, job information, and job skills. Therefore, universities should play a pivotal role in establishing new institutions for the fourth industrial revolution in preparation for what education a consumer wants, and therefore which education he or she wants, at the time of transition to consumer-oriented education.

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Factors Affecting on Career Attitude Maturity in Korean Nursing Students

Kyung-Sook Kim

Dept.of Nursing, Namseoul University, 91 Daehakro, Seonghwan-eup, Seobuk-gu, Cheonan-city, Chungnam, 31020, South Korea

ABSTRACT

Background/Objectives: The purpose of this study was to determine the factors related to career attitude maturity in Korean nursing students.

Method/Statistical Analysis: A purposive sample of 135 students from N university was recruited for the cross-sectional survey design. The structured questionnaires were used for major satisfaction, intrinsic/extrinsic work value, career attitude maturity and job barrier which was reported reliability in domestic studies. Data were analyzed using descriptive statistics, Pearson's correlation and stepwise multiple regression.

Findings: The mean scores of major satisfaction, intrinsic/extrinsic work value, career attitude maturity, and barrier were 3.86, 4.05/4.06, 3.43 and 2.08, respectively. Career attitude maturity was significantly positively related to intrinsic work value ($r = .258, p < .05$), major satisfaction ($r = .177, p < .05$) and also, negatively related to career barrier ($r = .43, p < .001$). Intrinsic work value ($\beta = 0.284, p = .004$), extrinsic work value ($\beta = -0.194, p = .043$), and career barriers ($\beta = -0.535, p < .001$) had significant effects on career attitude maturity ($F = 13.006, p < .001$). Adjusted explained variance for the career attitude maturity was 36.4%.

Improvements/Applications: Based on the findings of this study, career development programs are recommended to improve career attitude maturity in nursing students.

Keywords: Career attitude maturity, Intrinsic work value, Extrinsic work value, Major satisfaction, Job barriers

Introduction

As for the turnover rate of domestic nurses, turnover rate of general nurses in 2015 is 94.7% of total nurses' turnover, which is the turnover rate of general nurses rather than managers^[1]. In particular, the turnover of new nurses increased from 29% in 2013 to 33.5% in 2014, and annual rate of new nurses' resignation exceeded 50% of general nurses resignation, resulting in a very serious situation in terms of personnel management and patient care quality^[1]. The point of view about the turnover and maladjustment problems of new nurses should be linked with the university curriculum.

The college period is an important time for career decision, and it is an important time to decide career that meets his aptitude and interest through career development and to realize self-realization. However, Korean college students tend to enter college according to their school grades and career prospects after graduation, rather than choosing a department based on their aptitudes and interests, their values of life goals, and their values^[2]. In the case of nursing students, unlike other majors, the direction of a career has already been determined at the same time as going to college. It is easy to choose a career without a deep concern and evaluation about the course of their choice with a relatively high employment rate.^[3-4]

Corresponding Author:

Kyung-Sook Kim,
Professor, Department of Nursing,
Namseoul University, Korea
Email: kgs4321@nsu.ac.kr

Students who choose nursing careers without careful consideration of career choice have an experience directly or indirectly to the role that nurses perform during clinical practice. This leads to a lot of stress on patients' nursing care, overload of work, and mood of the nursing organization, and they are worried again

about their aptitude^[3, 5]. In the previous study, students with high satisfaction in clinical practice showed high degree of satisfaction and career identity. In other words, students who are less satisfied with clinical practice are less satisfied with their majors and become nurses without clear conviction about their job as a nurse. This will have a negative impact on future nursing experience^[6]. And also, the stress on academic tasks and future careers of nursing students eventually lead to a loss of interest in the major and a deterioration of career decision-making efficacy^[7].

Career attitudes are attitudes toward one's career in the process of preparing for work, and career attitude maturity is the degree of development of a planned, independent and firm attitude toward choosing and determining career paths.^[8] According to Super, career attitude maturity is the level of career development, which is the degree of attitude-cognitive preparation to cope with the process of identifying, preparing, working, and retiring from work^[9].

In the prior studies, career attitude maturity was associated with career-related variables such as sex, age, social-economic level, education, job barriers, job stress, self concept^[8,10-13]. Therefore, in order to have a successful career in a clinic or related field, students should be able to select their own career path after their search for various career paths^[14].

One of the problems of Korean nursing staff is that the number of cases in which new nurses consider the clinical practice as a burden or do not adapt to the organizational culture increases their early retirement. Considering this, it is necessary to develop desirable work values through nursing education^[15]. Also, it is necessary to improve the career attitude maturity of nursing students because they have low job satisfaction and high turnover intention when doing nursing work as a new nurse unless student has a clear career identity^[16].

This study aims to identify nursing students' major satisfaction, work value, job barriers and the factors affecting career attitude maturity. In this study, to determine the factors affecting the career attitude maturity of nursing students, we checked the influence of intrinsic work value, extrinsic value, career barriers and career attitude maturity as the main variables, based on the study, this study would be able to provide a basis for preparing a program to develop attitude maturity of nursing students.

Materials and Method

Samples: The subjects of this study were students of the N university which is located in Chungnam province. The survey was conducted in September 2016, and the questionnaires available for data analysis were collected from 135 students in the nursing department.

Measurements

Career Attitude Maturity: In order to measure the degree of career maturity, we used CAMI (Career Attitude Maturity Inventory) by Lee & Han^[17]. In total 47, negative items were reversed. The higher the score means the higher the maturity level of career attitude. Cronbach's alpha for career attitude maturity in Lee and Han^[17] was .78, this paper was .84.

Work Value: The occupational values were measured by intrinsic values and external values. In Johnson 's study^[18], 24 items of job value were presented. In this study, we used 16 items which were modified according to the characteristics of Koreans in Byun's study^[19]. The intrinsic value is the value for personal development that can be gained from the job itself. It is fun and interesting, demonstrating ability and skill, demonstrating creativity, challenging and adventurous, guaranteeing autonomy, feeling of accomplishment, and recognizing opportunity for self-development. External value is the value that can be gained from outside the job, such as high income and respect, status and reputation, employment security, pleasant work environment, power, guaranteed leisure time, regular working hours, and free time use. All items were rated 5-point scales (1 = 'not important at all', 5 = 'very important need').

Career Barriers: Career barrier instrument was used 22 items which developed by An^[20]. The instrument was composed of six sub-concepts such as lack of job information, external barrier, lack of self-clarity, lack of awareness of need, discrimination, indecisiveness. Career barriers has a 5-point scale (1 = not at all to 5 = very agree). The higher the score, the higher the career barrier. Cronbach's alpha for career barriers in An's study was .89, in the present study, it was .85.

Major Satisfaction: Major satisfaction was measured by 25 items used in the An's study^[20]. A total of 25 questions were composed of 5 points Likert items (1 = not at all, 2 = slightly dissatisfied to 5= very satisfied). Cronbach's alpha for career barriers in An's study was .95, the present study was .85.

Data Analyses and Ethical Consideration: All data were statistically analyzed using SPSS 23.0 (PASW, Chicago, IL, USA). Frequencies and percentages were calculated for the students' general characteristics; means and standard deviations were estimated and t-tests and ANOVAs were used to determine variations in career attitude maturity by general characteristics. Pearson product-moment correlation coefficient assessed the correlation among variables. Finally, stepwise multiple regression analysis identified the factors affecting career decision efficacy.

To begin the study an informed consent was obtained from the students. The research instruments were completed by the participants and were eventually collected. All students completed the informed consent form and agreed to participate prior to administering the study. Participants also received information on this study including research aims, potential risks, and benefits of this study and the questionnaires collection procedures

Limitation: This study was constricted by convenience sampling, which limited generalization to a broad population.

Results

Participants Characteristics: The sample data consisted of 135 students. 21 males (16.3 %), and 113 females (83.7%). The mean age of the subjects was 20.7 years and theirs ages ranged from 18 to 32 years. Of the 135 students, 40 students (29.6%) were freshmen; 45 (33.3%) were sophomores, 21 (15.6%) were juniors and 28 (20.7%) were seniors. There were 40 students (29.6%) with a certificate related to the major and 92 students (68.1) without certification. 71 students (52.6%) did not participate in club activities, and 62 students (45.9%) did club activities. There was no statistical difference in career attitude maturity according to general characteristics.

Table 1: General Characteristics and Comparison of Career Attitude Maturity by General Characteristics (N = 135)

Variables	Categories	n	%	Mean	SD	t/F(p)
Age (yr)	Mean(SD)/Range	20.7(1.57) /18-32				
Gender	Male	21	16.3	3.45	.37	1.032(.304)
	Female	113	83.7	3.36	.35	
Grade	1st	40	29.6	3.42	.33	.853(.468)
	2nd	45	33.3	3.39	.41	
	3rd	21	15.6	3.55	.29	
	4th	28	20.7	3.48	.40	
Major related certificate	Don't have	92	68.1	3.42	.31	-.692(.491)
	Have	40	29.6	3.47	.47	
Club activity	Don't participate in	71	52.6	3.42	.32	.606(.546)
	participate	62	45.9	3.46	.41	

Descriptive Statistics and Correlations for Variables: Descriptive statistics for main variables are shown in Table 2. The mean scores of career attitude maturity, intrinsic/extrinsic work value, major satisfaction and career barriers were 3.43 ± 0.37 (ranging 1-5), $4.05 \pm 0.51/4.06 \pm 0.58$ (ranging 1-5), 3.86 ± 0.60 (ranging 1-5), and 2.08 ± 0.69 point (ranging 1-5), respectively. Correlations for main variables is shown in Table 3. Career attitude maturity was significantly positively related to major satisfaction ($r = .177$, $p < .05$), intrinsic work value ($r = .258$, $p < .05$), and negatively related to career barriers ($r = -.586$, $p < .001$).

Table 2: Descriptive Statistics for Variables (N = 135)

Variables	Mean $\pm$ SD	Min	Max.	Range
Career attitude maturity	$3.43 \pm .37$	2.55	4.23	1-5
Intrinsic work value	$4.05 \pm .51$	2.56	5	1-5
extrinsic work value	$4.06 \pm .58$	2.13	5	1-5
Major satisfaction	$3.86 \pm .60$	1.53	5	1-5
Career barriers	$2.08 \pm .69$	1	5	1-5

Factors Influencing the Career Attitude Maturity:

Multiple regression analysis was conducted to examine the factors affecting career attitude maturity. Intrinsic work value ($\beta=0.284$, $p=.004$), extrinsic work value ($\beta=-$

.194, $p=.043$), and career barriers ($\beta=-.535$, $p<.001$) were found to be factors significantly associated with career attitude maturity. These variables explained 36.4% of career attitude maturity (see Table 4).

Table 3: Correlations among Variable

	Career attitude maturity	Major satisfaction	Intrinsic work value	Extrinsic work value
Career attitude maturity	1			
Major satisfaction	.177*	1		
Intrinsic work value	.258*	.365**	1	
Extrinsic work value	-.003	.295**	.615**	1
Career barriers	-.586**	-.173	-.132	.003

* $p<.05$, ** $p<.001$

Table 4: Factors Affecting Career Attitude Maturity

Variables	B	SE	Beta (β)	t	p
(constant)	3.590	.289		12.418	.000
Intrinsic work value	.213	.073	.284	2.921	.004
Extrinsic work value	-.124	.060	-.194	-2.045	.043
Career barriers	-.288	.041	-.535	-7.069	.000
F=17.893($p<.001$), $R^2=.386$, Adj $R^2=.364$					

In present research, the level of career attitude maturity was 3.43 point (range 1-5) indicating a moderate level and it was similar to those of Ahn and Kim's study [22] who studied nursing students. However, Kim and Kim [23] presented a career maturity score of 3.13 for a majoring in dance, which was lower than that for the present study. Also, in the prior study, male students had higher career maturity [22], but there was no significant difference in this study. This implies that nursing college students have a clear career path as a future nurse and therefore have a higher level of occupational maturity than students of the same age group.

Discussion

The time of studying in college is the period when students develop basic competencies to establish their identity, choose their careers, and grow as capable professionals. This research was attempted to find out the factors that impact on career attitude maturity among nursing students.

When graduating from a nursing department in Korea, most of the students are employed in hospitals, and the curriculum of the university is operated as a clinical center. Currently, Korean nurses have high employment rates in general hospitals or university hospitals, but small hospitals are suffering from labor shortages because they can not find nurses. As a result, nursing students have been choosing jobs without worrying about their careers. This may lead to a positive perception for job after employment, but it may lead to a decrease in the career decision self-efficacy of nursing students [21].

Furthermore, in multiple regression, the results showed that predictors of career attitude maturity in nursing students were intrinsic work value ($\beta=0.284$, $p=.004$), extrinsic work value ($\beta=-0.194$, $p=.043$), and career barriers ($\beta=-0.535$, $p<.001$) and explanatory power of the model was 36.4%. These results show the importance of intrinsic work value as a facilitating factor for career attitude maturity. In order to increase career maturity, it is necessary to eliminate factors related to career barriers. In this study, intrinsic work value was the strongest influential factor, but as the extrinsic work value increased, career maturity decreased. Major satisfaction was positively correlated with career attitude maturity, but it was not influential factor. Besides, it was found that extrinsic work value is an influential factor and that the increase of external value is inversely proportional to career attitude maturity. Therefore, nursing students' career attitude maturity shows that intrinsic work value is more important than extrinsic value and major satisfaction.

By the prior report, family conflicts had a indirect impact through self-esteem and depression on career attitude maturity [12], and in addition, self-esteem and depression had a direct impact on career attitude maturity [12] and more over, the higher the self-esteem, the more confidence in the choice of major, and the more critical thinking, the more career attitude maturity increased [24]. This is similar to our study because mental factors such as self-esteem, depression and confidence of major are in a context similar to intrinsic values. This implies that intrinsic value should be emphasized more for improvement of career attitude maturity. The intrinsic value is the value for individual development that caused from the work itself and extrinsic work value is derived from outside factors of work. Additionally, the current study suggests that nursing students' career attitude maturity could be increased through the strengthening of intrinsic work value and eliminating career barriers. In conclusion, low self-esteem, regret of choice of major, and family conflicts are considered to be obstacles to career development. Therefore, it is necessary to identify the barriers to career paths in career counseling, efforts should be made to resolve this issue. In other words, by making efforts to improve career decision efficacy and career attitude maturity, it will increase the satisfaction and adaptation of job as a clinical nurse after graduation from nursing college. In the follow - up research, it is necessary to study what kind of career barriers factors are.

Conclusion

This study was attempted to identify the factors that affect the career attitude maturity of nursing students. The present survey was carried out on September, 2016. The subjects of this study were the students in N university. The answer sheets from 145 respondents were gathered, and the answer sheets from 135 respondents were analyzed except for 10 incomplete ones. The main results of this study are as follows. The mean scores of career attitude maturity, intrinsic/extrinsic work value, major satisfaction and career barriers were 3.43 ± 0.37 (ranging 1-5), $4.05 \pm 0.51/4.06 \pm 0.58$ (ranging 1-5), 3.86 ± 0.60 (ranging 1-5), and 2.08 ± 0.69 point (ranging 1-5), respectively. Career attitude maturity was significantly positively related to major satisfaction ($r = .177$, $p < .05$), intrinsic work value ($r = .258$, $p < .05$), and negatively related to career barriers ($r = -.586$, $p < .001$). Intrinsic work value ($\beta = 0.284$, $p = .004$), extrinsic work value ($\beta = -.194$, $p = .043$), and career barriers ($\beta = -.535$,

$p < .001$) were found to be factors significantly associated with career attitude maturity. These variables explained 36.4% of career attitude maturity. The current study suggests that nursing students' career attitude maturity could be increased through the strengthening of intrinsic work value and eliminating career barriers. In the follow - up research, it is necessary to determine and to study career obstacle factors.

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A Study on the Dying Well Education Expert Training Course For Professional Instructors

Moon-Sook Shim¹, Moo-Sik Lee², ChongHyung Lee³, HyoNam Lim¹, Seo-Hui Lee⁴, Kwang-Hwan Kim³

¹College of Nursing, ²College of Medicine, ³Dept. of Hospital Management, ⁴Dept. of Public Health, The Graduate School of Public Health & Welfare, Konyang University, 158, Gwanjeodong-ro, Seo-gu, Daejeon, 35365, Korea

ABSTRACT

Background/Objectives: This study was conducted in order to determine the validity of developing a license system for qualified dying well education training experts by identifying the need of the dying well education and license system.

Method/Statistical Analysis: A survey was conducted from April 20 to May 20, 2018 for 54 professional lecturers who completed the education course for training dying well instructors, and the statistical program R was used for the analysis. All items in the questionnaire except the general characteristics of subjects were composed of 4-point Likert scale (“Very unnecessary” was 1 point, “unnecessary” was 2 points, “necessary” was 3 points, and “Very necessary” was 4 points.).

Findings: According to the result of measuring the need for dying well education expert license education contents, the average score for each subject was found to be as follows: Thanatology 3.40 points(± 0.63), care for terminally ill patients (hospice) 3.56 points(± 0.56), communication 3.38 points(± 0.59).

Improvements/Applications: In the future, it is necessary to provide systematic and integrated death education through the training of qualified education experts and the composition of subjects according to the necessities of the curriculum of the professional dying well education.

Keywords: *Dying well, Dying well Education, Expert Training Course, professional instructors, the training of experts*

Introduction

As interest in terminal cancer patients has increased in Korea in recent years, the use of hospice and palliative care has been emphasized and the need for health insurance coverage has led to debate about hospice palliative care services. As the dying well law (Act on Life-Sustaining Treatment Determination) was enacted as a result of the enforcement of Act on Life-Sustaining Treatment Determination with the purpose of allowing the patient himself/herself subject to terminal hospice

to choose dignified death, the need for professional education for dying well has increased ^[1,2]. However, it can be said that there are only a few professional education courses, professional educators, and specialized facilities to conduct education at a national level for well-being and dying well for all citizens who can choose dignified death for patients and their families. In the current situation where the operator’s expertise is not secured such as educational workforce as well as dying well educational institutions, it is difficult to meet the increasing social demand related to dying well ^[3,4], so there is a need for dying well education that can change the perception and attitude toward death through the understanding of death ^[5,6], and professional dying well education should be preceded in order to consider the quality of death and to improve the perception of death ^[7,8]. In addition, there is a high demand for the training of professional death education experts in order to secure the professionalism

Corresponding Author:

Kwang-Hwan Kim
Professor,
Dept. of Hospital Management,
Konyang University, Korea
Email: kkh@konyang.ac.kr

of dying well education, and there should be a license system to verify this. However, current death preparation education focuses on death lecture and how to overcome the bereavement by death education lecturers [9,10]. Therefore, it is urgent to educate those who are about to die by experts educated by the development of correct understanding and acceptance of death, psych therapeutic, more specialized and diverse programs. Thus, this study is to secure the validity of the development of the license system for the training of talented people with basic knowledge of dying well, humanistic, sociological and healthcare knowledge of death.

If dying well education is achieved through the training of experts with the qualification for dying well education by identifying the need for dying well education and license system, this study not only can change the perception and attitude of death but it is also an opportunity to prepare the death well and to determine the quality of life.

Method

Subject: The organization which has been conducting dying well related education courses for training dying well instructors for a month from April 20, 2018 sent e-mails, and a survey was conducted only for those who want to participate in the research for professional dying well lecturers aged 19 or older who have completed the dying well education course in dying well related organizations. A total of 54 people responded to the questionnaire, and they were selected as subjects.

Method: The study was approved by the Institutional Review Board (IRB No. KYU-2018-008-02) of Konyang University. The questionnaire consists of the following: The general characteristics were 3 items of sex, age, and education. For the need for each subject of dying well education expert license educational contents of the subjects, 9 items of thanatology, 19 items of care for terminal patients (hospice), 16 items of communication were composed of Likert 4-point scale (“Very unnecessary” was 1 point, “unnecessary” was 2 points, “necessary” was 3 points, and “Very necessary” was 4 points.).

Analysis Method: The statistical program R was used for the analysis. For the item of questionnaire, the frequency analysis of the general characteristics was carried out. Based on age, an independent sample t-test was performed for the need for each subject of dying well education expert license educational contents of the subjects (thanatology, care for terminal patients (hospice), communication).

Results

General Characteristics of Subjects: Table 1 shows the general characteristics of the subjects. The total number of subjects was 54, and men (55.6%) accounted for more than women (44.4%). In age, “50~59 years old” (55.6%) accounted for more than “60 or older” (44.4%). In the level of education, grad school graduates were the most common (68.5%), followed by university graduates (24.1%), college graduates (5.6%) and high school graduates (1.9%).

Table 1: General Characteristics of Subjects

Category	N	(%)	Category	N	(%)
Sex			Level of Education		
Men	30	(55.6)	High school graduate	1	(1.9)
Women	24	(44.4)	College graduate	3	(5.6)
Age			University graduate	13	(24.1)
50~59 years old	30	(55.6)	Grad school graduate	37	(68.5)
60 or older	24	(44.4)			
Total	54	(100.0)	Total	54	(100.0)

The need for each subject of dying well education expert license educational contents of subjects (thanatology): Table 2 shows the results of measuring the need for each subject of dying well education expert license educational contents of the subjects (thanatology). The total average of

the need for each subject in thanatology was found to be 3.40 points. In death education, the need for death education was found to be the highest, 3.65 points, followed by 3.50 points for the purpose of death education, 3.49 points for the main content and reality of death education and 3.43 points

for death education according to the subject. Those aged 59 or younger answered that the purpose of death education is necessary following the need for death education, while those aged 60 or older answered that the main contents and reality are needed following the need for death education. According to the understanding of death, the definition of

death was found to be the highest, 3.51 points, followed by 3.46 points for psychological understanding of death, 3.36 points for social understanding of death, and 3.18 points for philosophical understanding of death and death and human civilization was found to be the lowest, 3.04 points.

Table 2: The need for dying well education expert license educational content details of subjects (thanatology)
Unit: Mean $\pm$ S.D

Category	59 or younger (N = 30)		60 or older (N = 24)		Total (N = 54)		p-value
Death Education							
Purpose of death education	3.50	± 0.57	3.50	± 0.59	3.50	± 0.58	1.000
Need for death education	3.63	± 0.56	3.67	± 0.48	3.65	± 0.52	0.817
Main contents and reality of death education	3.40	± 0.77	3.58	± 0.50	3.49	± 0.64	0.319
death education according to the subject	3.40	± 0.62	3.46	± 0.59	3.43	± 0.60	0.727
Understanding of Death							
Definition of death	3.43	± 0.63	3.58	± 0.50	3.51	± 0.56	0.345
Death and human civilization	3.17	± 0.70	2.92	± 0.78	3.04	± 0.74	0.219
Philosophical understanding of death	3.20	± 0.66	3.17	± 0.87	3.18	± 0.77	0.874
Psychological understanding of death	3.47	± 0.63	3.46	± 0.59	3.46	± 0.61	0.960
Social understanding of death	3.43	± 0.73	3.29	± 0.55	3.36	± 0.64	0.433
Total	3.40	± 0.65	3.40	± 0.61	3.40	± 0.63	
1point = lowest, 4 point=highest							

The need for each subject of dying well education expert license educational contents of subjects (care for terminal patients (hospice)): Table 3 shows the need for each subject of dying well education expert license educational contents of the subjects (care for terminal patients (hospice)). The total average of the need for each subject is 3.56 points in care for terminal patients (hospice). In physical symptoms and care, difficulty breathing (shortness of breath) was the lowest, 3.52 points, followed by delirium (3.50 points), bedsores care (3.48 points), nutrition management (3.38 points). In spiritual care, “human as a spiritual being” was found to be the highest, 3.70 and the detail which showed the lowest score was “Holistic human” (3.60 points). In age, “Holistic human” was the lowest in 59 or younger, while the score of human as a spiritual being was the lowest in 60 or older. In the part of spending

remaining time together, “Traveling with family” and “The effect of time with family on mental state of patient” showed similar scores, 3.65 points and 3.66 points, respectively. Of 7 contents on understanding of symptoms and psychology of terminally ill patients, both understanding of hospice palliative care and understanding of patient psychology were the highest, 3.65 points, and “Symptoms at the moment of death of patients”, “Types of hospice palliative care”, “Criteria and scope for selecting subjects of hospice palliative care”, “Contents of hospice palliative care” and “Status of hospice palliative care use” were found to be 3.61 points, 3.55 points, 3.50 points, 3.49 points and 3.47 points, respectively. In social care for terminal patients, the score of “Care service for patients with terminal cancer” (3.57 points) was higher than that of “In-ward therapy program” (3.40 points).

Table 3: The need for dying well education expert license educational content details of subjects (care for terminal patients (hospice))**Unit : Mean $\pm$ S.D**

Category	59 or younger (N = 30)		60 or older (N = 24)		Total (N = 54)		p-value
Physical Symptoms and Care							
Difficulty breathing (shortness of breath)	3.53	± 0.57	3.50	± 0.66	3.52	± 0.62	0.843
Delirium	3.50	± 0.57	3.50	± 0.66	3.50	± 0.62	1.000
Bedsore care	3.53	± 0.63	3.42	± 0.72	3.48	± 0.67	0.527
Nutrition management	3.50	± 0.63	3.25	± 0.85	3.38	± 0.74	0.235
Spiritual Care							
Holistic human	3.73	± 0.45	3.50	± 0.59	3.60	± 0.52	0.117
Human as a spiritual being	3.77	± 0.43	3.46	± 0.59	3.70	± 0.46	0.038*
Spiritual suffering of terminal patients	3.77	± 0.43	3.63	± 0.49	3.68	± 0.47	0.274
Spiritual care	3.77	± 0.43	3.58	± 0.50	3.65	± 0.47	0.163
Spending remaining time together							
Traveling with family	3.67	± 0.48	3.54	± 0.51	3.65	± 0.49	0.359
The effect of time with family on mental state of patient	3.73	± 0.45	3.63	± 0.49	3.66	± 0.48	0.404
Understanding of symptoms and psychology of terminally ill patients							
Understanding of patient psychology	3.80	± 0.41	3.63	± 0.49	3.65	± 0.50	0.170
Symptoms at the moment of death of patients	3.77	± 0.43	3.58	± 0.50	3.61	± 0.51	0.163
Understanding of hospice palliative care	3.77	± 0.43	3.67	± 0.56	3.65	± 0.51	0.463
Criteria and scope for selecting subjects of hospice palliative care	3.63	± 0.49	3.50	± 0.59	3.50	± 0.53	0.368
Types of hospice palliative care	3.63	± 0.49	3.46	± 0.59	3.55	± 0.57	0.238
Contents of hospice palliative care	3.73	± 0.45	3.54	± 0.59	3.49	± 0.56	0.195
Status of hospice palliative care use	3.43	± 0.73	3.38	± 0.58	3.47	± 0.66	0.750
Social care for terminal patients							
Care service for patients with terminal cancer	3.57	± 0.63	3.46	± 0.66	3.57	± 0.63	0.539
In-ward therapy program	3.40	± 0.67	3.25	± 0.68	3.40	± 0.67	0.421
Total	3.64	± 0.52	3.50	± 0.59	3.56	± 0.56	
*p<0.05, 1point = lowest, 4 point=highest							

The need for each subject of dying well education expert license educational contents of subjects (communication): Table 4 shows the need for each subject of the dying well education expert license educational contents of the subjects (communication). In the communication course, the total average of the need was found to be 3.38 points. In the understanding of communication, nonverbal communication, verbal communication, significance of communication and process of communication were found to be 3.45 points, 3.35 points, 3.28 points and 3.25 points, respectively and a similar pattern was shown even when examined

by age. In listening, importance of listening and effort for listening were the highest, 3.45 points and method of listening is 3.43 points and significance of listening showed the lowest score, 3.39 points. In the effective death communication method, "Effect of hospice palliative care communication" showed the highest score, 3.51 points, followed by reaction in death communication (3.48 points), ineffective death communication (3.45 points), telling bad news (3.19 points). By age, "Effect of hospice palliative care communication" showed the highest score in 59 or younger, while "Reaction in death communication" showed the highest score in 60 or older.

In the contents of identifying family relationships and patient background, telling your death, telling the death of others, identifying the patient's family relationship and identifying the background of dying patients were found to be 3.48 points, 3.32 points, 3.31 points and 3.25 points, respectively, and it can be seen that it is necessary to inform death.

Table 4: The need for dying well education expert license educational content details of subjects (communication)
Unit : Mean $\pm$ S.D

Category	59 or younger (N = 30)		60 or older (N = 24)		Total (N = 54)		p-value
Understanding of communication							
Significance of communication	3.27	± 0.52	3.29	± 0.69	3.28	± 0.61	0.880
Process of communication	3.17	± 0.53	3.33	± 0.64	3.25	± 0.58	0.299
Verbal communication	3.20	± 0.55	3.50	± 0.51	3.35	± 0.53	0.045*
Nonverbal communication	3.37	± 0.61	3.54	± 0.51	3.45	± 0.56	0.268
Listening							
Significance of listening	3.40	± 0.56	3.38	± 0.49	3.39	± 0.53	0.865
Method of listening	3.40	± 0.56	3.46	± 0.51	3.43	± 0.54	0.695
Importance of listening	3.37	± 0.56	3.54	± 0.51	3.45	± 0.53	0.238
Effort for listening	3.37	± 0.56	3.54	± 0.51	3.45	± 0.53	0.238
Effective death communication method							
Reaction in death communication	3.47	± 0.57	3.50	± 0.51	3.48	± 0.54	0.824
Ineffective death communication	3.43	± 0.63	3.46	± 0.59	3.45	± 0.61	0.882
Effect of hospice palliative care communication	3.57	± 0.57	3.46	± 0.59	3.51	± 0.58	0.496
Telling bad news	3.30	± 0.70	3.08	± 0.88	3.19	± 0.79	0.319
Identifying family relationships and patient background							
Identifying the patient's family relationship	3.33	± 0.61	3.29	± 0.62	3.31	± 0.62	0.805
Identifying the background of dying patients	3.30	± 0.60	3.21	± 0.59	3.25	± 0.59	0.575
Telling your death	3.53	± 0.57	3.42	± 0.58	3.48	± 0.58	0.463
Telling the death of others	3.47	± 0.63	3.17	± 0.70	3.32	± 0.67	0.104
Total	3.37	± 0.58	3.39	± 0.59	3.38	± 0.59	
*p<0.05, 1point = lowest, 4 point=highest							

Discussion and Conclusion

This study was attempted to secure the validity of the license system for the training of dying well education experts so that dying well education can be rooted as socially acceptable education. According to the results of the study, in the need for each subject of the dying well education expert license educational contents, care for terminal patients (hospice) was found to be the highest, and communication was found to be the lowest. The need for each subject of thanatology was the second highest following care for terminal patients (hospice), followed by communication. It can be interpreted that the need for education for care for terminal patients (hospice) was the highest because the recent increase in

cancer patients and the enforcement of the Act on Life-Sustaining Treatment Determination led to the need for education of care for terminal patients.

Through the education of thanatology, we can increase the philosophical, psychological and social understanding of death, know the true meaning of death education, and identify the characteristics of death education according to the subject. Especially in death education, the need for death education was found to be the highest, followed by purpose of death education, main contents and reality of death education, death education according to the subject, which showed a difference depending on age. For those aged 59 or younger, the purpose and need for death education

are important, while those aged 60 or older said that death education and main contents and reality of death education are necessary. According to the understanding of death, the meaning of death was found to be the highest, which is believed that it will be the basis of the high demand for the professional dying well education which can change the attitude and perception of death. It is considered that it is necessary to construct a curriculum considering the need for each subject in the composition of educational contents in the future and to reflect the weight in the qualification examination to acquire a license. In addition, the qualification test should be carried out with the content that can verify the professional dying well educational contents, which is believed that it can support the adequacy and accuracy of the qualification examination. However, the most important thing is that professional education for dying well education should be preceded in order to increase the acceptance of death and the quality of death and to bring about a change in perception of death, and can be said that professional education institutions and professional education personnel are needed to support this. Based on this support, systematic and integrated death education should be carried out and the role of the dying well education experts is important in order to secure a central point that plays a leading role in making all the people accessible. In this way, if responsible dying well education is provided by professional staff, the training of dying well education experts is expected to secure sufficient validity as a national license system. This study was carried out in order to identify the need for dying well education and license system. If dying well education is achieved through the training of education experts with the qualification for dying well education, it not only can change the perception and attitude of death but it is also an opportunity to prepare the death well and to determine the quality of life through professional dying well integrated training.

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The Effect the Training Program on Dementia Has on the Knowledge and Attitude of Nursing College Students towards Dementia and Attitude towards the Caring of the Elderly

Eun-Hee Shin¹, Hyea-Kyung Lee²

¹Department of Nursing, Munkyeong College, 161 Daehaggil, Hoggemyeon, Munkyeong-si, Gyeongbuk, Korea;

²Jungwon University of Nursing,, 85 Munmuro, Goesan-eup, Goesan-gun, Chungcheongbuk-do, Korea

ABSTRACT

Background/Objectives: This study aims to investigate the effects of dementia education program on the knowledge and attitude to the dementia, and caring attitude to the elderly people in the nursing university students.

Method/Statistical Analysis: 122 nursing students in Seniors of Nursing University located in M City were selected as the subjects and 12-hours dementia education program for 5 times were performed in the education group. They were analyzed by frequency, percentage, and T-test for independent sample using SPSS/WIN 22.0 program.

Findings: Upon the results, the education group showed higher knowledge on dementia with 13.25 points, but not statistically significant ($p=.621$). With respect to the attitude to dementia, mean score in the education group was 4.01 points which was more positive attitude to the dementia to the elderly with statistically significant difference ($p=.027$). Regarding caring attitude to the elderly, the education group showed 3.78 points as a mean score to be more positive with statistical significance ($p=.003$).

Improvements/Applications: From these results, dementia education program demonstrated the effects to change the attitude to dementia and caring the elderly positively. Therefore, it is required to seek the improvement plans of nursing quality by enhancing the knowledge and understanding on dementia in the nursing students upon development of dementia education program together with theory and practices.

Keywords: Knowledge, Attitude, Elderly, Dementia, Nursing student.

Introduction

Rapid increase of dementia patient due to aging is a global phenomenon. There are over 40 million dementia patients in the world, and it is expected to grow 3 times in next 35 years. Especially, Korea's aging tendency is one of the fastest in the world, and it is expected to reach super-aged society in 2026 as of 2000^[1]. There are 702,436 dementia patients among 7,066,201 elderlies over age 65 as of 2017, and the prevalence rate of dementia is 9.94%^[2].

Dementia is a chronic mental disease that cause loss of memory, thinking ability, orientation, understanding, mathematical ability, learning ability, language and judgement which cause various social problems due to the burden and pain of patients' family^[3]. Thus, the Ministry of Health and Welfare has announced the war against dementia, and has put dementia management act into force on February 2012 aiming to reduce the individual pain, damage and social burden from dementia and contribute to improvement of public health by implementing comprehensive dementia prevention and management policy.

However, the interest, understanding and knowledge about dementia of nurses who should play main role in implementing preventive and management policy of dementia is very insufficient^[4], and even though the

Corresponding Author:

Hyea-kyung Lee

Assistant Professor, Division of Nursing Department
Jungwon University, Korea

Email: lee-hk1214@hanmail.net

negative attitude toward dementia increase burden in nursing^[5], the cultivation of dementia knowledge and attitude of nursing students, the future dementia nursing manpower is insufficient^[6]. Thus, there is a need to improve dementia knowledge and positive dementia attitude of nursing students through nursing curriculum, and to develop various dementia education program and confirmation on its effectiveness^[7].

When examining the influence of education on knowledge and attitude toward dementia, it was confirmed that the level of student's dementia knowledge was correlated to the duration of education^[8], and those who experienced dementia elderly had more positive attitude on dementia patients than those without experience^[9]. Also, it was confirmed that dementia education was a significant step for doctor's dementia treatment and is helpful to patient management^[10]. Thus, there is a need for nursing education to cultivate professional nursing manpower with professional dementia knowledge and positive dementia attitude required for the nursing service.

However, Alshi suggested that there is a limitation in improving dementia knowledge and attitude only with teaching-oriented theoretic education^[11], and there is a need to apply various education program, volunteer work, revision on curriculum to let students obtain dementia knowledge and positive dementia attitude in school^[7, 12, 13, 14].

Previous researches has reported the importance of dementia education and the improved knowledge and attitude after education^[7, 14]. Thus, this study developed a dementia theory education program to cultivate build up dementia knowledge and positive dementia attitude of nursing students and applied the program. Also, the study used qualitative measuring tool to confirm the effectiveness, examined changes of dementia knowledge and attitude, confirmed the effectiveness which would be able to provide significant basic data providing ground regarding necessity of reinforcing dementia education for nursing students.

The purpose of this study is to examine the effectiveness of dementia education program on dementia knowledge and attitude and elderly care attitude of students through quantitative method.

Hypothesis 1: Knowledge score on dementia of nursing students will be higher after participating in dementia education program.

Hypothesis 2: Attitude score on dementia of nursing students will be higher after participating in dementia education program.

Hypothesis 3: Elderly care attitude score of nursing students will be higher after participating in dementia education program.

Study Method

Study Design: This study adapted one-group pretest-posttest design, a quantitative study method to examine the influence of dementia education on dementia knowledge and attitude of nursing students.

Study Subject: This study selected freshmen in nursing college located in M city. They were explained with the purpose of the study, and the study targeted 137 subjects who agreed to receive the dementia education. The final subjects were 122 excluding those with insincere responses.

Study Tool

Dementia Knowledge: The study used a dementia knowledge level survey tool developed by Seoul Metropolitan Dementia Management Center^[15] and revised by Kim^[16] to measure the dementia knowledge. Each questions are answered by 'yes' or 'no'. Correct and incorrect answers are each given 1 and 0 point to calculate the final score. For 18 questions, the range of score is from 0 to 18, and the higher score refers to higher dementia knowledge. The credibility of the tool in this study was Cronbach's $\alpha=.70$.

Dementia Attitude: The tool Cho^[17] developed is composed of 10 questions. Each question is answered by 5 point Likert scale, the higher score refers to the negative dementia attitude. The credibility of the original tool was Cronbach's $\alpha=.66$ and it was Cronbach's $\alpha=.78$ in this study.

Elderly Care Attitude: The study used tool developed by Kim^[18] and revised by Joung^[19]. 17 questions are answered by 5 point Likert scale, the higher score refers to positive attitude toward elderly. The credibility of the original tool was Cronbach's $\alpha=.66$ and it was Cronbach's $\alpha=.95$ in this study.

Study Procedure: The procedure of data collection and study is as follows.

Pretest: Before the main research, the study measured general characteristics, dementia knowledge, dementia attitude of study subjects before the dementia education. This study distributed written consent on research explaining the purpose and data collection of this study, and those who agreed on the form responded to the survey. The written consent introduces purpose

and details of study, and explains that subjects can reject the participation at any time, the collected data is anonymous, and only subjected to the research.

Experiment: As for the dementia education program, it was conducted from October 9 to November 17, 2017 targeting 122 students. The details of experiment are as follows.

Table 1: Dementia Education Program

Session	Duration (hr)	Title	Contents
1	2	What is dementia? (1)	Lecture on the theory, using multi-media (on campus)
2	2	What is dementia? (2)	Presentation of cases on dementia (on campus)
3	2	What is dementia? (3)	A tablet-based dementia test conducted at the 'Dementia Experience Center' located in city S
4	4	Diagnosis and prevention of dementia using the cognitive rehabilitation program	Each team to visit recreational centers for the elderly in city M to conduct diagnosis of dementia, foot massages of the elderly, and art programs using paper or fallen leaves
5	2	Presentation of dementia experience	

Post Test: The post test measured dementia knowledge and attitude based on the survey responded by each of the individual subjects right after the dementia education program.

Ethical Consideration: The study subjects were explained with the purpose of study before data collection, and the researchers received written consent from subjects that the data is only subjected for the study purpose, and they could withdraw from the study any time.

Data Analysis: The study used SPSS/WIN 22.0 program for data analysis. The general characteristics of subjects were analyzed in frequency and percentage. The effectiveness of dementia education program was analyzed by independent sample T test.

Result

General Characteristics of Study Subject: General characteristics of study subjects are suggested in Table 2. 79.5% of subjects(97) are women, 32.8% of subjects(40) had religion, while 67.2% of subjects(82) didn't have religion.

Table 2: Characteristics of study participants (n = 122)

Characteristics	Categories	n (%)
Gender	Male	25(20.5)
	Female	97(79.5)
Religion	Yes	40(32.8)
	No	82(67.2)

Hypothesis Verification: The result of hypothesis verification is as Table 3.

Hypothesis 1: As the result of verifying 'Knowledge score on dementia of nursing students will be higher after participating in dementia education program', before the education, the average dementia knowledge score was 12.83(71.3%) which rose to 13.25(73.6) after education, but there was no statistically significant difference($t=.49$, $p=.621$). Thus, hypothesis 1 is not supported.

Hypothesis 2: As the result of verifying 'Attitude score on dementia of nursing students will be higher after participating in dementia education program', before the experience, the dementia attitude was average 3.86 which rose to 4.01 after education, and there was statistically significant difference($t=-2.23$, $p=.027$). Thus, as the educated group had higher score of dementia attitude, hypothesis 2 is supported.

Hypothesis 3: As the result of verifying 'Elderly care attitude score of nursing students will be higher after participating in dementia education program', before the education, the elderly care attitude was average 3.56 which rose to 3.78 after education, and there was statistically significant difference($t=-3.02$, $p=.003$). Thus, as the educated group had higher score of elderly care attitude, hypothesis 3 is supported.

Table 3: Dementia Education Program Result (n = 122)

Variables	Pre-test	Post-test	t	p
	M ± SD	M ± SD		
Knowledge about dementia	12.83 ± 2.79	13.00 ± 2.63	.495	.621
Attitudes toward dementia	3.86 ± .47	4.01 ± .59	-2.23	.027
Elderly care Attitudes	3.56 ± .51	3.78 ± .60	-3.02	.003

Discussion

Considering the increase of elderly population due to rapid aging, and hence the rapid increase of dementia elderly, nurses will have to deal with growing number of dementia elderly. Among socioeconomic costs of elderly disease, dementia(25.4%) occupies the largest portion, and the significance of nursing and management on dementia elderly has become a social issue^[20]. Thus, there is a need to develop a dementia education program for nursing students to conduct high quality nursing by obtaining proper knowledge and attitude.

This study has developed a dementia education program targeting nursing students and aimed to verify the effectiveness of dementia knowledge, attitude and elderly care attitude, and to discuss the results.

This study has examined the dementia knowledge after conducting dementia education program. As the result of verifying ‘Knowledge score on dementia of nursing students will be higher after participating in dementia education program’, before the education, the average dementia knowledge score was 12.83(71.3%) which rose to 13.25(73.6) after education. As there is no research that evaluated dementia knowledge after conducting education targeting nursing students in Korea, it is hard to conduct direct comparison, but according to the study of Park et al.^[14], Kang et al.^[5] which examined the knowledge about dementia elderly after conducting elderly nursing education program the dementia knowledge increased. Students dealt with difficulty when dementia elderly’s behavior was unexpected and they felt lack of knowledge^[17]. Lack of knowledge and stereotype about dementia is the cause of delayed treatment which ultimately leads to low quality of life of the patient and family and increase of medical expense^[22]. Improving dementia knowledge is a significant measure^[23] of leading positive attitude toward dementia. inKo^[21]’s study targeting nurses, the higher the knowledge was, the less the nursing burden was. Considering consistently increasing nursing demand, education that can improve professional dementia knowledge is crucial.

As the result of verifying ‘Attitude score on dementia of nursing students will be higher after participating in dementia education program’, before the experience, the dementia attitude was average 3.86 which rose to 4.01 after education. In another study comparing the nursing student before and after the education, it confirmed positive changes after education which is corresponds to the study result^[5, 14]. The more negative dementia attitude is, the higher the nursing burden is in a study targeting dementia support center nurses^[21]. Positive dementia attitude provides patient-oriented nursing focusing on dementia patient, and not the symptom which enables high quality nursing^[24] while negative attitude affects diagnosis, treatment, support and decision making to deter the various service quality given to dementia elderly^[25]. Gathering up the results, it is clear that attitude of nursing students affect nursing quality in the field of medicine. Thus, nursing education is crucial to cultivate professional manpower with essential professional knowledge and positive attitude for dementia elderly nursing service^[14].

As the result of verifying ‘Elderly care attitude score of nursing students will be higher after participating in dementia education program’, before the education, the elderly care attitude was average 3.56 which rose to 3.78 after education. This confirms that the program not only affects the dementia knowledge and attitude positively but also the elderly care attitude, which indicates the program will influence the better understanding toward elderly and lead to positive attitude toward elderly.

In 2015, the prevalence rate of dementia for those over age 65 was 9.8% which is expected to be as high as 15.1% in 2050(NSO), and dementia patients who are under medical service is growing 20% annually(NHIC, 2015). Thus, as a medical professionals, nursing students must work hard to improve dementia knowledge and establish positive attitude. There are elderly nursing education targeting nursing students, but it requires improvement in professional contents, Dementia

education program affects not only the dementia knowledge but also the attitude and elderly care attitude, which could contribute to preparing the service provision measures for individual characteristics due to increase of dementia patients. Furthermore, once the program is expanded to the public, it would contribute to the responsive capability of society regarding the prevention and management of dementia.

Conclusion

This study has conducted 12 hour dementia education in 5 sessions targeting freshmen in nursing college to examine the education's effectiveness to dementia knowledge, attitude and elderly care attitude. As the result, those who received education had better dementia knowledge, more positive dementia attitude and elderly care attitude.

Based on the result, the study suggests as below.

First, to improve professional knowledge and positive attitude toward dementia elderly, there is a need to apply curriculum that conducts both theoretic education and practices.

Second, this study suggests a phased and consistent dementia education program for professional nursing manpower and caretakers who conduct direct nursing on dementia elderly.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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A Study on the Validity of Dying Well Education Expert License System For Ordinary People

Hye-Jeong Hwang¹, HyoNam Lim², Kwang-Hwan Kim³

¹Dept. of Healthcare & Welfare, Konyang Cyber University, 158, Gwanjeodong-ro, Seo-gu, Daejeon, 35365, Korea; ²College of Nursing, ³Dept. of Hospital Management, Konyang University, 158, Gwanjeodong-ro, Seo-gu, Daejeon, 35365, Korea

ABSTRACT

Background/Objectives: This study was conducted in order to secure the validity of the license system development for education training experts with the multidisciplinary knowledge of dying well by identifying the need for the dying well education and license system.

Method/Statistical Analysis: A total of 128 adults aged 19 or older who visited D Station in D city from April 14 to May 14, 2018 was randomly selected and surveyed, and the statistical program R was used for the analysis.

Findings: All subjects answered that dying well education is necessary, and that educators suitable for dying well education included experts, medical professionals, and religious leaders who received dying well education. Of the educational contents, care for terminal patients (hospice) and psychological healing were the most needed. There was a correlation between experts who received dying well education, terminally ill patients and their families, and nursing and elderly hospital workers.

Improvements/Applications: In order to secure the expertise of dying well education in the future, it is necessary to form a curriculum based on the results of this study and to train death education experts with multidisciplinary knowledge through the verification of a professional national license.

Keywords: *Dying well, Education, License System, ordinary people, Necessity, Validity*

Introduction

Recently, the elderly population and chronic diseases are increasing in Korea, and in addition to well-being^[1], dying well culture that means good death and decent death is spreading as the interest in human death is growing^[2]. Death is the end of life, and the right to die like a human being should be guaranteed by the concept of human dignity and human rights^[3]. The term 'human-like' herein means more or less active death, which includes planning for death and dignified, beautiful death, not lonely death, and preparing for death on their own such as writing a will in advance and preparing

for shroud^[4]. In particular, dying well is important not only to alleviate the pain of death, but also to find the meaning of life^[2]. In addition, as interest in terminal cancer patients has increased, the institutionalization of hospice and palliative care has been emphasized, and the need to apply health insurance has been raised, thus raising the discussion on the need for institutionalization. Although the hospice palliative medical institutions are operated, there are only a few independent facility type medical institutions and independent wards, which are models of ideal hospice palliative medical institutions, not providing good quality services.

The application of dying well programs to solve these social problems positively changes elderly people's perception of the meaning of life, self-efficacy, and successful aging and is an opportunity to realize the meaning of death, to think seriously about death, to look back on their life^[5], and systematic and continuous

Corresponding Author:

Kwang-Hwan Kim
Professor, Dept. of Hospital Management,
Konyang University, Korea
Email: kkh@konyang.ac.kr

program application management can be achieved through the development of dying well education contents and programs needed for the elderly in order to find ways to live a healthy and happy life psychologically as well as physical health through preparation for death of the elderly [2].

‘Hospice palliative care’ is the extensive treatment that checks the meaning of the time left until a patient who is unlikely to be cured dies and allows him/her to live during the time faithfully. With the ‘Act on Decisions on Life-sustaining Treatment’, it is overall treatment and care which alleviate the pain of terminally ill patients and help them to die a comfortable death physically and mentally and hospice, palliative care and hospice palliative care are used in the same sense^[6]. Hospice and palliative health care system should be transformed into a nation-wide ‘National cultural movement for decent death’ in which many leaders of society such as culture art world, academic world, religious world as well as the government participates^[7]. In order to do so, it is necessary to train experts for institutional and professional education. In addition, it is necessary to develop programs for experts treating dying patients mainly in hospital intensive care units or hospice wards and death preparation course education of professional death preparation field educators and dying well of hospice dying patients sharply increased in proportion to the diagnosis of medicine in recent years and expand the subjects of dying well preparation education^[8].

As the Dying well Act (Act on Life-Sustaining Treatment Determination) which determines not to carry out or discontinue medical care for life prolongation for patients in the dying process was enacted^[9], the need for professional education for dying well has increased, and at present, the expertise of the education operating subject has been secured, and it is difficult to meet the increasing social demand related to dying well. Therefore, there is a high demand for professional death education experts in order to secure the expertise of dying well education^[10]. Dying well preparation education programs should be conducted in a continuous and long-term way as part of life, not as an educational short-term program. Also, when constructing a program, it is necessary to constantly supplement and develop programs that can meet the psychological and social needs by reflecting the desire of participants and to activate them professionally^[5]. In addition, information on dying well should be exchanged by establishing cooperative systems such

as funeral instructors, death preparation educators, end care nurses, program experts, family therapists, hospice nurses, and social welfare practitioners who are experts in interdisciplinary fields^[5].

Thus, this study not only includes knowledge of basic dying well but is to secure the validity of the license system development for training educators with overall multidisciplinary knowledge of death.

Method

Subject: Adult men and women aged 19 or older who visited D Station located in D city were randomly selected and surveyed. For four weeks from April 14, 2018, we visited D Station on Saturdays and conducted surveys only for those who wanted to participate in the study. A total of 128 people answered the survey.

Method: The study was approved by the Institutional Review Board (IRB No. KYU-2018-007-02) of Konyang University. The questionnaire consists of the following: The general characteristics were 3 items such as sex, age, religion. The subjects’ perception of the need for dying well education and qualification courses, the need for each subject of the dying well education expert license educational contents of the subjects and the subjects’ perception related to dying well education expert training course were composed of 4 items, 5 items and 3 items, respectively. Referring to Cancer Registration Standard Occupational Classification System (Korean Standard Occupational Classification), we carried out the study by classifying the occupations of the subjects into experts, students, ordinary people as independent variables.

Analysis Method: The statistical program R was used for the analysis. For the item of questionnaire, the frequency analysis of the general characteristics was carried out. Based on occupations (expert, student, ordinary person), the perception of the need for dying well education and qualification course and the perception related to dying well education expert training qualification course were analyzed by performing the chi-square test and the need for each subject of the dying well education expert license educational contents by performing One-way ANOVA, and the canonical correlation analysis was carried out in order to identify the correlation between educators, educational subjects and perception related to qualification course.

Analysis Results

General characteristics of subjects: Table 1 shows the general characteristics of the subjects. The total number of subjects was 128, and men (9.4%) accounted for more than women (90.6%). In age, 29 or younger was the most common (48.4%), followed by 16.4% of 30-44 or older, 35.2% of 45 or older. In religion, no religion, Protestantism (Christianity), Catholics and Buddhism were found to be 46.1%, 29.7%, 7.8% and 16.4%, respectively.

Subjects' perception of the need for dying well education and qualification course: The Table 2 shows the subjects' perception of the need for dying well education and qualification course. All answered "Yes" to the question of "Do you think dying well education is necessary?". To the question of "If dying well education is necessary, who do you think is best for education?", the answer was found to be experts who received dying well education (82.0%) and medical personnel (14.8%) in, and both religious people (pastor, priest, monk) and others were found to be the lowest, 1.6%. Among groups of experts, students, ordinary people, experts who received dying well education were the most common, which showed a statistically significant difference ($p < 0.05$). To the question of "for whom do you think dying well education is necessary?", the most answered all the people (51.6%), followed by nursing and elderly

hospital workers (25.8%), terminally ill patients and their families (15.6%), medical personnel (6.3%), others (0.8%). To the question of "Which is the right institution for dying well education", the most people answered educational Institutions (Association or Society, Lifelong Education Center, Social Education Center, followed by university (25.0%), social welfare organs (General welfare center, senior welfare center, nursing facility, nursing home etc.) (19.3%), cultural Center (12.5%), Community Center (senior citizens' center, hall for senior citizens in addition to dong office) (7.0%), graduate school (3.1%), medical institutions (hospitals, public health centers, etc.) (2.3%), religious institutions (0.8%). In the expert group, university was the highest (37.8%) and Community Center (senior citizens' center, hall for senior citizens in addition to dong office) and religious groups were the lowest (no response). In the student group, educational institutions (Association or Society, Lifelong Education Center, Social Education Center) were the lowest (44.4%) and Cultural Center was the lowest (no response). In the ordinary people group, like the student group, educational institutions (Association or Society, Lifelong Education Center, Social Education Center) were the highest and graduate school, religious institutions, medical institutions (hospitals, public health centers, etc.) were the lowest (no response), which showed a statistically significant difference ($p < 0.01$).

Table 1: General characteristics of subjects

Category	N	(%)	Category	N	(%)
Sex			Religion		
Men	12	(9.4)	Christianity	38	(29.7)
Women	116	(90.6)	Catholics	10	(7.8)
Age			Buddhism	21	(16.4)
29 or younger	62	(48.4)	No religion	59	(46.1)
30~44 or older	21	(16.4)			
45 or older	45	(35.2)			
Total	128	(100.0)	Total	128	(100.0)

Table 2: Subjects' perception of the need for dying well education and qualification course

Unit :N(%)

Category	Expert		Student		Ordinary Person		Total		p-value	
Do you think dying well education is necessary?										
Yes	37	(100.0)	54	(100.0)	37	(100.0)	128	(100.0)		
No		-		-		-		-		

Conted...

If dying well education is necessary, who do you think is best for education?									
Experts who received dying well education	30	(81.1)	49	(90.7)	26	(70.3)	105	(82.0)	0.047*
Religious people (pastor, priest, monk)	1	(2.7)		-	1	(2.7)	2	(1.6)	
Medical personnel	4	(10.8)	5	(9.3)	10	(27.0)	19	(14.8)	
Others	2	(5.4)		-		-	2	(1.6)	
For whom do you think dying well education is necessary?									
Terminally ill patients and their families	7	(18.9)	8	(14.8)	5	(13.5)	20	(15.6)	0.082
Nursing and elderly hospital workers	11	(29.7)	7	(13.0)	15	(40.5)	33	(25.8)	
Medical personnel	1	(2.7)	5	(9.3)	2	(5.4)	8	(6.3)	
All the people	18	(48.6)	34	(63.0)	14	(37.8)	66	(51.6)	
Others		-		-	1	(2.7)	1	(0.8)	
Which is the right institution for dying well education?									
University	14	(37.8)	9	(16.7)	9	(24.3)	32	(25.0)	0.005**
Graduate school	1	(2.7)	3	(5.6)		-	4	(3.1)	
Educational Institutions (Association or Society, Lifelong Education Center, Social Education Center)	10	(27.0)	24	(44.4)	12	(32.4)	46	(35.9)	
Religious institutions		-	1	(1.9)		-	1	(0.8)	
Social welfare organs(General welfare center, senior welfare center, nursing facility, nursing home etc.)	4	(10.8)	10	(18.5)	3	(8.1)	17	(13.3)	
Community Center(senior citizens' center, hall for senior citizens in addition to dong office)		-	6	(11.1)	3	(8.1)	9	(7.0)	
Medical institutions (hospitals, public health centers, etc.	2	(5.4)	1	(1.9)		-	3	(2.3)	
Cultural Center	6	(16.2)		-	10	(27.0)	16	(12.5)	
Total	37	(28.9)	54	(42.2)	37	(28.9)	128	(100.0)	
*p<0.05, **p<0.01									

The need for each subject of dying well education expert license educational contents of subjects: Table 3 shows the need for each subject of dying well education expert license educational contents of the subjects. The total average of the need for each subject was found to be 3.35 points, and psychological healing and care for terminal patients (hospice) were the highest (3.50 points), followed by communication (3.42 points), thanatology (3.35 points), funeral (2.96 points). In the expert group, care for terminal patients (hospice) was the highest and psychological healing was the highest (3.41 points) in the student group and the score is 3.62 in the ordinary people group, and psychological healing was found to be the highest like the student group.

Table 3: The need for each subject of dying well education expert license educational contents of subjects
Unit :Mean $\pm$ S.D

Category	Expert		Student		Ordinary person		Total		p-value
Thanatology	3.43	± 0.80	3.35	± 0.48	3.27	± 0.65	3.35	± 0.63	0.550
funeral	3.03	± 0.80	2.98	± 0.57	2.86	± 0.63	2.96	± 0.66	0.547
care for terminal patients (hospice)	3.57	± 0.83	3.43	± 0.50	3.54	± 0.73	3.50	± 0.68	0.566
Communication	3.41	± 0.90	3.37	± 0.56	3.51	± 0.80	3.42	± 0.74	0.657
Psychological healing	3.51	± 0.77	3.41	± 0.53	3.62	± 0.68	3.50	± 0.65	0.305
Total	3.39	± 0.82	3.31	± 0.53	3.36	± 0.70	3.35	± 0.67	
1point = lowest, 4 point=highest									

Subjects' perception related to dying well education expert training qualification course: Table 4 shows the subjects' perception related to dying well education expert training qualification course. In the effective lecture method during death education lecture, the most answered practice/experience style (37.5%), followed by use of video (35.2%), lecture style (16.4%), discussion style (10.2%). By group, the expert and student groups responded the most to the practice/experience style, while the ordinary people group responded the most to "Using video" (43.2%). In the item of appropriate education period for acquiring dying well education expert license, one semester (3 months) was found to be the highest (49.2%), followed by one month (22.7%), 6 months(17.2%), 1 year (9.4%), 1 week (0.8%), others(0.8%). In the item of appropriate educational expense for acquiring dying well education expert license, 43.0% answered 200,000 won~290,000 won followed by 300,000 won~390,000 won(25.0%), 400,000 won~490,000 won(16.4%), others(8.6%), more than 500,000 won(7.0%). Each group showed similar trends

Correlation factors between educators and subjects and qualification course related perception: According to the result of the canonical correlation analysis of educators and subjects, lecture method, education period, cost of education, six canonical functions were derived. Among them, 1 canonical function was found to be statistically significant ($p < 0.05$). In the case of the top two canonical functions among them, when the chi-square value was 104.914 and the degree of freedom was 78, statistical significance was shown in the canonical function 1 ($p < 0.05$). According to the standard canonical coefficients of canonical function 1, it was found that there was a correlation between experts who received dying well education as educators and terminally ill patients and their families, Nursing and elderly hospital workers as subjects. It was found that there was a correlation in all items of the lecture method and the education period, and there was a correlation between 400,000~490,000 won, 300,000~390,000 won, 200,000~290,000 won in the case of educational expense

Table 4: Subjects' perception related to dying well education expert training qualification course**Unit :N(%)**

Category	Expert		Student		Ordinary person		Total		p-value
Effective lecture method during death education lecture									
Lecture style	3	(8.1)	10	(18.5)	8	(21.6)	21	(16.4)	0.176
Discussion style	7	(18.9)	5	(9.3)	1	(2.7)	13	(10.2)	
Use of video	13	(35.1)	16	(29.6)	16	(43.2)	45	(35.2)	
Practice/Experience style	13	(35.1)	23	(42.6)	12	(32.4)	48	(37.5)	
Others	1	(2.7)		-		-	1	(0.8)	
Appropriate education period for acquiring dying well education expert license									
One week		-		-	1	(2.7)	1	(0.8)	0.521
One month	10	(27.0)	12	(22.2)	7	(18.9)	29	(22.7)	
One semester (3 months)	16	(43.2)	29	(53.7)	18	(48.6)	63	(49.2)	

Conted...

6 months	5	(13.5)	10	(18.5)	7	(18.9)	22	(17.2)	
1 year	6	(16.2)	3	(5.6)	3	(8.1)	12	(9.4)	
Others		-		-	1	(2.7)	1	(0.8)	
Appropriate educational expense for acquiring dying well education expert license									
More than 500,000 won	4	(10.8)	3	(5.6)	2	(5.4)	9	(7.0)	0.620
400,000 won~490,000 won	8	(21.6)	8	(14.8)	5	(13.5)	21	(16.4)	
300,000 won~390,000 won	8	(21.6)	16	(29.6)	8	(21.6)	32	(25.0)	
200,000 won~290,000 won	13	(35.1)	25	(46.3)	17	(45.9)	55	(43.0)	
Others	4	(10.8)	2	(3.7)	5	(13.5)	11	(8.6)	
Total	37	(28.9)	54	(42.2)	37	(28.9)	128	(100.0)	

Table 5: Correlation factors between educators and subjects and qualification course related perception

Category		Standard Canonical Coefficient		Canonical Loadage		Canonical Cross Loadage	
		1	2	1	2	1	2
Educator	Experts who received dying well education	-.921 [†]	-.323 [†]	-.896	.204	-.445	.087
	Medical personnel	.039	-.680 [†]	.828	-.242	.411	-.103
Subject	Terminally ill patients and their families	-.550 [†]	-3.025 [†]	-.351	-.679	-.174	-.290
	Nursing and elderly hospital workers	-.501 [†]	-2.639 [†]	-.031	.250	-.015	.107
	Medical personnel	-.172	-1.314 [†]	.146	.230	.073	.098
	All the people	-.200	-3.290 [†]	.206	.058	.102	.025
Lecture method	Lecture style	1.346 [†]	1.435 [†]	.318	-.235	.158	-.100
	Discussion style	1.116 [†]	1.418 [†]	.318	.100	.158	.043
	Use of video	1.363 [†]	1.851 [†]	.180	-.205	.089	-.088
	Practice/Experience style	.851 [†]	2.278 [†]	-.581	.380	-.288	.163
Education period	one week	-.900 [†]	-.244	-.211	-.334	-.105	-.143
	one month.	-2.318 [†]	1.305 [†]	.134	-.112	.067	-.048
	One semester (3 months)	-2.904 [†]	1.516 [†]	-.047	.243	-.024	.104
	6 months	-2.280 [†]	.969 [†]	-.103	-.073	-.051	-.031
	1 year	-1.906 [†]	.748 [†]	-.047	-.002	-.023	-.001
Educational expense	More than 500,000 won	.023	.695 [†]	.118	.444	.059	.190
	400,000~490,000 won	-.463 [†]	.231	-.170	.067	-.084	.029
	300,000~390,000 won	-.524 [†]	-.197	-.090	-.462	-.045	-.197
	200,000~290,000 won	-.478 [†]	.346 [†]	.004	.181	.002	0.77
		1			2		
Canonical Correlation		.497			.428		
Wilk's Lamda		.408			.541		
Chi-square		104.914			71.773		
df		78.000			60.000		
p-value		0.023*			0.142		
*p<0.05							

Conclusion

This study not only includes knowledge of basic dying well, but also aims to provide basic data for securing the validity of the license system development for training education experts with multidisciplinary knowledge about death. The results of this study are summarized as follows: First, all the experts, students, ordinary people answered dying well should be educated by experts who received dying well education, which was found to be significantly high ($p < 0.05$). Second, students and ordinary people answered that educational institutions (Association or Society, Lifelong Education Center, Social Education Center) are appropriate for dying well educational institutions. In the case of experts, university was found to be significantly high ($p < 0.01$). Third, the result of the canonical correlation analysis of educators and subjects, lecture method, education period, educational expense showed that there was a correlation between experts who received dying well education as educators and terminally ill patients and their families, nursing and elderly hospital workers as subjects. It was found that there was a correlation in all the items of the lecture method and education period. There was a correlation between 400,000~490,000 won, 300,000~390,000 won and 200,000~290,000 won in educational expenses ($p < 0.05$). In conclusion, despite the development of medicine, it is necessary to train death education experts who have multidisciplinary knowledge through the verification of professional national license in order to carry out education and perception of death in order to finish the last period of life that cannot be avoided.

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Life Satisfaction and Related Factors of Denture Wearers

So-Young Park¹, So-Youn An², Youn-Soo Shim³

¹Department of Dental Hygiene, Wonkwang Health Science University, Assistant professor, 514, Iksan-daero, Iksan-si, Jeollabuk-do, 54538, Korea; ²Department of Pediatric Dentistry, College of Dentistry, Wonkwang University, Professor, 460, Iksan-daero, Iksan-si, Jeollabuk-do, 54538, Korea; ³Department of Dental Hygiene, Sunmoon University, Associate professor, 70, Sunmoon-ro 221beon-gil, Tangeong-myeon, Asan-si, Chungcheongnam-do, 31460, Korea

ABSTRACT

Background/Objectives: The purpose of this study is to understand the factors affecting the satisfaction of life of female denture wearers and to practice proper denture management.

Method/Statistical Analysis: The subjects of this study were the elderly welfare facility residents of Seoul, 337 were selected for final analysis. Data collection was conducted by questionnaire survey method through face - to - face interview with the researchers who were fully informed about the purpose of the study after selecting the sample as the convenience sampling method. In this study, general characteristics were calculated as frequency and percentage.

Findings: The age of the patients was 75-79 years old with 210, followed by 69 patients over 80 years old and 58 patients 65-74 years old. And 74 women with family members were living together. There are 159 women with religion and 140 patients with activity limitation. The results of multiple regression analysis on the factors affecting the general characteristics of female denture wearers were as follows. Among the general characteristics, age, cohabiting family and activity limitation were significant influences. In other words, life satisfaction was high in the case of the younger age, the family with the same family, the absence of the physical activity restriction, and the explanatory power of the variables was 29.9. The results of multiple regression analysis on the factors affecting the satisfaction of life using the denture of female denture wearers are as follows. Satisfaction with chewing and Satisfaction with taste were significant.

Improvements/Applications: Using the right denture has a positive effect on not only the oral function but also the satisfaction of life, so efficient management habits are necessary for a happy life.

Keywords: Denture management, Denture wearer, Factor, Female, Life satisfaction

Introduction

The use of dentures is a factor that can help recovery of oral function and enhance the satisfaction of life by running a healthy life. The correct functioning of dentures leads to improved quality of life and satisfaction, which ultimately has a positive impact on happiness. In order to achieve a happy life for female denture wearers, it is necessary to investigate the current status of dental

use satisfaction and behavior, and to provide a basis for their comfortable denture prosthesis use and to prove their validity. In the World Health Organization, periodontal diseases, especially periodontal diseases, are closely related to systemic health such as diabetes, cardiovascular diseases, and also related to the quality of life, so it is necessary to have an oral health project for health promotion for lifelong healthy life^[1].

It has been reported that the good oral condition of the elderly contributes to the improvement of the quality of life by leading to active participation in social activities due to recovery of self-confidence. Therefore, to support the elderly living alone to accept the current environment and feel satisfied with life, it is necessary to

Corresponding Author:

Youn-Soo Shim

Associate Professor, Department of Dental Hygiene,
Sunmoon University, Korea

Email: shim-21@hanmail.net

systematically manage the physical and oral health and improve the satisfaction of life by increasing self-esteem in terms of mental health^[2-4]. The reason why oral health of the elderly is important is that interpersonal relations and smooth social life for pronunciation and appearance as well as affecting the whole body health maintenance. It is closely related to nutritional intake, and oral condition is related to quality of life, depression. This is because it has a great influence on the health of the people^[5-6].

In previous studies, the elderly reported that there was no tooth pain, less oral restorations and missing teeth, no oral disease, higher quality of life, and oral health status and oral health behavior affected overall satisfaction with life^[7]. The satisfaction of life related to oral health was high in the group satisfied with the use of denture. The elderly feel the emotional loss by the use of dentures. It may be a matter of avoiding interpersonal relationships, feeling alienation, isolation, etc., when the first dentures are worn out during the adaptation and problems such as rancidity and bad breath are encountered. Therefore, improving the correct sterilization and denture fixation is a management method that must be taken in order to improve the quality of life of denture users as well as oral health.

When dentures are missing from natural teeth and associated tissues, implies an artificial replacement prosthesis. A denture made entirely in the form of a tooth that is completely fixed to an adjacent tooth is called a fixed denture. A denture made in such a form as to be able to take away the teeth and the support of the gum together with the tooth is called a removable denture. It is said to be dent in the dentures, which can be inserted and removed mainly. The denture will help the recovery function of the oral cavity as it contributes to mental efficiency, nutrient intake and psychological stability of the elderly^[8].

Dentures enhance the mastication efficiency of the elderly, help nutrient intake, and help in psychological stability. The discomfort of the work has a direct impact on the satisfaction of life by depriving the satisfaction and happiness of food intake^[9]. Dentures will help the elderly to improve masticatory efficiency, help nutrient intake, and contribute to psychological stability. However, oral care providers recommend that implants or dentures be installed when some or all of the teeth are lost, but it is presumed that the elderly who have low financial status

will have less chance of using dentures. Therefore, it is thought that the dental prosthesis business carried out by the present government should be extended for the long-term welfare of the elderly, and the life satisfaction should be improved through restoration of oral function in old age.

The healthful oral condition of the elderly helps mastication and swallowing function and reduces the possibility of threatening the whole body health due to the difficulty of digestion. It also leads to improvement of eating pleasure from normal feeding and recovery of interpersonal relationship by maintenance of aesthetic function. It will help to increase satisfaction.

Materials and Method

Research Subject and Method: The subjects of this study were the elderly welfare facility residents of Seoul, 337 were selected for final analysis. Data collection was conducted by questionnaire survey method through face-to-face interview with the researchers who were fully informed about the purpose of the study after selecting the sample as the convenience sampling method.

Data Analysis: In this study, general characteristics were calculated as frequency and percentage. Multiple regression analysis was performed to investigate the factors affecting general satisfaction and durability using general characteristics and denture. The explanatory power of the model was determined through multiple decision factors (R^2). The collected data were analyzed using SPSS 19.0 statistical program. The general independent variables used in the study were age, living with the family, religion, activity limitation, denture type. Among the detailed items, the ages were classified as "65-74 years, 75-79 years, 80 years old or older", and the question about family members living together was answered as "Yes" or "No". The question about religion was surveyed as "Yes" or "No" as "Do you currently conduct religious activities regularly?" In addition, the question on whether activities are restricted in daily life was surveyed as "Yes" or "No" as "Do you have any difficulty in doing usual activities at home or outdoors?" The types of dentures were '1 Jaw Partial denture, 1 Jaw Full denture, 2 Jaw Partial denture, 2 Jaw Full denture and 2 Jaw Partial + Full denture'. The independent variables related to the use of dentures for female dentures were 'Wear dentures all day, Daily denture

cleaning, Use a denture cleanser, Keep dentures in water, Number of brushes per day'. The independent variables related to denture satisfaction were 'Satisfaction with appearance, Satisfaction with chewing, Satisfaction with taste, Satisfaction with pronunciation, Satisfaction with denture fixation and Number of dentures made'. The above items were surveyed on 4 points scale of 'very satisfied' (4 points), 'satisfaction' (3 points), 'dissatisfied' (2 points) and 'very dissatisfied' (1 point) 'And' dissatisfied ' , respectively.

The dependent variable, Life Satisfaction, was assessed as perceived subjective satisfaction, and the most satisfied life status was classified as 5 points and the least satisfied as 1 point. Cronbach's alpha 0.821 for denture use related items of the female denture user, Cronbach's alpha 0.742 for the denture satisfaction related item, and the item has a lower reliability value than the overall reliability.

Results and Discussion

General characteristics of the subjects: The demographic characteristics of the subjects are shown in Table 1. The age of the patients was 75-79 years old with 210 (62.3%), followed by 69 patients (20.5%) over 80 years old and 58 patients (17.2%) 65-74 years old and 74 (22.0%) women with family members living together. There are 159 (47.2%) women with religion and 140 patients (41.5%) with activity limitation.

The most common type of denture was 1 jaw partial denture (31.8%). The next order was 2 jaw partial dentures in 85 patients (25.2%) and 2 jaw full dentures in 82 patients (24.3%).

Table 1: General characteristics of the subjects

Variables		N	%
Age (years)	65-74	58	17.2
	75-79	210	62.3
	≥80	69	20.5
Living with the family	Yes	74	22.0
	No	263	78.0
Religion	Yes	159	47.2
	No	178	52.8
Activity limitation	Yes	140	41.5
	No	197	58.5

Conted...

Denture type	1 Jaw Partial denture	107	31.8
	1 Jaw Full denture	56	16.8
	2 Jaw Partial denture	85	25.2
	2 Jaw Full denture	82	24.3
	2 Jaw Partial + Full denture	7	2.1
Total		337	100.0

Factors affecting the satisfaction of life in general characteristics: The results of multiple regression analysis on the factors affecting the general characteristics of female denture wearers were as follows. Among the general characteristics, age ($\beta = -0.166$, $p = 0.006$), cohabiting family ($\beta = 0.536$, $p = 0.000$) and activity limitation ($\beta = -0.039$, $p = 0.019$) were significant influences. In other words, life satisfaction was high in the case of the younger age, the family with the same family, the absence of the physical activity restriction, and the explanatory power of the variables was 29.9. <Table 2>.

Table 2: Factors affecting the satisfaction of life in general characteristics

Variables	B	β	P
Constant	0.199		0.595
1. Age(years)	-0.351	-0.166	0.006
2. Cohabiting family	1.676	0.536	0.000
3. Religion	-0.158	-0.061	0.346
4. Activity limitation	-0.103	-0.039	0.019
5. Denture type	0.001	0.001	0.981
$R^2=0.309$; $AdR^2=0.299$; $F=9.620$			

B: Unstandardized Coefficients, β : Standardized Coefficients.

Statistically significant differences by multiple regression analysis at $\alpha=0.05$.

Satisfaction of life according to habit of using dentures: The factors affecting the satisfaction of the dentist use habit of female denture wearers are as follows as shown in table 3. When denture was not worn all day ($\beta = -0.132$, $p = 0.045$), daily denture cleaning ($\beta = 0.201$, $p = 0.031$) and use a denture cleanser ($\beta = 0.057$, $p = 0.035$). There was a significant difference according to the number of brushes ($\beta = 0.104$, $p = 0.033$).

The 'keep dentures in water' variable was not statistically significant. This means that when dentures are not worn all day, when dentures are cleaned daily, when denture cleansers are used, and when the number of brushes per day is high, life satisfaction is high. The explanatory power of the variables was 84.4.

Table 3: Satisfaction of life according to habit of using dentures

Variables	B	β	P
Constant			
1. Wear dentures all day	-0.152	-0.132	0.045
2. Daily denture cleaning	0.232	0.201	0.031
3. Use a denture cleanser	0.062	0.057	0.035
4. Keep dentures in water	0.094	0.087	0.512
5. Number of brushes per day	0.126	0.104	0.033
$R^2=0.854$; $AdR^2=0.844$; $F=26.351$			

B: Unstandardized Coefficients, β : Standardized Coefficients.

Statistically significant differences by multiple regression analysis at $\alpha=0.05$.

Factors affecting the satisfaction of life using dentures: The results of multiple regression analysis on the factors affecting the satisfaction of life using the denture of female denture wearers are as follows as shown in table 4. Satisfaction with chewing ($\beta = 0.140$, $p = 0.006$) and Satisfaction with taste ($\beta = 0.468$, $p = 0.000$) were significant. The greater the satisfaction of chewing, the greater the sense of taste, the higher the satisfaction of life, and the explanatory power of the variables was 30.2.

Table 4: Factors affecting the satisfaction of life using dentures

Variables	B	β	P
Constant	5.299		0.000
1. Satisfaction with appearance	0.009	0.003	0.947
2. Satisfaction with chewing	0.409	0.140	0.006
3. Satisfaction with taste	1.464	0.468	0.000
4. Satisfaction with pronunciation	0.100	0.032	0.484
5. Satisfaction with denture fixation	0.108	0.042	0.409
6. Number of dentures made	0.111	0.030	0.568
$R^2 = 0.315$; $AdR^2 = 0.302$; $F = 5.239$			

B: Unstandardized Coefficients, β : Standardized Coefficients.

Statistically significant differences by multiple regression analysis at $\alpha=0.05$.

Conclusion

The purpose of this study was to examine the general characteristics of the subjects and to determine the determinants of overall life satisfaction. The results of the analysis are summarized as follows.

Life satisfaction was high when there was no activity limit. The physical changes due to the aging of the elderly are related to the satisfaction of life, so physical activity can be an important variable for determining the degree of life satisfaction. Female denture wearers were more satisfied with life when they were living together. The elderly living alone have a majority of three or more chronic diseases and the rate of restricting physical function is higher than that of non - living elderly people. Along with this trend of social change, we should consider various ways to lead the happy life of old age. The existence of a family living together is very important because it directly affects the satisfaction of life and reduces depressed mental state and helps to improve happiness. It is thought that concrete practical plan is necessary for the elderly living alone to ensure the elderly living guarantee for elderly people living alone and efficient co-living home.

The degree of physical activity is the minimum ability for the elderly to maintain their independence as a social member, and is the most important factor for the elderly living alone. Therefore, it is required that the health care activities of the elderly living alone should be steadily prevented from deteriorating and the health care education and publicity to practice it will be needed. The most significant factor affecting the happiness of female denture wearers was family members living together. In the previous study, the quality of life was high when living with family members, and the quality of life was low in elderly women. When using dentures, satisfaction with writing and taste was high. The discomfort of the work can directly affect the quality of life by depriving the satisfaction of food intake. Therefore, the use of correct dentures by female denture wearers has a positive effect on the oral function as well as on the satisfaction of life, so it is an oral health care habit that must be followed for a happy life.

In the case of using the denture, the satisfaction of all the items was high. The satisfaction of life was high when the dentist was satisfied with the use of denture. The denture contributes to the mental efficiency of the elderly, helps nutrient intake, and contributes to psychological stability.

It can be said that one of the requirements for living happily is 'eating pleasure', so that the decrease of chewing ability can lower the satisfaction of life. It can be a major cause. Furthermore, the dental wearer's work satisfaction is a little more significant than that of the prehistoric. Their chewing abilities were the most important reason for the use of dentures after tooth loss, which is the most important factor affecting not only the health of the teeth but also the whole body health. It also has a positive effect on the digestion ability of food. The pleasure of ingesting food will also increase the satisfaction of life.

Periodic oral examination of denture users has two main meanings. First, there are many opportunities to get proper denture management knowledge from oral health professionals by visiting regular oral care institutions, and systematic education opportunities for denture management are gained. In other words, the person can directly clean the denture himself or herself through regular oral examination, and can expect basic denture management knowledge, attitude, and behavior change that can be kept in clean water during sleep. Second, it is possible to reduce the inconvenience of dentures due to the inspection, repair and repair of removable dentures. It is possible to use the correct denture to help the function of the oral cavity by eliminating the low fixation force of the denture and the irritation of the oral soft tissue. Oral care of denture wearers. The main contents of dentures for oral health are dentures, which are stored in lukewarm water for sleeping. To prevent bad breath, dentures are separated from natural teeth and managed with denture cleanser. Lastly, if the denture is not fixed properly, food enters the gap between the gums and dentures, causing pain, bad breath, and gingival inflammation.

In the present study, it was found that the denture management of the elderly people is not proper, and the elderly people perceive themselves as needing denture management education. Denture management and oral health education should be done. Denture wearers are more likely to avoid interpersonal relationships due to authoring activities and cosmetics. Use of correct dentures will increase their confidence. If you use oral dentifrices and denture adhesives to improve oral health, you will feel confident when you meet people. The implication of this study is that the denture wearers' duties and denture use satisfaction variables are generalized in order for the elderly living alone to live happily and satisfactorily. In order to protect the dental health of female denture

wearers, it is necessary to support various policies. In particular, the role of healthcare institutions should be expanded when oral health problems arise. What is important is that women's dentists should improve their life satisfaction by helping them to maintain their self. The limitations of this study were that the study was designed as a cross-sectional study and it was somewhat lacking in identifying the causal relationship between the factors affecting the satisfaction of life of female denture wearers. Therefore, in future researches, we would like to carry out a systematic investigation that can realize the satisfaction of life of denture wearer by developing items and scales that set up more diversity and influence factors related to life satisfaction.

In this study, we observed various factors affecting the health of female denture wearers by their life satisfaction, which is considered to be valuable as a basic data for oral health related programs for denture wearers. However, it is considered to be a limitation of the systematic subdivision of the measurement tools of denture and oral health related variables. Therefore, the use of correct dentures by denture wearers positively affects not only the oral function but also the satisfaction of life, which is an essential requirement for a happy life.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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A Study on the Hamate Bone Learning Effect Using DICOM Images and 3D Printing

Hyeong-Gyun Kim

Dept. of Radiology Science, Far East University, Chungbuk, Korea

ABSTRACT

Background/Objectives: This study compared the characteristics and the anatomical learning effects of a hamate bone model printed from DICOM images on a 3D printer.

Method/Statistical Analysis: After printing a hamate bone model from DICOM images obtained from a wrist joint examination using a 3D printer, this study examined the anatomical understanding of 102 university students in public health departments.

Findings: The intuitive awareness and the morphological awareness of the students on the protrusion, front and back of the hamate bone, and 5-way joint contact surfaces which were difficult to identify in conventional 2D and 3D medical images were improved by 60.7% and 58%, respectively.

Improvements/Applications: The experiment showed that instrumenting of shape through 3D printing as a knowledge transfer method for students learning anatomy can improve the learning effect.

Keywords: DICOM, 3D Printer, hamate bone, learning effect, anatomy

Introduction

Recently, 3D (Dimension, D) printing technology is developing as it has been applied to various fields such as industry, education, and medical care. In particular, the synergy is increasing as 3D printing is integrated with medical images used for diagnosing the human body for surgical simulation and in the production of implants in the bio-industry^[1]. This is an integrated technology of methods for planning the location and extent of the tumor using 3D printing, after 3D CT(Computed Tomography) and MRI(Magnetic Resonance Image) examinations of the patient's surgical site^[2-4]. This is based on the study results that 3D structure of a human body can be formed by 3D printing based on DICOM(Digital Imaging and Communications in Medicine)^[5]. In addition, the recent social structure has increased a human-centered lifestyle, increasing individual sports activities for promoting health, while golf, tennis, and baseball lovers experience many hamate bone fractures in the wrist joint due to the stress of repeated impact^[6]. This is a risk that reflects the protruding characteristics of the hamate bone, which increases the frequency of injuries. This requires the necessity of learning for students majoring in human anatomy. Therefore, this study used DICOM wrist joint images to extract the hamate bone into a 3D image, and performed STL(StereoLithography) modeling to

print the shape on a 3D printer for conducting a survey on the students' understanding. The intention is to examine the learning effect of the students' intuitive and morphological understanding by 3D printing the actual hamate bone rather than using 2D or 3D medical images. The purpose of this study is to compare the anatomical understanding of 102 university students in public health departments majoring in human anatomy.

Materials and Method

Study Direction: This study extracted only the hamate bone from the acquired wrist joint DICOM images and created the same shape through 3D printing to evaluate the anatomical understanding of the characteristics by conducting a survey[Figure 1].

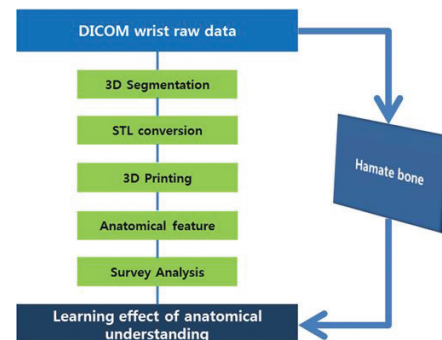


Figure 1: Overall schematic diagram of the experiment

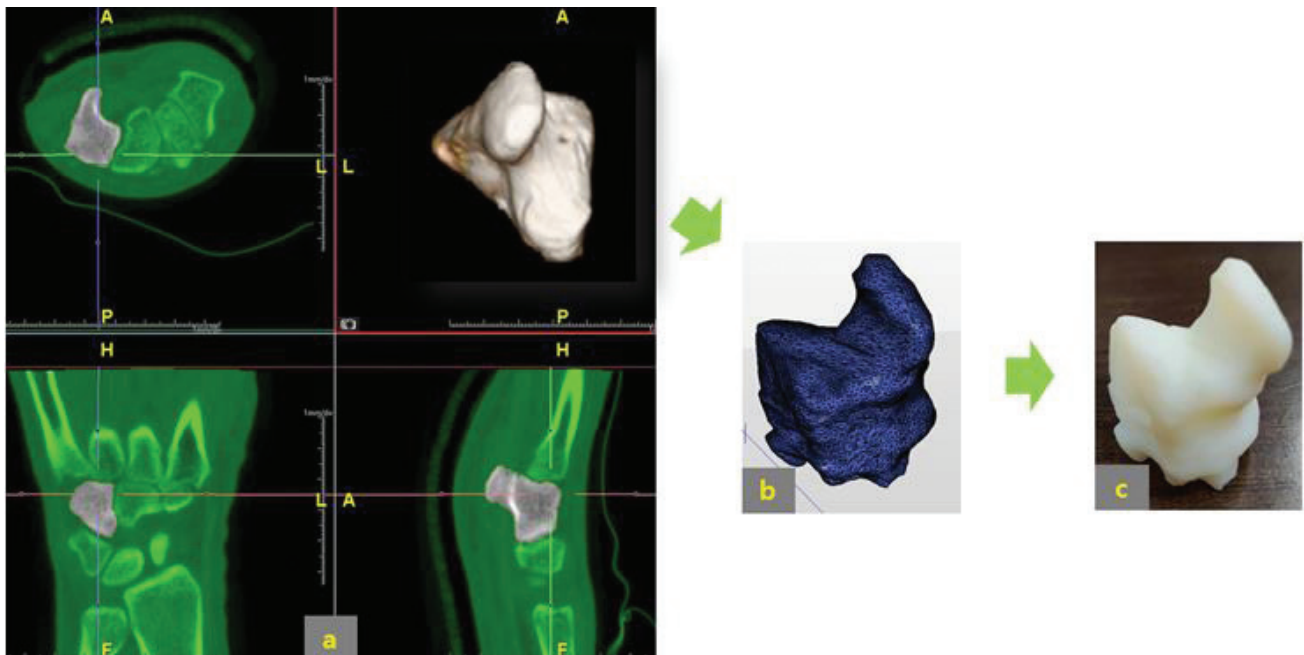
Experimental Equipment and Materials: The wrist joint DICOM image used in the experiment was acquired as a 0.5mm volume image of 640 MSCT (multi-slice computed tomography, Aquilion ONE, TOSHIBA, JAPAN)[Figure 2. a]. This study used a 3D printer(Objet

CONNEX 500, Stratasys, USA) to print the shape of the hamate bone by irradiating the liquid resin to solidify the form, and Endur RGD 450 from Stratasys was used as the material[Figure 2. b].



The computed tomography(a) and 3D Printing (b) device
Figure 2: Hamate bone image acquisition device and 3D Printer

Experimental Method: The wrist joint images acquired by DICOM imaging was segmented using the dynamic region growing tool and free ROI tool of the Aquarius NET (TERARECON, USA) 3D program. Then, after converting to a stereolithography file, 3D printing was performed using the basic G-code of the hamate bone confirmed in STL View^[7] [Figure 2. a, b, c]. The survey was performed by a preliminary survey showing only the DICOM image followed by a post-survey showing the image and 3D printed shape using a 5-point Likert scale for 102 university students in public health departments who completed human anatomy classes and compared the results^[8].

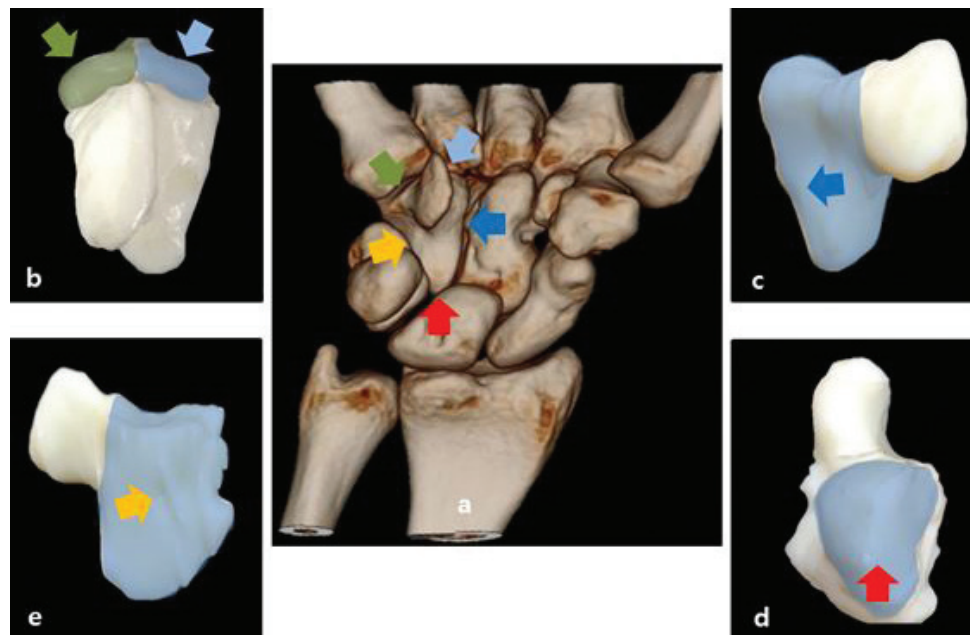


The segmentation process of the acquired image (a), converted STL shape (b), and 3D Printing shape(c).

Figure 3: The process of creating a shape of the hamate bone

Results

Morphological characteristics of the hamate bone



Wrist volume rendering image (a) and various articular surfaces of the hamate bone (b-e).

Figure 4: The joint correlation of the hamate bone within the carpal bone

The front, back, and side of the hamate bone, which is difficult to distinguish visually with 2D and 3D images, were confirmed in 3D printed shape. This shows the 5 characteristic joint surfaces of the hamate bone that are in contact with the 5th metacarpal, 4th metacarpal, Capitate, Lunate, and Triquetrum. As shown in Fig. 4, (a) is the DICOM volume rendering image, and (b) to (e) show the contact surfaces of the hamate bone in the clockwise direction of image (a). Anatomically, (b) is the distant part of the wrist joint, and the hamate bone is divided into the form of a seagull (green and sky-blue arrows), forming a joint in the metacarpal bone. (c) is the articular surface parallel to the long axis of the body, forming the longest articular surface in the hamate bone and a flat boundary with the capitate bone. (d) is the

part forming a joint with the lunate, showing a pointed shape in front of the abdomen. (e) is the part forming a joint with the triquetrum and pisiform bone, showing a hollow shape in the center of the articular surface. As such, the overall shape of the hamate bone shows the characteristics of forming an inverted triangle, protruding hook, and 5 joints in an anatomic position [Figure 4].

Evaluation on the hamate bone learning effect: After preparing a questionnaire for 102 university students in public health departments to examine the learning effect of recognizing the hamate bone shape, this study examined and analyzed the preliminary evaluation in which the survey was performed with only the images and the post-evaluation showing 3D printed shape as well [Table 1].

Table 1: Survey questions and evaluation results

Item	Survey analysis N(%) N = 76, 102						
	Score	Very bad	Bad	Mediocre	Good	Very good	Total
Can you recall the structure of the hamate bone from the wrist bone in 3D?	Preliminary	9(8.8)	38(37.3)	40(39.2)	11(10.8)	4(3.9)	102(100)
	Post	0(0)	6(5.9)	19(18.6)	54(52.9)	23(22.5)	102(100)
Can you distinguish the front and back of the hamate bone in an anatomical position?	Preliminary	1(1.3)	29(38.2)	29(38.2)	10(13.2)	7(9.2)	76(100)
	Post	0(0)	6(5.9)	14(13.7)	52(51)	30(29.4)	102(100)

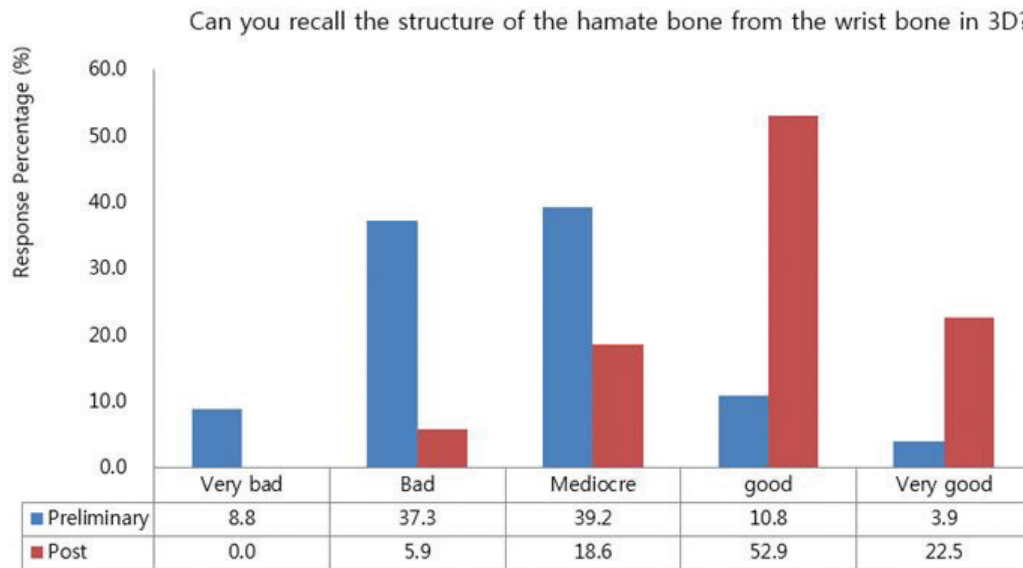
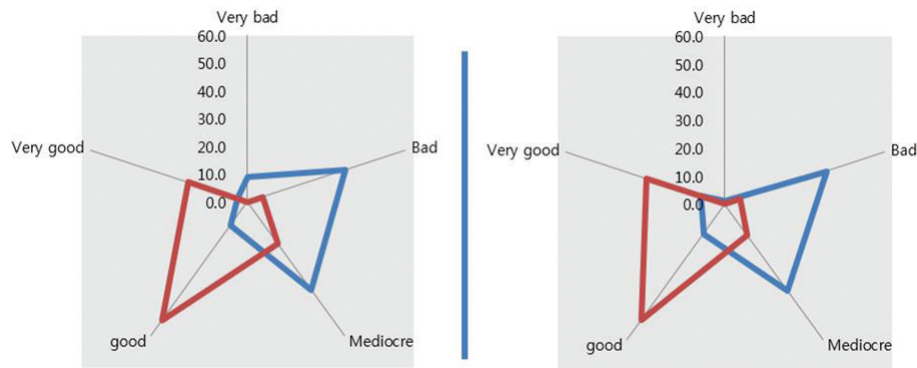


Figure 5: Hamate bone pre- and post-survey learning effect analysis graph

The students who answered “Good” and “Very good” to the question “Can you recall the structure of the hamate bone from the wrist bone in 3D?” increased from 14.7%(preliminary survey) to 75.4%(post-survey), and the students who answered “Good” and “Very good” to the question “Can you distinguish the front and back of the hamate bone in an anatomical position?” increased from 22.4%(preliminary survey) to 80.4%(post-survey). Fig. 5 is a bar graph comparing the 5-point Likert scale survey questions, and Fig. 6 is a radial graph that compares the results of the survey, which shows the preliminary negative opinion(blue) in contrast with the post-positive opinion(red) [Figure 5] [Figure 6].



Evaluation on the ability to recognize 3D shape of the hamate bone(left) and the ability to distinguish the front and back of the hamate bone(right).

Figure 6: Comparison of hamate bone pre- and post-survey learning effect

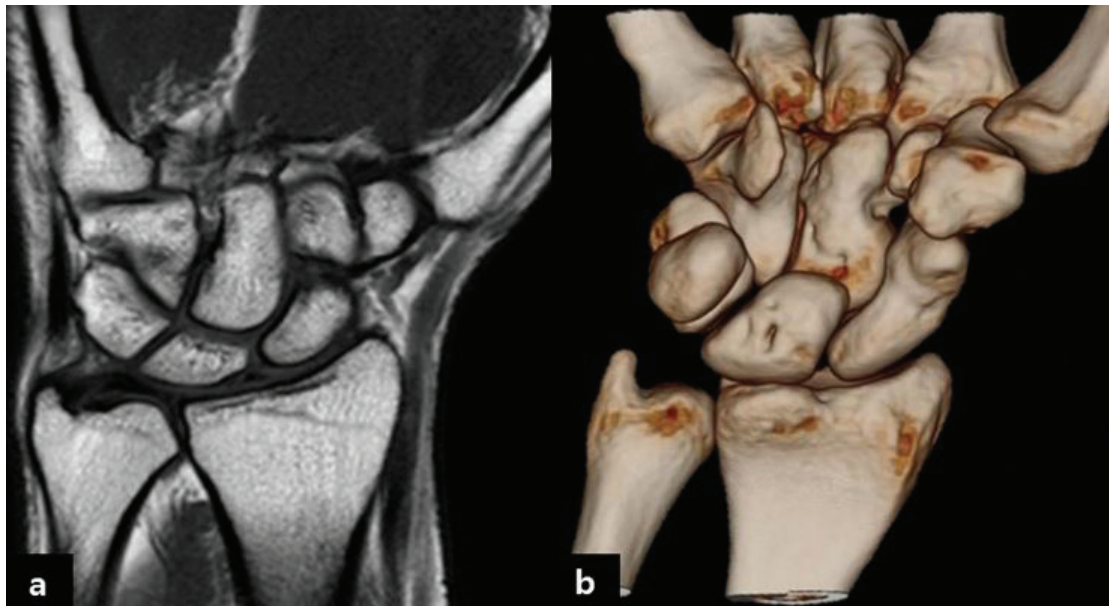
Discussion

This study used DICOM images and 3D printing technology to fabricate the hamate bone of the wrist joint in the human anatomy structure^[9-11]. With the hamate bone model printed by 3D printing technology, the 5-joint surfaces and the front and back of the protruding hook were examined, which are difficult to identify in 2D and 3D images. This hamate bone is one of the 8 wrist bones and has a distinctive hook of hamate in the front in the

shape of a wedge. It also forms a joint with the 4th and 5th metacarpal bone, triquetrum, capitate, and lunate^[12]. The various shapes of bones in the human body result from the ligaments and muscles attached to function the human body, and the hamate bone was applied to this study because an important ligament that holds the wrist tunnel is attached to this bone, and recently many injuries have occurred in this area due to the increase of sports activities. This study aimed to explore the understanding of anatomy students by modeling the characteristics of

the hamate bone with 3D printing. With the application of 3D printing, 2D medical images can be instrumented and visualized, which can draw curiosity and interest of the students in future. Designing human anatomical structural models for learning and printing them on a 3D printer will provide a variety of applications for learning^[13]. Recently, DICOM imaging has the technology to acquire a thin section of less than 0.5mm. Through this technology, the synergies will increase by visualizing the reconfiguration of multiple sections and integrating with 3D printers. As shown in the wrist joint image of this

study, it is possible to distinguish several bone shapes and boundaries to some extent, but to understand the 5 articular surfaces of the hamate bone, a lot of time along with 3D reconstruction technology and environment must be accompanied to continuously view and understand many cross-sectional images[Figure 7]. As shown in Fig. 8, there are many limitations in enhancing the academic understanding of the various shapes of the hamate bone with DICOM images only [Figure 8]. Furthermore, it is more difficult to understand for students with a low level of human anatomical knowledge.



2D coronal section(a) and 3D volume rendering(b) images.

Figure 7: Carpal bone coronal images

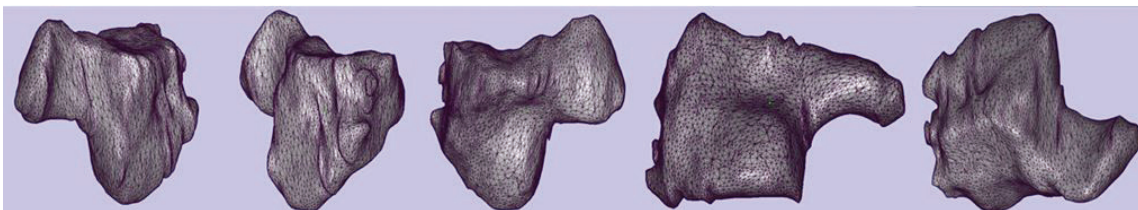


Figure 8: Various shapes of the hamate bone

In the questionnaire survey of this study, only 76 students responded to the question “Can you distinguish the front and back of the hamate bone?”, which is considered to be the result of students in lower grades were unable to answer the question. These students are familiar with the term ‘hamate bone’ but have a low human anatomical understanding of the front and back of the bone. As a result, although this study was limited to 102 university students, the learning effect of showing the actual shape of the hamate bone was high. Therefore, if DICOM technology that is capable of describing the

human body and 3D printing technology that can copy the same shape are integrated, the educational effect for students learning human anatomy will increase significantly^[14].

Conclusions

A hamate bone printed with 3D printing technology has increased the students’ understanding of the 5 articular surfaces and the front and back of the protruding hook that are difficult to identify in 2D or 3D medical

images. This was the result of comparing visual medical images with an actual shape printed on a 3D printer, which resulted in a 60.7% improvement in the intuitive awareness and a 58% improvement in the morphological awareness through a hamate bone shape. This is a result that shows modeling through 3D printing is effective for students learning human anatomy.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Effect of Science and Technology on Quality of Life Perceived by College Student

Byung-Man Kim¹, Mi-Seung Yun², Jeongjin Yoon³, Jungin Kim⁴, Migyung Cho⁵

¹Early Childhood Education, Kyungnam University, Kyungnamdaehak-ro, Masanhappo-gu, Gyeongsangnam-do, Korea; ²Dept. of Early Childhood Education, Kyungsung University, 309, Suyeong-ro, Nam-gu, Busan, Korea; ³Dept. of Early Childhood Education, ⁴Dept. of Computer Engineering, ⁵Dept. of Game Engineering, Tongmyong University, 428, Sinseon-ro, Nam-gu, Busan, Korea

ABSTRACT

Background/Objectives: We examined the perceptions of how science technology can change quality of life. We wanted to analyze what kind of images students have about science technology and quality of life.

Method/Statistical Analysis: A total of 144 students attending liberal arts classes were asked to describe the impact of science and technology on quality of life. All students were divided into small groups and activities were conducted among the groups. Two experiments were conducted to investigate whether the science technology have a positive or negative impact on quality of life. In addition, we analyzed the factors that lead to positive or negative views.

Findings: We could classify students' images about science and technology and quality of life as mental factors, Socio-economic factors, technical factors and environmental factors. Socio-economic factors accounted for 63% of the total image frequency. The second most common factor was technical factors, accounting for 27% of the total. From the technical point of view, there are many positive factors that can improve the quality of life. Third, mental factors accounted for about 6%. Students thought that science and technology would negatively affect human mental factors. Finally, the image of the environmental factor was 3.7%, indicating that science technology would cause environmental problems such as air pollution and water pollution. The results of the chi-squared analysis showed that the four factors were discriminative factors that showed differences in opinion about how science technology affects quality of life in the future.

Improvements/Applications: In order to improve the quality of life through the development of science and technology, socio-economic, mental factors and environmental factors derived from this study can be reflected in the policy.

Keywords: *Science and technology, future society, quality of life, Perception of university students, chi square analysis*

Introduction

People think differently about how science and technology will affect the quality of human life. To address these problems, some researches have been conducted on how science and technology can affect the

quality of life of humans ^[1-5]. Some people are worried that the development of science and technology led by global corporations can not improve the quality of life of individuals and lead to a dystopian future due to indiscreet development. Some people worry that the development of robotic technology will lose human jobs. But some people think that science and technology in various fields are improving the quality of our lives. It is hoped that science and technology will help the lives of the underprivileged and be very useful for health and welfare, thus improving the quality of human life. They believe that the development of technology to predict and

Corresponding Author:

Migyung Cho
Professor, Dept. of Game Engineering,
Tongmyong University, Korea
Email: mgcho@tu.ac.kr

respond to natural disasters such as floods and typhoons has ensured a safer life for mankind. Especially, science and technology are directly connects with the economy of the country and have a great impact on the lives of the people.

Quality of life generally refers to the level of mental life, and we tend to regard subjective happiness as the quality of life [6-7]. Quality of life is known not only to economic conditions but also to non-economic factors such as social relations, social psychological factors, institutional factors, environmental factors, and physical factors. The economic condition and the quality of life are known to be less correlated if the economic level exceeds a certain level. If annual GDP is more than \$ 10,000 the rate of increase in subjective well-being with income increases tends to decrease [8]. The impact of income on life satisfaction is maximized in a set of annual income less than \$ 15,000. When income is above a certain level, non-economic variables determine the quality of life [9]. The WHO Quality of Life Groups defines the quality of life as a personal perception of one's own situation in the context of his or her own cultural and value system and his/her goals, expectations, norms and interests [10]. UN defined the quality of life from a subjective perspective by defining quality of life as the concept of human welfare measured by social indicators rather than quantitative measures such as income or production [11].

Cho et al. investigated how science and technology affect the quality of lives of the socially underprivileged, and they reported that science and technology have a very positive effect on the quality of life of people with disabilities and the elderly [1]. Through hearing aids, hearing impaired people perceive sounds, perceive their surroundings, communicate with people, and express their opinions. Therefore, hearing aids are very closely related to emotional well-being and satisfaction, interpersonal relations, self-determination and choice, and rights. They said that the quality of life for people with mobility impairments due to electric wheelchairs is greatly improved. Science and technology can contribute to meet social demand and increase social value. When the quality of life and the promotion of welfare are linked with technological innovation, the related industrial base is formed and the development of the industry can create employment and added value. Therefore, they said that it is necessary to promote the technological innovation, the

technology acquisition, and the policy and the linkage between them in order to increase the quality of life in the public area [1].

Kang said that quality of life includes value judgment, but science technology itself can be assumed to be value-neutral [2]. Therefore, it is easy to understand how to connect with each other through variables of science and technology utilization rather than directly associating quality of life with science and technology. No matter how wonderful science and technology are, if the use of science and technology plays a negative role in the quality of life, science and technology will greatly deteriorate the quality of life. On the other hand, even if science technology is a little lacking, the quality of life is improved if utilization of science technology plays a positive role in quality of life. A rich life due to the driving force of economic development, a healthy life due to advanced medical equipment, a safe life due to weather forecasts, a convenient life to utilize rehabilitation aids, and so on. However, environmental destruction could lead to global warming, the depletion of energy resources and excessive waste, which could reduce quality of life. He argued that the current use of science and technology should seriously analyze and predict the impact on future quality of life.

Kim claimed that the functions of science and technology should be changed in terms of the quality of life and the role of science and technology [3]. Science and technology should be able to provide meaning for sustainability and concrete measures for achieving it. In order to do this, it is necessary to make efforts for continuous research and information acquisition under global cooperation, and to provide national support for this. Kim suggested that the quality of life can be divided into objective dimension and subjective dimension in the improvement of future life quality and the development of science and technology [4]. The objective dimension is something that can be identified as an objective indicator of physical components such as clothing, health, income and working environment. And the subjective dimension is the cognitive state in which subjective evaluation such as satisfaction, independence, sense of achievement, cultural affluence, safety, and stress works. It is argued that science and technology that promote communication and relationship together will be needed when considering the Korean people's strong desire for competition and expectation.

Cho et al. focused on the impact of science and technology development on quality of life in that science and technology development is aimed at improving the quality of human life^[5]. He studied to identify perceptions of quality of life in specific areas. He examined how science and technology affected human economic life quality, healthy life quality, safe life quality, convenient life quality, pleasant life quality, socio-cultural life quality. In addition, research on the sustainability and quality of life of science and technology has confirmed that both agree that science and technology will help improve the quality of life. The results that science and technology can improve the quality of life showed a very positive response overall, and it was confirmed that future generations perceived more positively than current generations. The impact of science and technology on the quality of economic life and the quality of life is more positive for future generations than for generations. The question on safety, education, environment, and society was that the average response of the current generation was higher.

We investigated the perception of college students about the impact of science and technology on the quality of life in the future. Our research team saw a science fiction film about a future society that could come from science and technology. We looked at movies with students over three weeks and looked at college students' perceptions through small-group discussions and mini-essay tests. Students enrolled in liberal arts classes vary from grade 1 to grade 4, with majors in science and arts, and men and women. We analyzed students' opinions and responses to the effects of science and technology on future students' lives after class. We look at how similar the views of college students are with previous studies. And we want to see if college students have a positive or negative view of science and technology and why they had such a view.

Materials and Method

After the liberal arts class using movies, we conducted mini-essay tests asking students about their personal opinion on the impact of science and technology on quality of life in the future. We asked our students a personal opinion on whether they think science and technology will improve the quality of life in the future or that they will decrease the quality of life. We had asked them to describe three or more freely

why they think so. We wanted to know the views on the relationship between science and technology and quality of life. In addition, we wanted to see what images they have about future science and technology.

Test Subjects: The subjects participating in this study are 144 people as shown in Table 1. There are 40 students in science and engineering major and 104 students with major in humanities. The genders participated in the experiment were similar, and 87% of the lower grades were more than two grades. In the first week, students watched the film and in the second week, they lectured on modern genetic engineering techniques that became the background of the movie "Gattaca". In the third week, small groups were discussed about how science and technology would affect future society. In order to analyze their perception and image of science and technology in detail, a mini essay test was conducted.

Table 1: Test subjects

	Kinds	Number	Ratio
Grade	Freshman	84	0.583
	Sophomore	43	0.299
	Junior	11	0.0764
	Senior	6	0.0417
Gender	Female	71	0.493
	Male	73	0.507
Major	Science and engineering	40	0.278
	humanities	104	0.722

Research Method: Movie "Gattaca" was released in 1997 and is a science fiction film about how future science and technology can change human life. The film deals with the destruction of human life by science and technology in the future. Those who are born with genetic engineering to remove the recessive factors form the upper echelons of society. However, people born with traditional marital relationships are born with inferior factors. So they are treated as inferior humans and pushed to the bottom of society. The film deals deeply with the negative views that may arise from the development of science and technology. We thought that because of this movie theme, students could have more negative thoughts about science and technology, and that this prejudice could affect the mini essay test.

The subjects of the mini-essay test conducted for the recognition survey of college students were

as follows.” Some people dream of a future where all people live happily with the development of brilliant science and technology. However, there are people who pessimistically anticipate the future in which individuals can not enjoy human life because of the side effects of science and technology. Movie “Gattaca” we saw belongs to the latter. Predict whether one thinks science and technology development will improve the quality of life for the future or whether it will decrease it. Explain three or more concrete examples that you can predict and prove your argument in detail.

We categorized the words that students expressed freely about science technology and future quality of life. We could classify all of the students’ words into mental factors, social boundary factors, technical factors, and environmental factors. The perception of the students we classify is based on the existing studies that the quality of life is influenced not only by economic conditions but also by non-economic factors such

as social, psychosocial, institutional, environmental, and physical factors. However, students’ perceptions differed from those of previous studies that showed positive views on existing science and technology. We conducted a chi-square analysis to see if the four factors that were categorized had an effect on students’ views and perceptions.

Results and Discussion

Table 2 shows the words related to the image of the science technology described by the students on the quality of life. There were 23 images described by students. We divided them into themes and classified them into mental factors, socio-economic factors, technical factors, and environmental factors. As shown in Table 2, the areas described by the majority of students with the most factors are socio-economic factors. This showed that science and technology have the greatest impact on human socio-economic factors in the students’ perception.

Table 2: Students’ image on the impact of science and technology on quality of life

Territory	Contents (Frequency/Ratio)
Mental factors	Life satisfaction (1/0.32), Loss of humanity (1/0.32), Depression (2/0.64), Loss of dream (1/0.32), Loss of emotion (1/0.32), Loss of will (6/1.93), Machine dependence (6/1.93).
Socio-economic factor	War(4/1.29), political participation(1/0.32), lack of interpersonal relationship(7/2.26),aging(2/0.64), telecommuting(1/0.32), abundant life(16/5.16), convenient life(13/4.19), welfare system(1/0.32), social unrest(2/0.64), polarization of wealth(32/10.3), job problem(29/9.35), social control(5/1.61), leisure life(17/5.48), alienation(1/0.32), suicide rate(1/0.32), misuse of the technique(14/4.52), monopoly of the technique(25/8.06), ignore life(16/5.16)
Technical factors	treatment of incurable diseases(15/4.84), transportation(7/2.26), robot(7/2.26), artificial intelligence(2/0.64), genetic engineering(4/1.29), space travel(3/0.96), virtual reality(2/0.64), life extension(4/1.29), personal information leak(3/0.96)
Environmental factors	overcoming environmental pollution(2/0.64), environmental pollution(7/2.26), depletion of resources(2/0.64)

Socio-economic factors accounted for 63% of the total image frequency, with 18 factors. The majority of socioeconomic factors were wealth polarization, job problems, monopoly of science and technology, abundant life and leisure life. Positive and negative views were found to be compatible, with a slightly less negative view. The word most often mentioned by students was the polarization of the rich. Students thought that science and technology would encourage the polarization of the poor in the future. Next, students considered their job problems to be serious and human jobs were threatened by high-level robotic engineering. In addition, they believed that

the monopoly of science and technology and the abuse of science and technology of a global company or a specific country had a negative impact on humanity. In a positive view, students expected that the development of science and technology would enable them to enjoy leisure life, abundant life and convenient life, and increase human life span. Unusual among negative views, they thought that life-shortening phenomena would appear. This was close to 5%, which seems to be the influence of the film “Gattaca”. There was also a lack of interpersonal relationships. We have not found anything different from previous studies in socio-economic factors.

The second most common factor was technical factors with 9 factors, accounting for 27% of the total. In the technical factor, there were many positive views that science and technology can improve the quality of life. The development of artificial intelligence, transportation and robotic technology was expected to make human life more convenient. In addition, medical technology due to genetic engineering was developed, and it was expected that it would be possible to treat incurable disease and give them a healthier life. He also thought that the development of robots would replace dangerous and difficult things that humans should do. On the other hand, a small number of students worried that the information would be collected and leaked by science and technology, which would affect the individual's life negatively.

Third, the mental factor had seven images and was about 6%. They thought that science and technology would negatively affect human mental factors. They thought that when science was highly developed, the dependence on machines increased and humans might fall into a loss of motivation, loss of dream and loss of emotion. They also recognized that human alienation could occur in the future. Finally, the overall image of environmental factors was 3.7%. In environmental factors, very few students thought that environmental pollution would be overcome, but most students thought that science and technology would cause environmental pollution problems such as air pollution or water pollution and depletion of resources, which would reduce the quality of life. There was no significant difference between the factors in the existing studies that have studied the impact of science and technology on quality of life and the image of students' science and technology.

Table 3 shows the chi-square analysis of the students' answers to their positive or negative opinions for four categories of the science and technology. In order to investigate the difference of image perception between positive and negative viewpoints of college students on the impact of science and technology on quality of life, we classified the cognitive contents into mental, socio-economic, technical and environmental factors and then conducted a Kai test. As a result of the analysis, there were statistically significant differences in the image recognition of positive and negative opinions ($\chi^2 = 28.02$, $p < .001$).

Table 3: Difference between positive and negative views (N = 297)

Item Contents	University students					χ^2
	MF	SEF	TF	EF	Total	
Utopia	1 (1.0)	49 (51.0)	44 (45.8)	2 (2.1)	96 (100.0)	28.02***, df=3
dystopia	17 (8.5)	138 (68.7)	37 (18.4)	9 (4.5)	201 (100.0)	
Total	18 (6.1)	187 (63.0)	81 (27.3)	11 (3.7)	297 (100.0)	
***p < .001., MF: Mental factors, SEF: Socio-economic factors, TF: Technical factors, EF: Environmental factors						

Conclusion

We examined perceptions of the science and technology of college students on the quality of human life through liberal arts classes using movies. We have classified students' images of science and technology into mental, socio-economic, technological, and environmental factors. Students thought that the development of science and technology had the greatest impact on socioeconomic factors among the categories of quality of life. And the number of students who perceived that they would improve their quality of life and the number of students who perceived that they could degrade were similar. On the other hand, students had the perception that technical factors would improve the quality of life. For mental factors, they perceived that science and technology would reduce the quality of life. We conducted a Kai test to see if the four factors have a significant effect on predicting whether to improve or deteriorate the quality of future life. The result showed that there was statistically significant difference in image recognition for the two opposing views of the four factors.

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Development of Korean Herbal Medicine Cosmetics Containing Polygonum Multiflorum Extracts

Eun-Suk Kim¹, Hye-Jin Kwon²

¹Professor, Dept. Beauty Art, Seokyeong Univ., Sungbuk-gu Seoul Korea, 02713; ²Professor, Dept. Chemical Engineering, Soongsil Univ., Dongjak-gu Seoul Korea, 06978

ABSTRACT

Background/Objectives: The purpose of this study is to develop raw materials of Korean herbal medicine cosmetics that can improve aging skin of middle-aged women through the analysis of anti-oxidation and anti-aging using domestic PolygonumMultiflorum.

Method: Extraction, anti-aging and antioxidant experiments were designed and performed by synthesizing previous studies based on scientific evidence and a prescription in Donguibogam (Treasured Paragon of Eastern Medicine) that utilized PolygonumMultiflorum for regaining vigor and rejuvenating at an old age.

Findings: The result of this study showed that PolygonumMultiflorum presented high anti-oxidation effect from the analysis of Polyphenol, Flavonoid, and DPPH and it also has an excellent inhibiting ability, showing great possibility to be used as a material for functional cosmetics. Moreover, it showed a significant synergy effect in composites mixed with other raw materials at a small mixing quantity.

Improvements/Applications: it has a great potential to be developed as a natural material for complex cosmetics in future.

Keywords: PolygonumMultiflorum, natural material, complex cosmetics, skin aging, middle-aged women, Korean herbal

Introduction

Aging population is increasing due to the recent increase in average life span. According to the announcement of Statistics Korea, the proportion of people aged 65 and older in 2018 is 14.3% of total population, indicating that Korea has become an aged society and it is expected to become a super-aged society by 2025 that the proportion of people aged 65 and older will reach 20.0%^[1]. Due to such social phenomenon, a lot of interest in elderly life and various efforts to prepare for old age and maintain youth and beauty are being made. Aging is a general and universal phenomenon that everyone experiences in life but it is recognized as a negative matter from various aspects including body,

soul, society, and culture in modern society^[2]. Therefore, many people are fearful and anxious about aging^[3].

Especially, middle-aged woman complain of psychological depression and emptiness from aging that happens suddenly before and after menopause along with physical abnormality. In addition, aging in the middle age impairs the function of the ovaries and reduces hormones such as estrone, estradiol, and estrogen, resulting in a collapse of collagen formation that causes a loss of elasticity and wrinkles. In other words, the vitality is lost in terms of functionality as well as beauty. The desire to prevent or improve such skin aging is growing further in proportion to the improvement of general living standard and trend of studies on anti-aging and development of raw materials is switching from a passive concept as “prevention of aging” to an active concept as “treatment”^[4]. The cosmetics industry is equipped with anti-aging system that can remove and prevent excessive oxygen free radicals from the skin and studies regarding natural antioxidants that can delay the aging of skin are being carried out actively^[5].

Corresponding Author:

Hye-Jin Kwon
Professor, Division of Chemical Engineering,
Soongsil University, Korea
Email: kwonhj0070@ssu.ac.kr

Polygonum Multiflorum is a tuberous root of *Polygonum multiflorum* Thunberg which is a perennial herb and it belongs to Polygonaceae. *Polygonum Multiflorum* is classified into red *Polygonum Multiflorum* and white *Polygonum Multiflorum*, and red *Polygonum Multiflorum* is a polygonaceae plant which is distributed and inhabits in Henan, Guangxi, Guangdong, Sichuan, and Guizhou in China^[6,7]. In addition, white *Polygonum Multiflorum* is an asclepiadaceae plant which is distributed and inhabits in Korea, China, and Japan and its cultivation method has been developed recently, so it is cultivated and produced in various areas^[8]. The composition of *Polygonum Multiflorum* includes starch 45%, crude fat 3.1%, anthraquinone emodin, lecithin, and shrysophanol and among these components, emodin shows the highest content and it is reported that it has antibacterial, antioxidant, anti-inflammatory, and anti-tumor activities^[9,10].

Therefore, the purpose of this study is to confirm the antioxidant effect and skin-aging improvement effect of *Polygonum Multiflorum* which is a natural herbal raw material and present direction of raw material development for multi-functional cosmetics.

Materials and Method

Materials for Experiments and Production of Extracts: *Pleuropterum multiflorum*, used as the experimental specimen, was purchased from a farm in Jangsu-gun, Jeollabuk-do Province in May 2017, and it was used after the process of washing and drying. 100 mL of three types of solvents (DW, 70% EtOH, 99% EtOH) were applied to 10 g of dried *Pleuropterum multiflorum*, respectively. The extract was obtained using reflux condenser (Labpia, LP, Korea) at 40°C~80°C for 24 hours. After filtering the extract (No.2, Advantec, Japan), a vacuum evaporation was carried out using the rotary evaporator (Rotary Evaporator N-1000SW, Eyela, Japan). The final specimen powder was obtained from the vacuum evaporated *Pleuropterum multiflorum* extract using the lyophilizer (Lyophilizer FD5508, Ilshin Lab co., Korea).

MTT Assay: For the RAW 264.7 cells used in the cell experiment for toxicity assessment, the cells obtained after culturing for 3 days using the DMEM culture medium were divided into 24 well plates by 1.5×10^5 and cultured at 37°C, 5% CO₂ culture medium for 24 hours. When the cells were grown by more than 90%,

10, 50, 100 µg/mL were set as the final concentration of three different extracts, and the cells were divided into each well by 100 µL and cultured again for 24 hours. After reaction, 900 µL of culture medium and 100 µL of 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) were added and reacted for 2 hours. The culture medium was removed after 2 hours, and 100% DMSO 1 mL was added to resolve MTT formazan absorbed into the cells, and the cells were separated into 96-well plates by 50 µL and the absorbance was measured at 570 nm using the microplate reader (Synergy MX BioTek instrument, Winooski, VT).

Measurement of Total Polyphenol Content and Total Flavonoid Content: For total polyphenol compound content of the extract, experiment was conducted using the modified Folin-Denis method showing a change in color through the reaction with a certain reagent (phosphomolybdic acid). 100 µL of extracted specimen and 1 mL of 2% Na₂CO₃ were mixed and reacted for 2 minutes, and then 100 µL of 50% Folin-ciocalteu's phenol reagent concentration was added and reacted for 30 minutes. Total flavonoid content per gram was measured using the Diethylene glycol method. 100 µL of extracted specimen, 100 µL of 1N NaOH and 1 mL of diethylene glycol were added and reacted at 30°C for 1 hour. The discoloration was measured using the UV/VIS spectrophotometer (OPTIZEN 2120UV, Mecasys co. Korea) at 750 nm for total polyphenol and 420 nm for total flavonoid.

Dpph Radical Scavenging Activity: The antioxidant activity was measured using the modified 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity Blois which was one of most general methods. Triz buffer and Methanol 500 mM DPPH with a pH of 7.4 were produced. 100 µL of extracted specimen, 400 µL of 0.1M Triz buffer and 500 µL of 500 mM DPPH were mixed and reacted for 30 minutes and the absorbance was measured at 517 nm.

Measurement of Elastase Inhibitory Activity: The extracted specimen was diluted by 0.1%, 1%, 10% and 100%, respectively and elastase and N-succinyl-(L-Ala)3-p-nitroanilide were dissolved in 50 mM Tris-HCl buffer (pH 8.6). 40 µL of 2.5 U/mL elastase concentration was added to 40 µL of the specimen, and then 80 µL of 0.5 mg/mL N-succinyl-(L-Ala)3-p-nitroanilide concentration was added and reacted at 37 °C for 30 minutes, and then the absorbance was measured at 445 nm wavelength.

Measurement of Collagenase Inhibitory Activity: The extracted specimen was diluted by 0.1%, 1%, 10% and 100%, respectively and 4-phenylazobenzoyloxycarbonyl-Pro-Leu-Gly-Pro-D-Arg was dissolved in 0.1M Tris-HCl buffer (pH 7.5) added with 4 mM CaCl₂. 250 μ L of 0.3 mg/mL 4-phenylazobenzoyloxycarbonyl-Pro-Leu-Gly-Pro-D-Arg concentration was applied to 100 μ L of the specimen, and 150 μ L of 0.2 mg/mL collagenase concentration was added and reacted for 20 minutes, and then, 500 μ L of 6% citric acid and 1.5 mL of ethyl acetate were applied and the absorbance was measured at 320nm wavelength.

Sub-title: All results were measured and analyzed repeatedly for three times. For the verification, the significance at $p < 0.05$ was investigated with Duncan's multiple range test during the oneway analysis of variance (ANOVA) using the SPSS 20 (SPSS Inc., Chicago IL, USA).

Results and Discussion

MTT Assay: The cytotoxicity result of Pleuropterus multiflorus extract was shown in Figure 1. The cell survival rate in all extracts was over 80%, indicating that Pleuropterus multiflorus extract had no cytotoxicity.

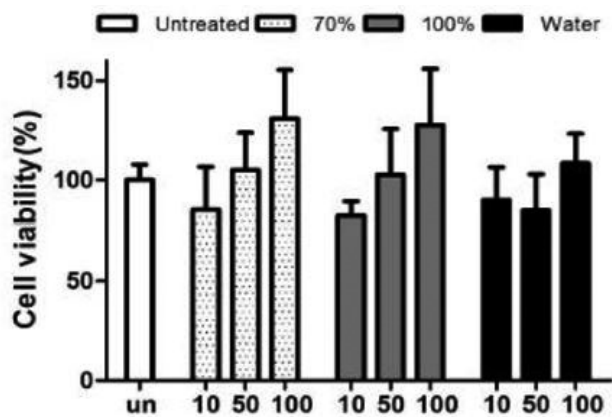


Figure 1: Cell viability of RPME

Analysis of total polyphenol content and total flavonoid content: Polyphenol and flavonoid are typical antioxidants in plants that have various effects. Especially, such substances affect the skin, preventing natural aging due to oxygen free radical. These substances are very effective for rapid skin aging of middle-aged women who entered menopause [11]. In addition, antioxidants are essential for preventing or making skin pigments such as freckles and blemishes caused by the irregularity of

melanin in the skin due to reduced estrogen lighter^[12]. Total polyphenol content and total flavonoid content in Pleuropterus multiflorus extract were shown in Table 1. Both of these substances showed excellent antioxidant effects, indicating that these substances are suitable for antioxidants.

Table 1: According to solvents contents of total polyphenol and total flavonoid

Solvent	D.W	70%EtOH	100% EtOH
T. P.	12.53 $\pm$ 0.02 mg/g	26.22 $\pm$ 0.06 mg/g	39.38 $\pm$ 0.08 mg/g
T. F.	0.10 $\pm$ 0.01 mg/g	0.13 $\pm$ 0.01 mg/g	0.13 $\pm$ 0.01 mg/g

Analysis of DPPH radical scavenging ability: The DPPH radical scavenging activity comparison result of Pleuropterus multiflorus extract according to solvents was shown in Table 2. The extract showed concentration dependent antioxidant effect and the antioxidant effect was shown in order of "70% EtOH > 100% EtOH > distilled water" according to the comparison result by solvent. The result at 10000 ppm was similar to that of Ascorbic acid which was the control group, indicating that the antioxidant effect of Pleuropterus multiflorus extract was highly superior.

Table 2: According to solvents DPPH radical scavenging ability

Solvent	D.W.	70% EtOH	100% EtOH
10 ppm	12.00 $\pm$ 0.35, %	11.93 $\pm$ 0.25 %	9.06 $\pm$ 0.20 %
100 ppm	21.04 $\pm$ 0.06 %	20.04 $\pm$ 0.11 %	22.80 $\pm$ 0.04 %
1000 ppm	53.97 $\pm$ 0.18 %	78.77 $\pm$ 0.05 %	72.72 $\pm$ 0.40 %
10000 ppm	64.59 $\pm$ 0.36 %	82.39 $\pm$ 0.04 %	75.03 $\pm$ 0.05 %

Analysis of elastase inhibitory activity: According to the research paper of Jin (2015) [13], anti-aging materials of representative domestic cosmetics companies included retinol from Amore Pacific, culture medium of a stem cell from plant cambium jointed developed by LG Household & Health Care Ltd. and the Sederma research institute in France, and peptide from ISA KNOX. Such anti-aging cosmetics materials display excellent ability to inhibit Elastase or Collagenase activities that cause

a loss of elasticity and wrinkles ^[14]. Therefore, the test substance formula containing DCCM4 which was the culture medium of a stem cell supplied from SMEDIA was used as the control group in the analysis of Elastase inhibitory activity and Collagenase inhibitory activity for anti-aging analysis. In addition, the specimen extracted with 70% EtOH solvent which showed the highest effect in the antioxidant activity test was used for *Pleuropterismultiflorus* extract. The measurement result of elastase inhibitory activity from three specimen types was shown in Figure 2. All specimens were concentration dependent and DCCM4 showed higher inhibitory activity by concentration than *Pleuropterismultiflorus* extract, but composites containing 10% *Pleuropterismultiflorus* extract showed higher activity than DCCM4, indicating that the mixing with low concentration natural substance shows a higher effect.

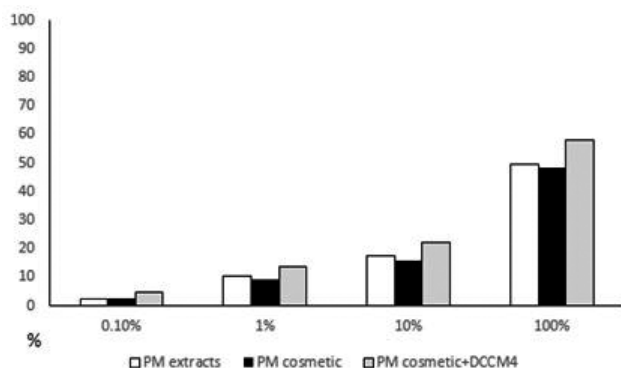


Figure 2: Elastase inhibitory activity of Samples were incubated at 0.1,1, 10 and 100% with elastase, N-succinyl-(L-Ala)3-p-nitroanilide for 30 mins. Activities were determined by measurement of absorbance at 445 nm. The results were expressed as mean $\pm$ S.D from three independent experiments

Analysis of collagenase inhibitory activity: The measurement result of collagenase inhibitory activity from three specimen types was shown in Figure 3. These specimens were concentration dependent similarly to the elastase inhibitory activity result, but the result of composites and single DCCM4 was similar, so there was no significant difference. Various factors cause skin aging in the middle age, and one of most significant factors is the activation of enzymes that break down connective tissues such as collagen ^[15]. Therefore, it is considered that *Pleuropterismultiflorus* extract which effectively inhibits the activation of enzymes is highly suitable as a raw material for anti-aging cosmetics, and *Pleuropterismultiflorus* extract is also natural herbal substance that can solve various problems from synthetic materials that may occur in the middle age.

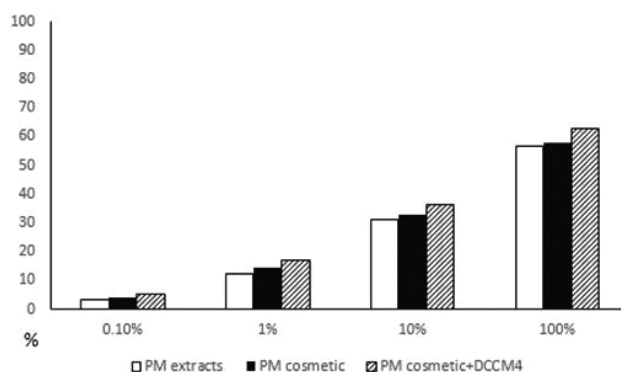


Figure 3: Collagenase inhibitory activity of Samples were incubated at 0.1,1, 10 and 100% with Collagenase, 4-phenylazobenzyloxycarbonyl-Pro-Leu-Gly-Pro-D-Arg for 20 mins. Activities were determined by measurement of absorbance at 320 nm. The results were expressed as mean $\pm$ S.D from three independent experiments

Conclusion

In this study, it was intended to develop raw materials of Korean herbal medicine cosmetics for middle-aged women using *PolygonumMultiflorum* that only grew naturally in Korea. The result of the study showed that *PolygonumMultiflorum* contained high content of polyphenol and flavonoid that were typical antioxidants of plants and DPPH activity similar to that of ascorbic acid which was the control group at 10,000 ppm, proving that it was an excellent antioxidant. It also showed a high Elastase and Collagenase inhibitory activity, and especially, composites containing 10% extract showed very high Elastase inhibitory activity, so it is considered that *PolygonumMultiflorum* extract is suitable as a natural and herbal functional raw material.

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Moderating Effects of Wage Satisfaction and Social-organizational Support on the Relationship between Emotional Dissonance and Turnover Intention among Korean Dental Hygienists

Cho-Rong Kim¹, Leeann R. Donnelly², Jun-Seon Choi³

¹Department of Dental Hygiene, Graduate School of Gachon University, 191 Hambakmoero, Yeonsu-gu, Incheon, Korea, 21936; ²Faculty of Dentistry, University of British Columbia, Vancouver, BC, Canada, V6T 1Z3; ³Department of Dental Hygiene, Gachon University, 191 Hambakmoero, Yeonsu-gu, Incheon, Korea, 21936

ABSTRACT

Background/Objectives: Emotional dissonance is a risk factor for job dissatisfaction among healthcare workers. This study investigated the moderator variables influencing the relationship between emotional dissonance and turnover intention.

Method/Statistical Analysis: This cross-sectional study surveyed 270 Korean dental hygienists working full-time at dental care facilities using a structured questionnaire. Socio-demographic characteristics, emotional dissonance, turnover intention, and individual and organizational factors were collected. The individual and organizational factors were considered moderator variables. The t-test, one-way ANOVA, and moderated multiple regression were used.

Findings: Dental hygienists experiencing more emotional dissonance had higher turnover intention ($p < 0.001$). The relationship between emotional dissonance and turnover intention was moderated by wage satisfaction and social-organizational support ($p < 0.05$), but not by individual factors. These findings suggest that intervention strategies to buffer, effectively, turnover intention due to emotional dissonance should be developed and implemented at an organizational level.

Improvements: Further studies must examine a greater variety of moderator variables that may effectively mitigate turnover intention.

Keywords: Dental hygienists, Emotional dissonance, Social-organizational support, Turnover intention, Wage satisfaction

Introduction

Dental care facilities are facing competitive pressure and unprecedented challenges^[1]. Patients expect high-quality dental care, increasing the potential for patient complaints^[2]. As patient satisfaction can have an impact on the business performance of a health care facility, particularly on the patients' cooperation with

treatment^[3], health professionals must make efforts to provide high-quality health care. Furthermore, the patient's perspective is becoming more and more important in evaluating the quality of health care^[4], exposing more health professionals to situations where they must behave or express their feelings in accordance with rules and regulations defined by the organization^[5]. In such a patient-driven work environment, emotional labor—the process of managing one's true feelings and expressions—is increasingly important for health professionals, including dental hygienists^[6]. Unfortunately, emotional dissonance i.e., the conflict due to the discrepancy between emotions experienced by the employee and those required by the organization, is

Corresponding Author:

Jun-Seon Choi
Associated Professor, Department of Dental Hygiene,
Gachon University, South Korea
Email: junseon@gachon.ac.kr

prevalent among health professionals, resulting in severe side effects^[7,8]. Generally, when health professionals experience emotional dissonance, they choose a harmful coping strategy such as surface acting, which leads to increased work strain, to fulfill their responsibilities to the patients^[9]. As a result, substantial literature has highlighted that emotional dissonance is a risk factor for emotional exhaustion^[10], medically certified absence due to illness^[11], and depression^[12]. In addition, emotional dissonance causes job dissatisfaction and burnout, and thus may be a reason for changing jobs^[8,13]. Therefore, emotional dissonance should be considered not just as a personal matter, but also as a social issue.

Effective management of health care staff is important to achieve business targets, while at the same time aiming to improve of the patients, and is particularly relevant in the highly labor-intensive industry of dental care^[14]. Dental hygienists providing oral hygiene services while also interacting verbally and face-to-face with patients. Therefore, as caregivers dental hygienists are required to conform to emotional regulations with respect to expressing appropriate emotions to patients^[15,16]. While emotional dissonance has received much attention among caregivers in the medical sector, we know little about how this impacts dental hygienists^[5].

The purpose of this study was to identify the relationship between emotional dissonance and turnover intention among dental hygienists, and to analyze the moderator variables influencing the relationship between emotional dissonance and turnover intention.

Materials and Method

Participants: This study was approved by the Institutional Review Board (IRB) of Gachon University, Korea (IRB NO. 1044396–201411- HR-028-01), and conducted in accordance with the tenets of the World Medical Association Declaration of Helsinki. Participants were recruited from 30 dental care facilities in Seoul and Incheon, Korea. The study's purpose and methods were sufficiently explained to the full-time dental hygienists. They signed a consent form, and completed a self-administered questionnaire during the period from December 15, 2014 through January 17, 2015. The minimum sample size required for multiple linear regression was calculated using G*power 3.1 software with the following parameters; 95% power, 5% significance level, and 0.15 medium effect size^[17].

The minimum sample size was determined to be 214. Considering the possibility of attrition, the survey was distributed to 300 participants; ultimately, 275 questionnaires were returned. Five of the questionnaires had missing data and were excluded, therefore a total of 270 questionnaires were used in the statistical analysis.

Study Design: This study used a cross-sectional design. The design of the study, based on the stressor-strain-outcome model^[18], is shown in Figure 1.

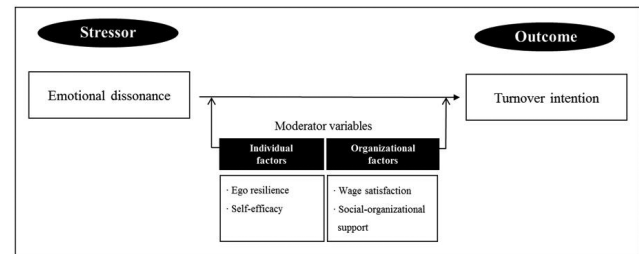


Figure 1: The Conceptual Model

Measurements: Five types of data were collected: socio-demographic characteristics (age, educational level, main professional duty, clinical experience), emotional dissonance, turnover intention, and individual factors (ego resilience and self-efficacy) and organizational factors (wage satisfaction and social-organizational support), treated as moderator variables. Emotional dissonance was assessed via the 14-items scale^[19]. The scoring options ranged from 0 (not at all) to 4 (almost always), with high scores indicating greater emotional dissonance. Turnover intention is defined as an employee's intention to voluntarily leave a job or company^[20]. Five items were used to assess turnover intention^[21]. The scoring options ranged from (not at all) to 4 (very much), and higher scores were considered indicative of greater turnover intention. Ego resilience is defined as the personality trait of not becoming frustrated, but rather adapting to stress and incessant environmental changes^[22]. The 14-item scale was used to assess ego resilience^[23]. The scoring options ranged from 0 (not at all) to 3 (very much), and higher scores were interpreted to show higher ego resilience. Self-efficacy is defined as a personal judgment of an individual that he/she can successfully accomplish a task necessary to achieve his/her desired result^[24]. The ten items were used to assess self-efficacy and rated on a 5-point scale^[25]. Higher scores were considered indicative of greater self-efficacy. The five items were used to assess wage satisfaction^[26]. The scores ranged from 0 (not at all) to 4 (very much), with higher scores indicating greater wage satisfaction. Social support refers to the helpfulness

of social interactions with both supervisors and peers in regard to work performance^[27]. A scale consisting of 8 items was used to assess social support^[28]. Organization support is the extent to which an employee believes that his/her organization cares about his/her well-being and endeavors to fulfill his/her socioemotional needs^[29]. The 13-item scale was used to assess organization support herein^[29]. Both measures were scored via 5-point Likert scales ranging from 0 (strongly disagree) to 4 (strongly agree). To quantify the overall support level within the dental care facility, scores on the two scales, social support and organization support, were combined. A higher score indicates greater social-organizational support.

Statistical Analysis

The collected data were analyzed using SPSS for Windows software (ver. 18.0; IBM Corp., Armonk, NY, USA), with statistical significance set at $p < 0.05$. The t-test and one-way ANOVA were conducted to analyze differences in emotional dissonance and turnover intention according to socio-demographic characteristics. Moderated multiple regression (MMR) was conducted

to measure the moderating effect of individual factors and organizational factors on the relationship between emotional dissonance and turnover intention^[30]. To reduce the multicollinearity problems, mean centering was performed on independent variables and moderator variables. In the MMR analysis, the dependent variable was turnover intention and the independent variables were input in the following order: Step 1: emotional dissonance, Step 2: emotional dissonance and moderator variable, Step 3: emotional dissonance, moderator variable, and interaction term (emotional dissonance $\times$ moderator variable). To demonstrate a moderating effect, two conditions must be met: First, the adj. R^2 value must gradually increase across steps; and second, the p-value of the F change must be less than 0.05^[31].

Results

Turnover intention according to socio-demographic characteristics: Dental hygienists who reported their main duty was clinically focused and limited to scaling/preventive care showed higher turnover intention than their peers in charge of consulting/management support ($p < 0.01$) [Table 1].

Table 1: Turnover Intention according to Socio-demographic Characteristics

Variables	Participants	Emotional dissonance		Turnover intention	
		Mean ± SD	t or F (P value)	Mean ± SD	t or F (P value)
Age					
≤25	111	31.87 ± 7.18	2.070 (0.128)	11.58 ± 4.43	1.441 (0.238)
26-30	104	32.66 ± 6.45		10.90 ± 4.20	
≥31	55	30.27 ± 7.85		10.40 ± 4.72	
Educational Level					
College diploma	158	31.44 ± 6.98	-1.145 (0.253)	11.49 ± 4.33	1.846 (0.066)
University	112	32.44 ± 7.21		10.49 ± 4.48	
Main Duty					
Consultation, management support	149	31.49 ± 7.63	-0.932 (0.352)	10.42 ± 4.51	-2.737 (0.007)
Scaling, preventive care	121	32.30 ± 6.34		11.88 ± 4.17	
Clinical Experience (yrs.)*					
≤6	166	31.95 ± 7.23	0.293 (0.770)	11.29 ± 4.53	0.994 (0.321)
≥7	104	31.69 ± 6.86		10.74 ± 4.21	

*Divided by participants' medium score.

Moderating effect of individual factors on the relationship between emotional dissonance and turnover intention

Moderating effect of self-efficacy: In multiple regression analysis, adj. R^2 decreased from Step 1 to Step 2 and the significance of F change was 0.450, demonstrating no significant moderating effect of self-efficacy on the

relationship between emotional dissonance and turnover intention [Table 2].

Moderating effect of ego resilience: Adj. R^2 decreased from Step 1 to Step 2, and the significance of F change was 0.862, demonstrating no significant moderating effect of ego resilience [Table 2].

Table 2: Moderating Effect of Individual Factors on the Relationship between Emotional Dissonance and Turnover Intention

Moderator	Step	R	R ²	Adj. R ²	Std. error of the estimate	Change statistics		
						R ² change	F change	Sig. F change
Self-efficacy	1	0.279 ^a	0.078	0.075	4.248	0.078	22.697	<0.001
	2	0.283 ^b	0.080	0.073	4.251	0.002	0.573	0.450
	3	0.292 ^c	0.085	0.075	4.247	0.005	1.496	0.222
Ego resilience	1	0.279 ^d	0.078	0.075	4.248	0.078	22.697	<0.001
	2	0.280 ^e	0.078	0.071	4.256	0.000	0.030	0.862
	3	0.282 ^f	0.079	0.069	4.261	0.001	0.306	0.580

^apredictors: emotional dissonance^bpredictors: emotional dissonance, self-efficacy^cpredictors: emotional dissonance, self-efficacy, interaction term (emotional dissonance × self-efficacy)^dpredictors: emotional dissonance^epredictors: emotional dissonance, ego resilience^fpredictors: emotional dissonance, ego resilience, interaction term (emotional dissonance × ego resilience)**Moderating effect of organizational factors on the relationship between emotional dissonance and turnover intention**

Moderating effect of wage satisfaction: The value of adj. R² increased from 7.5% to 30.7% between Step 1 and Step 2, and then again to 31.6% between Step 2 and Step 3 (p<0.05) [Table 3]. Thus, the relationship between emotional dissonance and turnover intention was moderated by wage satisfaction.

Moderating effect of social-organizational support: The value of adj. R² increased gradually, from 7.5% (Step 1) to 23.8% (Step 2) and to 25.1% (Step 3) (p<0.05) [Table 3]. Thus, the relationship between emotional dissonance and turnover intention was moderated by social-organizational support.

Table 3: Moderating Effect of Organizational Factors on the Relationship between Emotional Dissonance and Turnover Intention

Moderator	Step	R	R ²	Adj. R ²	Std. error of the estimate	Change statistics		
						R ² change	F change	Sig. F change
Wage satisfaction	1	0.279 ^a	0.078	0.075	4.248	0.078	22.697	<0.001
	2	0.559 ^b	0.312	0.307	3.676	0.234	90.891	<0.001
	3	0.569 ^c	0.323	0.316	3.653	0.011	4.328	0.038
Social-organizational support	1	0.279 ^d	0.078	0.075	4.248	0.078	22.697	<0.001
	2	0.494 ^e	0.244	0.238	3.855	0.166	58.466	<0.001
	3	0.509 ^f	0.259	0.251	3.822	0.015	5.523	0.019

^apredictors: emotional dissonance^bpredictors: emotional dissonance, wage satisfaction^cpredictors: emotional dissonance, wage satisfaction, interaction term (emotional dissonance × wage satisfaction)^dpredictors: emotional dissonance^epredictors: emotional dissonance, social-organizational support^fpredictors: emotional dissonance, social-organizational support, interaction term (emotional dissonance × social-organization support)

Discussion

This study showed that higher emotional dissonance leads to higher turnover intention among dental hygienists. This result supports the result of a previous study that the more emotional regulation and suppression that is demanded by a work environment, the higher the level of turnover intention that its employees have^[32]. As regulating and suppressing one's feelings requires effort and energy^[33], excessive emotional dissonance increases the rate of burnout among dental hygienists^[15], which may have strengthened their intention to change vocation. Therefore, understanding the emotional dissonance of dental hygienists is important to increase their job satisfaction and reduce turnover intention.

In exploring the moderator variables of the relationship between emotional dissonance and turnover intention, the moderating effects of wage satisfaction and social-organizational support were demonstrated, but the effects of individual factors were not. These findings indicate that intervention strategies provided by organizations and supervisors are more effective than individual factors in buffering the negative effect of emotional dissonance. First, the results confirmed that turnover intention due to emotional dissonance decreased as wage satisfaction increased [Table 3]. This is in line with a previous study that reported that wages influence the rate of burnout, and that wage dissatisfaction can lead to job dissatisfaction and turnover^[34]. Wage dissatisfaction is one of the primary reasons cited as to why Korean dental hygienists leave their jobs^[35]. Therefore, adoption of a wage system that sufficiently acknowledges the energy-consuming nature of the emotional labor and duties of dental hygienists is expected to buffer, to some extent, the negative effects of emotional dissonance. Second, in accordance with a previous study of health professionals^[36], the current study of dental hygienists concluded the subjects had low turnover intention when their perceived level of social-organization support was high; that is, social-organizational support was confirmed as a significant predictor of turnover intention in the context of the relationship between emotional dissonance and turnover intention. As proposed by some researchers, support from colleagues is one of the most acceptable ways to address chronic and cumulative stress among dental hygienists and reduce their turnover intention^[37,38]. Research has shown that support from colleagues increases the level

of knowledge of social support beneficiaries and helps improve their mental health^[39], which, in turn, reduces the negative consequences of emotional dissonance^[5]. Therefore, a preceptor system to facilitate communication and information-sharing among colleagues can be an effective way to promote social support among dental hygienists. Additionally, as an organizational measure to reduce turnover intention due to emotional dissonance, customized mentoring programs can be developed and implemented to facilitate understanding of stress and improve interpersonal interaction skills.

This study had several limitations. First, there may be a geographical bias in the findings because the participants were dental hygienists working at dental care facilities in only two large-sized cities in Korea. In addition, as there are a variety of reasons for turnover intention, reductions in turnover intention may be limited by using interventions addressing only the moderator variables identified in this study. Therefore, further studies must examine a greater variety of moderator variables that may effectively mitigate turnover intention. Longitudinal studies should also be conducted that cover wider regions and include larger samples. Nonetheless, this study is significant in that it demonstrates the importance of organizational factors, such as wage satisfaction and social-organizational support as moderator variables that can reduce turnover intention due to emotional dissonance among dental hygienists. The findings are expected to be useful in improving the occupational well-being of dental hygienists and managing human resources more effectively.

Conclusion

Dental hygienists experiencing greater levels of emotional dissonance had higher turnover intention. Organizational factors were confirmed to have moderating effects on the relationship between emotional dissonance and turnover intention, but individual factors were not. Therefore, intervention strategies to effectively buffer turnover intention due to emotional dissonance should be developed and implemented by dental care facilities at an organizational level.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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A Study on the Relationship between Social Support and Life Satisfaction of College Students

Hana Kim¹, Sang Hwa Lee², Bo-Kyoung Song³

¹Occupational Therapy Service, Chung Dam Clinic, 46Samseong-ro, 147-gil Gangnam-gu, Seoul, 06063, Republic of Korea; ²National Institute of Dementia, 670 Daewangpangyo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, 13494, Republic of Korea; ³Department of Occupational Therapy, Kangwon National University, 346 Hwangjo-gil, Dogye-eup, Samcheok-si, Gangwon-do, 24949, Republic of Korea

ABSTRACT

Background/Objectives: The aim of this study was to investigate the relationship between social support according to gender, grade, and residential type and between social support and life satisfaction of college student.

Method/Statistical Analysis: A survey was conducted among 444 college students in Gangwon area, South Korea. Questionnaire was composed of 32 items which consist of 27 items of social support and 5 items of life satisfaction.

Findings: Analysis showed that male in the relationship between social supports according to gender showed a significant difference in the teaching support. The relationship between social supports according to grade showed significant differences in parents, teaching support. The boarding house receives more friend support than other residential type. Social support and life satisfaction showed a correlation, teaching support and life satisfaction was the highest coefficient of correlation.

Improvements/Applications: There was a significant difference in teaching support among males than female's students, and there was a significant difference in teaching support among the lower grades than in the upper grades.

Keywords: Life satisfaction, Social support, Parents support, Friend support, Teaching support, College students

Introduction

After entering college, students experience many confusions and conflicts in their academic lives due to the different environments of the high school ¹. In fact, college is a time to prepare for life outside adolescence. As the grade increases, it gradually becomes recognized as an important process for expanding social awareness and forming a close relationship with others. Therefore, the high satisfaction of life obtained during the university life plays an important role in designing the

future positively². The main factors influencing the satisfaction of life during college are social support composed of various social relations related to parents, friends and university professors ³. This is closely related to emotional support that affects self-concept in individuals ⁴. Specifically, social support can be classified as parent, friend, or faculty support. First, parent support is a sub-concept of social support, which means the help provided by parents, but it is an important factor that greatly influences career choice and value formation in social support ⁵. Second, friend support is an important social factor that occurs throughout the entire human life cycle. Therefore, it plays an important role in solving various problems and forming a good social relationship through appropriate human relations with friends ⁶. Lastly, teaching support is a factor that influences the level of school adaptation of students. If teaching support is high, life satisfaction can be easily

Corresponding Author:

Bo-Kyoung Song,
Assistant Professor,
Department of Occupational Therapy,
Kangwon National University, Republic of Korea
Email: bksong@kangwon.ac.kr

increased through high adaptation at college ⁴. In fact, in the case of male students, the lower the sociality than the female students, the more difficult it is in friendship ⁷. In addition, the lower the grade, the higher the reliance on social support through parent supports ³. Therefore, it is important to analyze the relationship between social support and life satisfaction of students in understanding the stress of university students' adaptation to school life and their worries about career after graduation. In addition, college students experience a variety of residential spaces, such as dormitories, boarding houses, and self-help, away from their own homes, which can also affect life satisfaction ⁸. The purpose of this study is to investigate the correlation between college students' gender, grade, and type of residence, parent support, friend support, and teaching support.

Materials and Method

Subjects: This study was conducted on 444 male and female students in a university located in Gangwon-do.

There were 252 male students (56.8%) and 192 female students (43.2%), 122 students (27.5%) in the first grade, 131 students (29.5%) in the second grade, 138 students in the third grade (31.1%) and 53 students in the fourth grade (11.9%). In addition, the residence type of the subjects was the highest with 263 dormitories (59.2%), followed by 150 (33.8%), 23 (5.2%), 4 (0.9%) [Table 1].

Materials: In this study, we used the social support scale (SSS) and the Korean version of the Life Satisfaction Scale (SWLS-K) support scale, SSS) was composed of 27 items, each with 9 items for each of three parents, friends, and faculty members. The higher the score for each item, the more social support means high. In addition, the Korean version of the satisfaction with the life scale (K-SWLS) was composed of 5 items. Each question was a simple scale that responded to the 7-point scale. The higher the score, the higher the satisfaction of life^[9]. In this study, the items were revised and supplemented as the test items based on college students [Figure. 1].

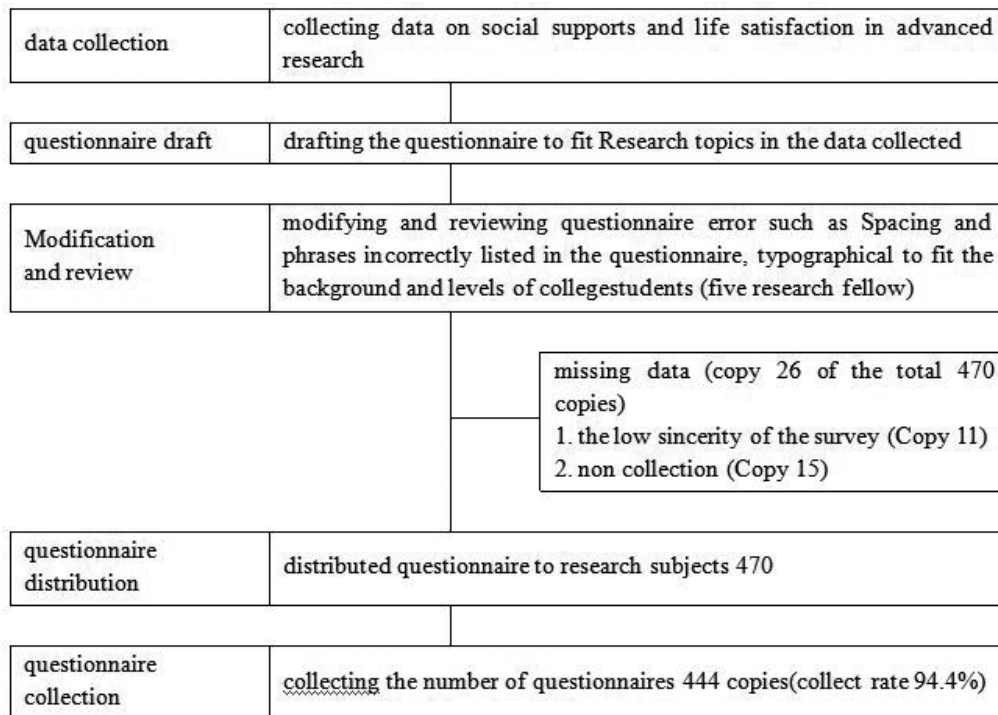


Figure 1: The design and progress summary of this study

Method

In this study, a total of 470 questionnaires were distributed and used in this study, with 15 unreturned copies and 444 copies excluding 11 copies with low

integrity [Figure. 1]. Data analysis was done using the SPSS 19.0 statistical program. The frequency of gender, grade, and residence type of college students was analyzed by frequency analysis. An independent t-test was conducted to examine the characteristics of gender

and social support. One-way ANOVA was conducted to examine the relationship between grade and social support for residence type. Statistical significance was $\alpha = 0.05$.

Results and Discussion

General characteristics of subjects: Table 1 shows the general characteristics of the study subjects. There were 252 (56.8%) male students and 192 (43.2%) female students. There were 60 students (13.6%) in male students, 122 students (27.5%) in first grade students and 131 students (29.5%) in second grade students. In the third grade, 138 (31.1%) showed the highest rate, and in the fourth grade, 53 (11.9%) were the lowest. The residence type was the highest with 263 dormitories (59.2%), followed by 150 (33.8%), 23 (5.2%), 4 (0.9%) and 4 others (0.9%) [Table1].

Table 1: General characteristics of the subjects (N = 444)

Characteristics		N (%)
Gender	Male	252 (56.8)
	Female	192 (43.2)
Grade	Freshman	122 (27.5)
	Sophomore	131 (29.5)
	Junior	138 (31.1)
	Senior	53 (11.9)
Residential type	Dormitory	263 (59.2)
	Live apart from house	150 (33.8)
	House	23 (5.2)
	Boarding house	4 (0.9)
	Etc.	4 (0.9)

Analysis of results of parent support, friendship support, and faculty teaching support on college students: Table 2 shows the differences in perception of social support among the subjects. First item, 65.3% of AS, 0.9% of NS, and AS of 67.6% were the second item in parents support, and the lowest value was 0.2% in NS. The third item was the highest with AS (65.3%) and the lowest one, NA (0.7%). The 4th question was the lowest at 57.9% for AS and 0.7% for NS. The 5 items were the lowest at 49.5% for AS and 0.5% for NS. In the 6 items, the lowest score was AS (51.6%) and NS (0.2%). In the 7 items, 57.7% of AS and 0.7% of NS were the lowest. In the 8 items, the lowest score was 55.6% for AS and 0.9% for NS. In the 9 items, AS were the lowest (61.0%) and NS was the lowest (1.1%) [Table 2]. In the case of friendship support, the 10 items were lowest at 64.6% for AS and 2.5% for NS. In the 11 items, the lowest score was AS (60.6%) and NS (1.6%). In the 12 questions, the lowest score was 58.6% for AS and 2.5% for NS. In the 13 items, the lowest score was 57.2% for AS and 1.1% for NS. In the 14 items, the lowest score was 63.3% for AS and 1.1% for NS. In the 15 items, the lowest score was 57.4% for AS and 0.7% for NS. In 16 items, the lowest score was 55.9% for AS and 2.0% for NS. In the 17 items, the lowest score was 55.6% for AS and 2.0% for NS. In the 18 items, the lowest score was 55.6% for AS and 2.5% for NS [Table 2]. Among the 19 items, 61.5% of the respondents supported the teaching and 4% of the professor supported the teaching. In the 20 items, the lowest score was 39.9% for AS and 9.5% for NS. The lowest score was 52.0% for AS and 5.0% for NS in 21 items. In the 22 items, the lowest score was 52.0% for AS and 5.6% for NS. In the 23 items, the lowest score was 52.0% for the AS and 5.9% for NS. In the 24 items, the lowest score was 52.7% for AS and 5.4% for the NS. In the 26 items, AS were the lowest at 49.3% and NS was the lowest at 4.7%. Finally, the lowest score was 53.4% for AS and 3.2% for NS in 27 items [Table 2].

Table 2: Responses rate per questionnaire item of social support (N = 444)

Characteristics		N (%)			
		NS(1)	LS(2)	OS(3)	AS(4)
Parent supports	1. Parents are interested in children.	4(0.9)	25(5.6)	125(28.2)	290(65.3)
	2. Parents recognize their children as valuable.	1(0.2)	10(2.3)	133 (30.0)	300(67.6)
	3. Parents feel that their children are receiving love and care.	3(0.7)	21(4.7)	130 (29.3)	290(65.3)
	4. Parents give praise for what their child did well.	3(0.7)	33(7.4)	151 (34.0)	257(57.9)
	5. Parents encourage your child when he is hesitant to make a decision.	2(0.5)	37(8.3)	185 (41.7)	220(49.5)

Conted...

Friend supports	6. Parents advise your child to make a reasonable decision	1(0.2)	31(7.0)	183 (41.2)	229(51.6)
	7. Parents help their children solve problems when they are in a difficult situation.	3(0.7)	24(5.4)	161 (36.3)	256(57.7)
	8. Parents can help their children do what they want.	4(0.9)	35(7.9)	158 (35.6)	247(55.6)
	9. Parents provide financial support to their children.	5(1.1)	26(5.9)	142 (32.0)	271(61.0)
	10. My friend is worried about my work.	11(2.5)	51(11.5)	287 (64.6)	95(21.4)
	11. My colleague friend helps me when I need help.	7(1.6)	36(8.1)	269 (60.6)	132(29.7)
	12. My colleague friend is doing my job when I'm sick.	11(2.5)	68(15.3)	260 (58.6)	105(23.6)
	13. When others turn me off, my department friend is with me.	5(1.1)	57(12.8)	254 (57.2)	128(28.8)
	14. Friends of my department respect my opinion and accept it positively.	5(1.1)	38(8.6)	281 (63.3)	120(27.0)
	15. My friend turns me on when I'm in a bad mood.	3(0.7)	53(11.9)	255 (57.4)	133(30.0)
	16. My colleague praises me when I work well.	9(2.0)	55(12.4)	248 (55.9)	132(29.7)
	17. My colleague friend kindly explains what I am confused about.	9(2.0)	57(12.8)	247 (55.6)	131(29.5)
	18. My colleague friend and I use things together.	11 (2.5)	41(9.2)	247 (55.6)	145(32.7)
	19. The faculty professor respects my personality.	13 (2.9)	71(16.0)	273 (61.5)	87(19.6)
	20. The department professor is interested in me.	42 (9.5)	162 (36.5)	177 (39.9)	63(14.2)
	21. The department professor encourages my college life.	22 (5.0)	115 (25.9)	231 (52.0)	76(17.1)
	22. The department professor tells me how to do the study.	25 (5.6)	116 (26.1)	231 (52.0)	72(16.2)
Teaching supports	23. The department professor will discuss my goals and interests.	26 (5.9)	110 (24.8)	231 (52.0)	77(17.3)
	24. Department professors provide information to help solve academic problems.	24 (5.4)	111 (25.0)	234 (52.7)	75(16.9)
	25. The department professor does my best to help me without paying the price	16 (3.6)	115 (25.9)	227 (51.1)	86(19.4)
	26. A professor advises me about my behavior	21 (4.7)	131 (29.5)	219 (49.3)	73(16.4)
	27. The department professor praises me when I have worked hard or have done well.	14 (3.2)	110 (24.8)	237 (53.4)	83(18.7)

NS(1): no support; LS(2): a little support; OS(3): often support; AS(4): always support

Results of Life Satisfaction of Study Subjects: Korean version of life satisfaction Questionnaire in each item, 1 item had the lowest score of 28.2% for 4 point and 4.5% for 1 point. The highest score was 29.1% from 3 points in 2 items, and the lowest was 0.2% in 1 point. In the 3 items, 4 points were the highest with 27.5% and 1 point was the lowest with 2.9%. In the 4 items, 30.4% of the 3 point were the highest, and 1point was the lowest at 5.0%. In the 5 items, 4 points were the highest (21.8%) and 1 point was the lowest (7.2%) [Table 3].

Table 3: Responses rate per questionnaire item of life satisfaction on college students (N = 444)

Characteristics		N (%)						
		7	6	5	4	3	2	1
Life Satisfaction	1. My college life is similar to my goal at the time of admission.	46(10.4)	67(15.1)	87(19.6)	125(28.2)	51(11.5)	48(10.8)	20(4.5)
	2. In my college life, social support (parent, friend, teaching support) is good.	11(2.5)	32(7.2)	123(27.7)	88(19.8)	129(29.1)	60(13.5)	1(0.2)
	3. I am satisfied with my college life.	13(2.9)	38(8.6)	71(16.0)	122(27.5)	75(16.9)	93(20.9)	42(7.2)
	4. I have done what I want in college life.	33(7.4)	67(15.1)	86(19.4)	135(30.4)	60(13.5)	41(9.2)	22(5.0)
	5. Even if I go to college again, will do the same school life as now.	75(16.9)	76(17.1)	69(15.5)	97(21.8)	38(8.6)	57(12.8)	32(7.2)

7: strongly disagree, 6: disagree, 5: slightly disagree, 4: neither agree nor disagree, 3: slightly agree, 2: agree, 1: strongly agree

Relationship between parental support, friendship support, and faculty teaching support according to gender differences on college students: There was no statistically significant difference in the satisfaction of males and females in parent support and friendship support according to gender difference of participants in the study ($p > 0.05$). However, there was a statistically significant difference in teaching support ($p < 0.01$) [Table 4].

Table 4: Difference of gender in social supports on college students

Variables	Male	Female	t	p
	M $\pm$ SD	M $\pm$ SD		
PS	31.77 $\pm$ 5.40	31.87 $\pm$ 5.23	- 0.19	0.85
FS	28.38 $\pm$ 4.92	27.85 $\pm$ 4.38	1.19	0.23
TS	26.26 $\pm$ 5.93	24.01 $\pm$ 5.31	4.13	0.00***

M $\pm$ SD: means $\pm$ standard deviation, ***p < 0.00, PAS: parent support; FS: friend support; TS: teaching support.

Differences in the support of parents' friends and professors by grade of college students: There was a statistically significant difference between the four groups in parent support and teaching support ($p < 0.05$)($p < 0.01$). There was no statistically significant difference between the four groups in friend support ($p > 0.05$)[Table 5].

Table 5: Difference of grade in social supports on college students (N = 444)

Variables	Freshman	Sophomore	Junior	Senior	F	p
	M $\pm$ SD	M $\pm$ SD	M $\pm$ SD	M $\pm$ SD		
PS	32.49 $\pm$ 5.60	32.35 $\pm$ 3.84	30.82 $\pm$ 6.39	31.68 $\pm$ 4.35	2.76	0.04*
FS	28.72 $\pm$ 4.82	28.44 $\pm$ 4.72	27.77 $\pm$ 4.70	27.34 $\pm$ 4.27	1.60	0.19
TS	25.79 $\pm$ 5.74	26.34 $\pm$ 5.13	24.40 $\pm$ 6.01	23.92 $\pm$ 6.10	3.95	0.01**

*p < 0.05 **p < 0.01, M $\pm$ SD: means $\pm$ standard deviation, PS: parent support, FS: friend support; TS: teaching support.

Relationship between parental support, friendship support, and teaching support and life satisfaction depending on the type of residence on college students: There was a statistically significant difference between friendship support and life satisfaction according to residence type of students ($p < 0.05$). There was no statistically significant difference between parents support, teaching support and type of residence on college students ($p > 0.05$) [(Table 6)].

Table 6: Difference of residential type in social supports on college students (N = 444)

Variables	Dormitory	LH	House	BH	etc.	F	p
	M $\pm$ SD	M $\pm$ SD	M $\pm$ SD	M $\pm$ SD	M $\pm$ SD		
PS	31.93 $\pm$ 5.96	31.82 $\pm$ 4.18	30.39 $\pm$ 4.49	34.75 $\pm$ 2.50	31.25 $\pm$ 4.50	0.76	0.55
FS	28.39 $\pm$ 4.62	28.03 $\pm$ 4.82	25.78 $\pm$ 4.34	33.75 $\pm$ 2.87	27.75 $\pm$ 2.98	3.14	0.02*
TS	25.19 $\pm$ 5.67	25.73 $\pm$ 5.96	22.95 $\pm$ 4.45	29.00 $\pm$ 8.75	25.75 $\pm$ 5.18	1.61	0.17

*p < 0.05, M $\pm$ SD: means $\pm$ standard deviation, PS: parent support, FS: friend support, TS: teaching support, LH: live apart from house, BH: boarding house.

Discussion

The purpose of this study was to examine the perception of university students' gender, grade, residence style and social support, and to examine the relationship between social support and life satisfaction

of students in college. First, male students were more satisfied with teaching support than female students and satisfaction was higher than male students in relation to social support of male students and female students. This is because there are many male professors in the

professorship at the university, so that male students have an environment where they can easily interact with female students. Therefore, it is necessary to propose environment improvement programs for female students and support programs for female students. In this study, we looked at the relationship of social support by grade, and it was confirmed that lower grades were more supported by department professors than upper grades. This means that the interactions among the professor and the student are relatively increased because the teaching support programs are concentrated in the lower grades, which means that the higher grade students have an environment with less discussion than the class. In addition to the class, it was found that visiting the professor by counseling about the career or academic plan was linked to the psychological burden and the teaching support decreased. Therefore, it is necessary to reduce the program and psychological burden according to the characteristics of each grade. In this study, we analyzed residence type and social support, and it was found that students who are living in boarding houses are more supportive than students who live in other residential areas. This is similar to the previous study in which dormitory or trainee students had relatively little social support ^[10]. In addition, university students reported that they received social support in the order of friend support, family support, and teaching support ¹¹, because active exchange with friends, neighbors, and groups positively influenced the satisfaction of life for young people ¹². Therefore, it is considered that the students who choose the boarding house because of their geographical distance are far from the house where they live, the quality of life is affected by the friend support rather than the parent and teaching support. And for the students of the provincial universities, it is necessary to improve the living environment and improve the life satisfaction by supporting the appropriate choice.

Conclusion

There was a significant difference in teaching support among male students than female students, and there was a significant difference in teaching support among the lower grades than in the upper grades. College students who chose to live in a boarding house showed a significant difference in friendship support compared to students living in another residence.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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The Effects of Task Application after Hand Intrinsic Muscle Treatment on Decreasing Unilateral Spatial Neglect in Stroke Patients

Sung-Ryoung Ma¹, Byung-Il Yang²

¹Assistant Professor, Department of Occupational Therapy, Shinsung University, Daehak-ro, Jeongmi-myeon, Dangjin-si, Chungcheongnam-do, 318-01, Republic of Korea; ²Assistant Professor, Department of Physical Therapy, Sangji University, 83, Sangjidae-gil Wonju-si, Gangwon-do, Republic of Korea

ABSTRACT

Background/Objectives: In this study, we assessed the effects of task application after hand intrinsic muscle treatment on decreasing unilateral spatial neglect in stroke patients.

Method/Statistical Analysis: 20 subjects with stroke patients participated. Subjects were randomly divided into task application after hand intrinsic muscle treatment group (n=10) and common upper extremity task group (n=10) both therapy was applied for 30mins in a day and 5 times in a week for 2 weeks. The Albert's test, Line bisection test was used to evaluate unilateral spatial neglect by paretic side(left) in stroke patients. To compare the treatments, we used paired t-test and independent sample t-test.

Findings: The task application after hand intrinsic muscle treatment group and common upper extremity task group showed statically significant differences before and after unilateral spatial neglect. The experimental group showed a more significant difference compared with the control group when Albert's test, Line bisection test.

Improvements/Applications: The task application after hand intrinsic muscle treatment was more effective in unilateral spatial neglect of stroke patients than in reaching treatment.

Keywords: stroke, task application, hand intrinsic muscle treatment, Unilateral spatial neglect, left hemiplegia

Introduction

A Stroke is a cerebral ischemic or hemorrhagic cause of the vascular loss of cerebral function with various accompanying symptoms ^[1]. Even after survival through appropriate first aid and early treatment after cerebrovascular disease, exercise, sensory, cognitive, perceptual, psychological, social, and physical functioning impairments remain ^[2]. Cognitive and perceptual impairment due to stroke is a major cause of difficulty in complete recovery, even if motor skills

are restored ^[3], especially when unilateral neglect lead to difficulties with sensory or motor function. It does not recognize or respond to stimuli on the opposite side of the damaged brain ^[4].

Unilateral neglect is more severe than a left cerebral hemispherical lesion in the right cerebral hemisphere, and patients with unilateral neglect have a problem with inadequately perceiving the shape of the left part ^[5]. If these symptoms persist, they continuously fail to recognize things in the left space, and functional recovery is highly difficult, resulting in greater difficulty in activities of daily living(ADL) ^[6,7]. Recent studies have suggested a treatment that improves motor function by altering the cortical motor area by activating paralyzed movements. It is reported that this treatment focus on spatial representation attention and it has positive effects, improving unilateral neglect and ADL ^[8].

Corresponding Author:

Byung-Il Yang

Assistant Professor, Department of Physical Therapy,
Sangji University, Korea

Email: bobathyang@naver.com

Dobler et al. (2001) also describe the relationship between familiar tools and body cognition, suggesting that hand use and activities can be applied to reduce neglect [9].

In this study, it is thought that treatment of the intrinsic muscles of the hand has the effect of transferring hand sensation, such as the proprioceptive and tactile senses, through hand contact. In previous study, it was reported body sensory information of the hand through the treatment acted as a powerful aid for the spatial recognition of the body's position in the space in the postural control element [10].

Stable postures of these hands were made by internal work [11]. The purpose of this study was to investigate whether the post treatment of the hand had positive effects on stroke patients with unilateral neglect.

Materials and Method

Experimental Subjects: The experiment was conducted in S hospital of Gyeonggi-do, South Korea. Twenty patients diagnosed with stroke for at least 6 months were randomly allocated between 2 groups. The study was conducted from July to April 2017, with the following inclusion criteria:

1. Diagnosed with cerebral hemorrhage or cerebral infarction for more than 6 months
2. Left hemiplegic patients who were diagnosed with stroke by a specialist through computed tomography
3. Those suspected of having unilateral negligence in a Motor-Free Visual Perception Test (MVPT) evaluation
4. There are no visual disturbances or visual field defects, and the elderly do not have visual impairment due to eye diseases, such as cataracts and glaucoma.
5. Score of at least 24 on the MMSE-K (Korean mini-mental state examination), with no difficulty comprehend instructions or communicating.
6. Without joint deformity, musculoskeletal pain, fractures, or hemianopsia.
7. Patient (or guardian) fully comprehends the object of this study and agrees to participate.

Evaluation Tools

Albert Test: Albert's test is an assessment tool to check the degree of unilateral neglect. The evaluation paper consists of 6 lines X 4 lines, totaling 40 lines at 2.5cm in length, 26cm in width, and 20cm in length [Figure 1]. The evaluator should demonstrate by plotting one line in the middle column before evaluation and instruct participants to mark all lines. The evaluation method confirms the number of lines marked, and the test-retest reliability is .99 [12].

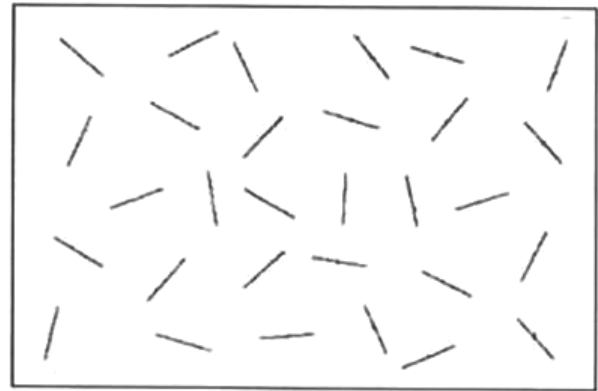


Figure 1: Albert Test

Line-bisection Test: The line-bisection test consists of lines arranged randomly in the center, left, and right on a 21.5cm X 29cm white paper. The top and bottom lines are used for practice. The six lines on the left are 100mm, 120mm, 140mm, 160mm, and 180mm, respectively, and the six lines on the right are 200mm [Figure 2]. The test involves positioning the paper at the center of the subject and marking the center of each line using a pen. The score is calculated by measuring the distance between the actual center point of each line and the displayed center point, dividing the values for each line by the total number of lines. On the other hand, the mean distance from the center is less than 6.33 mm, and the mean is greater than 6.33 mm [13]. The inter-later reliability was .82.

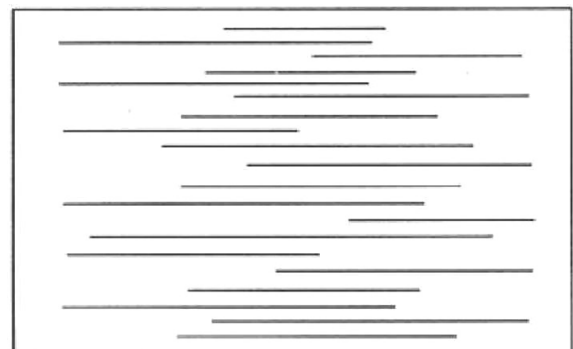


Figure 2: Line-bisection Test

Intervention Program: The subjects were allocated into control and experimental groups (10/group); Both groups were followed-up at the end of the day, and were equally mediated five times a week for two weeks, 30 minutes per session.

The experimental group was given of task application after hand intrinsic muscle treatment, and the control group a common upper extremity task.

Task Application After Hand Intrinsic Muscle Treatment (Experimental Group): In this study, the task application after intrinsic muscle treatment of the hand was revised and supplemented with reference to Sue Raine's (2013) proposal ^[11]. The treatment program for the intrinsic muscles of the hand was characterized by specific activation of the lumbricals and, specific activation of the abductor digiti minimi after the intervention, the mediator applied the flu the cup and drink, press a computer keyboard, and the small ball and put in basket [Table 1].

Table 1: Task Application After Hand Intrinsic Muscle Treatment and Common Upper Extremity Task

	Task Application After Hand Intrinsic Muscle Treatment		Common Upper Extremity Task
Intervention	Hand intrinsic muscle treatment	sSpecific activation of lumbriclas	1. Grip the cup 2. Press a button 3. Grip the small ball 4. Move the stocking cone 5. ROM arc exercise
		Specific activation of abductor digiti minimi	
		Specific activation of thenar eminence	
	Task application	Grip the cup and drink	
		Press a computer keyboard	
		Grip the small ball and put in basket	

Common Upper Extremity Task (Control Group): The control group mediates the training of five common upper extremity tasks, such as grip the cup, press a computer keyboard, grip the small ball, move the stocking cone, ROM arc exercise, applied in the control group[Table 1].

Two weeks after the intervention, a paired t-test was performed to compare the Albert test and Line-bisection test, and independent t-test was performed to compare the difference between the experimental and control groups. For statistical significance, α was set to 0.05.

Results and Discussion

General Characteristics of Experimental Subjects: The general characteristics of the experimental, control subjects are shown in table 2.

Table 2: General Characteristics of Subjects

	Division	Task application after hand intrinsic muscle treatment group (n = 10)	Common upper extremity task group (n = 10)
Gender (Persons)	Man	6(60.0%)	5(50.0%)
	Women	4(40.0%)	5(50.0%)
Brain Injury Type	Hemorrhage	5(50.0)	6(60.0)
	Infarction	5(33.3)	4(40.0)
Paretic Side	Left	10(100.0)	10(100.0)
Average Age		48.00 $\pm$ 7.43	49.70 $\pm$ 3.71
Average Disease Period (Month)		23.20 $\pm$ 8.69	25.90 $\pm$ 4.45

Comparison of Results before and after the Intervention

Comparison of Results before and after the Intervention in Experimental Group: In the Albert test, there was a statistically significant improvement from 29.00line before the intervention to 33.50line after the intervention($p<0.001$).

In the Line-bisection test showed the statistically significant decrease from 23.80mm before the intervention to 19.70mm after the intervention ($p<0.001$). See table 3.

Table 3: Comparison of Results before and after the Intervention in Experimental Group

	Pre-test (Mean $\pm$ SD)	Post-test (Mean $\pm$ SD)	t
Albert test (line)	29.00 $\pm$ 2.70	33.50 $\pm$ 2.12	-10.510***
Line-bisection test (mm)	23.80 $\pm$ 2.30	19.70 $\pm$ 1.25	8.947***

* $p<0.05$, ** $p<0.01$, *** $p<0.001$ by paired t-test

Comparison of Results before and after the Intervention in Control Group: In the Albert test, there was a statistically significant improvement from 29.70 line before the intervention to 32.70 line after the intervention($p<0.001$).

In the Line-bisection test showed the statistically significant decrease from 22.30mm before the intervention to 20.10mm after the intervention($p<0.001$). See table 4.

Table 4: Comparison of Results before and after the Intervention in Control Group

	Pre-test (Mean $\pm$ SD)	Post-test (Mean $\pm$ SD)	t
Albert test (line)	29.70 $\pm$ 3.19	32.70 $\pm$ 3.23	-7.115***
Line-bisection test (mm)	22.30 $\pm$ 1.94	20.10 $\pm$ 1.37	5.284***

* $p<0.05$, ** $p<0.01$, *** $p<0.001$ by paired t-test

Comparison of Results between the Two Groups: A comparison of experimental and control groups showed statistically significant differences for Albert test; the experimental group increased by 4.50 ± 1.35 line and the control group by 3.00 ± 1.33 line and a statistically significant improvement over the control groups($p<0.05$).

In the Line-bisection test, experimental group decreased by -4.10 ± 1.44 mm and the control group by -2.20 ± 1.31 mm and a statistically significant improvement over the control groups($p<0.01$). See table 5.

Table 5: Comparison of Results between the Two Groups

	Task application after hand intrinsic muscle treatment group (n = 10)	Common upper extremity task group (n = 10)	t
	(Mean $\pm$ SD)	(Mean $\pm$ SD)	
Albert test (line)	4.50 $\pm$ 1.35	3.00 $\pm$ 1.33	2.496*
Line-bisection test (mm)	-4.10 $\pm$ 1.44	-2.20 $\pm$ 1.31	3.069**

* $p<0.05$, ** $p<0.01$, *** $p<0.001$ by independent t-test

Discussion

Patients with unilateral disregard may often have difficulty in ADL, such as failing to eat food on the left side of the dish, being unable to shave the left side of the face, and avoiding obstacles on the left when or moving in a wheelchair [6]. To alleviate these symptoms, we applied the task after intrauterine treatment to reduce unilateral neglect in patients with left hemiplegia due to stroke. In this study, 20 patients with left hemiparesis

were divided into two groups. Subjects were randomly divided into task application after hand intrinsic muscle treatment group(experimental group, n=10) and common upper extremity task group(control group, n=10) both therapy was applied for 30mins in a day and 5 times in a week for 2 weeks. The Albert's test, Line bisection test was used to evaluate unilateral spatial neglect by paretic side(left) in stroke patients. To compare the treatments, we used paired t-test and independent sample t-test.

In the Albert's test and line bisection test, there was a statistically significant difference between the task application after intrinsic muscle treatment group and the common upper extremity task group. Therefore, task application after intrinsic muscle treatment and common upper extremity tasks were found to be effective in reducing unilateral spatial neglect.

However, in the comparison between the two groups after the intervention, the task application after intrinsic muscle treatment group showed significant improvement compared to the common upper extremity task group. The results of this study suggest that task application after intrinsic muscle treatment is more effective in reducing unilateral neglect than common upper extremity tasks. According to previous studies, Halligan et al. (1991) reported that the ability to recognize left stimuli could be increased by providing a proprioceptive sensation through upper limb movements in the external space [14]. In a single case study by Robertson and North (1993), manual and active exercises on the hands and feet showed significant effects only in the active movement of the hands and feet in the left space [15]. In this study, it was confirmed that the application of the task after the in-hand workout was more effective in reducing unilateral neglect than the general simple task in the control group.

Carr and Shepherd (2003) argued that the task-oriented approach could provide a higher level of improvement than repeated learning of the normal pattern of movement as a way to improve cognitive function and daily living behavior in stroke patients [16]. In this study, we also applied real daily life tasks after in-hand treatment and led the active participation of patients. All tasks used the left upper limb, which is the injured side. Therefore, the paralyzed upper limb has meaningful and functional tasks to allow the left space to be recognized and the left body to be used through active participation. These points are confirmed as positive in reducing unilateral neglect.

Although there have been reports that exercise methods that have been applied many times in a clinical setting can reduce unilateral neglect, the application of the task after the in-hand workout, as applied in this study has been shown to reduce participant disregard the injured side. It is thought to have therapeutic significance. However, the difference in ignorance response in the application of the task after the in-hand work in this study may be vary according to the individual function

of the patient after the stroke, and the specific method of the daily life activity to which the task is applied. It is necessary to confirm the experimental effect.

In addition, because the number of subjects is limited, it is difficult to generalize the results of this study to all stroke patients. The selection of tasks that can be motivated by the patient and the selection of tools for objectively evaluating upper limb function are considered necessary. By supplementing these points, I think it will have a positive effect on reducing unilateral neglect by following a stroke, and it will improve independence executing ADL.

Conclusion

The purpose of this study was to investigate the effect of treatment on the unilateral neglect in patients with left hemiparesis due to stroke.

First, in the pre- and post-interventional comparisons, the task application after intrinsic muscle treatment group and the common upper extremity task group showed statistically significant differences in the Albert's test and the line bisection test.

Second, in the comparison between the two groups, the Albert's test showed that the task application after hand intrinsic muscle treatment group showed a significant improvement over the common upper extremity task group.

In the third, second, and two groups, the line bisection test showed significant improvement in task application after hand intrinsic muscle treatment group compared to the common upper extremity task group.

In this study, it was found that the application of the task after the in-hand treatment was effective in reducing the unilateral neglect due to stroke.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Dating Violence Perceived by University Nursing Students

MiJin Shin¹, Ju Young Lee², Myeong-Jong Kim³

¹Dept. of Nursing, Youngsan University, 288 Junam-ro, Yangsan, Gyongsangnam-do, 50510, ROK;

²Dept. of Nursing, Hallym Polytechnic University, 48 Jang-hark Road, Chuncheon, Gangwon-do, 24210, ROK;

³Dept. of Management Information Systems CATHOLIC KWAN DONG University, 522, Naegok-dong, Gangneung-si, Gangwon-do, 25601, ROK

ABSTRACT

Background/Objectives: This study was designed to identify how nursing students recognized dating violence currently.

Method/Statistical Analysis: This study applied to the Q methodology to grasp dating violence perceived by university nursing students in order to identify future educational programs for dating violence. This study was conducted from May 8 to May 17, 2018, and 30 university nursing students in Gangwon and Gyongmam provinces, applied by convenience sampling method, scored 28 Q statements selecting forced normal distribution. Collecting data was analyzed by the QUANL PC program such as eigenvalues, variance, z-score and so on.

Findings: There are two different factors with two types showing eigenvalue more than 1. Factor I with twenty four participants showed that they understood giving the feeling of thrust, well behaved and a worthwhile job positively, the eigenvalue 7.1458. Factor II with twelve participants showed that they positively agreed with a comfortable person, a value and worthwhile job as well as playing a role as a mother, the eigenvalue 2.5628. Factor III with eight participants showed that they positively agreed with a doctor's assistance, well behaved and a comfortable person, the eigenvalue 2.5366. The correlation among three types was not relatively similar. However three types showed some consensus items. They recognized positively a value and worthwhile job, earnest and honest as a nurse, while negatively scientific knowledge, leadership and authority.

Improvements/Applications: The result of this study can provide basic data for preparing a nursing educational strategy with personalized the image of nurses for future generation who will become a nurse.

Keywords: Dating violence, Nursing students, Perception, Subjectivity, Q methodology

Introduction

There is no doubt that we are too easily exposed to horrible and threatening articles about dating violence recently compared to the past. It seems to be due to active involvement of society in order to recognize such violence as a social problem and deal with it while in the past, these violent forces were addressed to the personal

domain of the individual ^[1]. According to the Korean Times, one of the most widely read newspapers in South Korea, nine out of ten in Seoul among 2,000 women interviewed have experienced dating violence and it was the first official figure of dating violence conducted by the local government ^[2]. In addition, the National Maritime Police agency announced that there was more than 10 million of dating violence abusers in 2017 which increased by 17 percent compared with the last year^[3]. This result can simply assume that more violence occurs in loving relationships than we think, and the intensity of violence is significantly increasing between them as a serious social problem for all Koreans ^[4].

Corresponding Author:

Ju young Lee

Professor, Division of Nursing,

Hallym Polytechnic University, Korea

Email: jfamily12@hanmail.net

The American National Center for Victims of Crime defined dating violence as “controlling, abusive, and aggressive behavior in a romantic relationship [5].” A lot of researches showed that mild level of violence that is not physically injured also has a very negative psychological impact such as depressed mood, anger, fear, low self-esteem and so on, on the dating violence victims. Through these studies, we would think about the adverse impact on both victims and attacker with the negative social effect [4,6,7 and 8]. Therefore, this research will study how nursing students understand dating violence in order to provide one of wide database for individual thoughts.

Materials and Method

This research adopted Q methodology which focuses on the subjectivity or first person perspective of the participants to understand how nursing students discerned dating violence nowadays. This methodology research method is to show the subjectivity of the participants by modeling the results of individuals by compiling the Q statements, compulsorily ranking the subjects [9]. This study was conducted from May 8 to May 17, 2018, and 30 university nursing students in Gangwon and Gyongmam provinces, applied by convenience sampling method, scored 28 Q statements selecting forced normal distribution analyzing eigenvalues, variance, and z-score. The survey results were analyzed through using the QUANL PC program.

Results and Discussion

In terms of participants' general characteristics, the average age of participants was 23 years old and the ratio of male to female was the same. The third graders (juniors) in the college consisted of about 90%. Two-third of participants did not have any religion, but religious beliefs were surveyed in the order of Christianity, Buddhism and Roman Catholic. Currently, only one-third of participants have a dating partner. There were fewer students who experienced any types of violence such as bullying, dating and domestic violence than those who did not suffer from them. However, 6.6% of participants were both victims and abusers of dating violence in table 1.

Table 1: The General Characteristics (n = 30)

Items		Numbers	%
Genders	Male	15	50.0%
	Female	15	50.0%
Grades	3 rd	27	90.0%
	4 th	3	10.0%
Religion	Christian	5	16.7%
	Roman Catholic	2	6.7%
	Buddhism	4	13.3%
	No religion	19	63.3%
	Others	0	0.0%
Dating Partner	Yes	10	33.3%
	No	20	66.7%
Experience of school violence (bullying)	Yes	4	13.3%
	No	26	86.7%
Experience of dating violence (as a victim)	Yes	2	6.7%
	No	28	93.3%
Experience of dating violence (as an attacker)	Yes	4	13.3%
	No	26	86.7%
Experience of domestic violence	Yes	0	0.0%
	No	30	100%

There were two types of factors of dating violence which nursing students recognized. In addition, table 2 showed each factor's eigenvalue, factor I-16.9963 and factor II-1.4174. The variance has 61% of explanation power to this study clearly.

Table 2: Eigenvalues and Variance Percentage

	Factor I	Factor II
Eigenvalues	16.9963	1.4173
Variance Percentage	.5665	.0472
Cumulative Frequency	.5665	.6138

Table 3 shows correlation of two factors. It means that factor I and factor II have a strong positive correlation in this study.

Table 3: Correlation

	Factor I	Factor II
Factor I	1.000	.680
Factor II	.680	1.000

In terms of Factor I, there were twenty four participants out of the total number. The most agreed statements and disagreed ones are shown in table 4. There were the top four agreements of high scored Z-score. The first one was physical beating causing a dating partner to be hospitalized. The second one was coercive intercourse without a dating partner's agreement. The third one was using physical forces such as throwing objects to a dating partner rather than having verbal communication in the conflict situation. The last one was is the use of physical force to their dating

partner as often as kissing and caressing. On the other hand, there were the bottom five disagreements. The first one was giving a dating partner gifts unilaterally without respecting. The second one was forcing a dating partner to cut off relation with others. The third one was controlling their partner's behavior, hair, and clothes. The fourth one was informing a dating partner what they would do in advance. The last one was keeping an eye on dating partner's text messages and telephone. This group seems that they were more concerned with physical damage rather than other harms.

Table 4: Descending Array of Z-Scores of Factor I (Greater than ± 1) (n = 24)

	Statement	Z-score
Positive	Q16. Dating violence is beating a dating partner so badly that she/he is hospitalized.	2.04
	Q20. Dating violence is he/she forcefully had sex without their dating partner's agreement.	1.99
	Q17. Dating violence is to deal with conflict situation by a force rather than communication.	1.45
	Q22. Dating violence is the use of physical force to their dating partner as often as kissing and caressing.	1.18
Negative	Q15. Dating violence is giving a dating partner gifts unilaterally without respecting their own partner.	-2.18
	Q25. Dating violence is not to allow male friends/female friends to their dating partner.	-1.90
	Q26. Dating violence is the dating partner control their partner's behavior, hair, and clothes.	-1.31
	Q24. Dating violence is a coercion to tell the dating partner when, where, who and what to do before it.	-1.20
	Q4. Dating violence is keeping an eye on dating partner's text messages and telephone.	-1.18

In terms of Factor II, there were six participants out of the total number and there were more male nursing students than women compared with Factor I. The most agreed statements and disagreed ones are shown in table 5. There were the top six agreements of high scored Z-score. The first one was coercive intercourse without a dating partner's agreement. The second one was using physical forces such as throwing objects to a dating partner rather than having verbal communication in the conflict situation. The third one was physical beating causing a dating partner to be hospitalized. The fourth one was the forgiveness of their violent behaviors to their dating partner. The fifth one was to ignore their dating partner and to force their own opinion or thought

to their dating partner. The last one was glorifying everything including harmful actions for their dating partner. On the other hand, there were the bottom six disagreements. The first one was giving a dating partner gifts unilaterally without respecting. The second one was being afraid of his/her partner. The third one was keeping an eye on his/her partner's text messages and telephones. The fourth one was a fear of making one's partner angry so he/she cannot oppose his/her opinion. The fifth one was yelling or screaming enough to feel tremendous fear from their dating partner. The last one was all kinds of harm done by a dating partner in the name of love. Unlike the group of Factor I, this group recognizes various causes as dating violence.

Table 5: Descending Array of Z-Scores of Factor II (Greater than ± 1) (n = 6)

	Statement	Z-score
Positive	Q20. Dating violence is he/she forcefully had sex without their dating partner's agreement.	2.04
	Q17. Dating violence is to deal with conflict situation by a force rather than communication.	1.67
	Q16. Dating violence is beating a dating partner so badly that she/he is hospitalized.	1.63
	Q18. Dating violence is he/she can think of being forgiven their violent behaviors such as hitting or kicking their dating partner's cheek.	1.54

Conted...

Negative	Q14.Dating violence is to ignore the intention of their dating partner and to force their own opinion to their dating partner.	1.09
	Q28.Dating violence is glorifying everything including harmful actions for their dating partner.	1.02
	Q15.Dating violence is giving a dating partner gifts unilaterally without respecting their own partner.	-1.78
	Q6.Dating violence is afraid of his/her dating partner.	-1.36
	Q4.Dating violence is keeping an eye on dating partner's text messages and telephone.	-1.36
	Q7.Dating violence is a fear of making one's partner angry so he/she cannot oppose his/her opinion.	-1.28
	Q2.Dating violence is yelling or screaming enough to feel tremendous fear from their dating partner.	-1.22
	Q11.Dating violence is all kinds of harm done by a dating partner in the name of love.	-1.10

Among two groups, there were some consensus items. Two Factors strongly recognized dating violence as a physical and sexual threat while they weakly perceived their actions as a dating violence such as giving a dating partner gifts without respecting their own partner and closely watching his/her partner could be accepted in table 6.

Table 6: Consensus Item

	Statement	Z-score
Positive	Q20.Dating violence is he/she forcefully had sex without their dating partner's agreement.	2.01
	Q16.Dating violence is beating a dating partner so badly that she/he is hospitalized.	1.83
	Q17.Dating violence is to deal with conflict situation by a force rather than communication.	1.56
	Q18.Dating violence is he/she can think of being forgiven their violent behaviors such as hitting or kicking their dating partner's cheek.	1.24
Negative	Q15..Dating violence is giving a dating partner gifts unilaterally without respecting their own partner.	-1.98
	Q4.Dating violence is keeping an eye on dating partner's text messages and telephone.	-1.27
	Q24.Dating violence is a coercion to tell the dating partner when, where, who and what to do before it.	-1.04

The physical damage of violence by the dating partner is more serious than strange other's one. As a result, the adverse effect of mental harm between dating relationships would be greater than physical one ^[10]. Accordingly, our whole society should change the concept of dating violence. It means that the predisposition of violence happened in intimate relationships is believed to be learned from the society following their growth, and preventative intervention would be required for young children in order to educate them what the violence is. It also is the responsibility of society all so that we should all abuse and violence, regardless of the object, is criminal, and it is necessary to spread social awareness that it will never tolerate it socially. For this, it is necessary to strictly punish perpetrators of the act. It needs to be recognized as a social problem^[4]. "Safe Date Program" implemented in American schools has already proved effective. In order to prevent dating violence, it is necessary to educate people to control some factors that can promote dating violence ^[11]. Accordingly, our society will need an extensive research on how the

general population perceives dating violence in order to provide educational materials and develop prevention program in advance.

In addition, our society should widely discuss the punishment of dating violence because punishment of dating violence has been still insufficient and inadequate ^[8]. Because of traditional Korean society custom, it is true that violence in intimate relationships such as dating violence and domestic violence has been treated as an individual problem and is reluctant to actively engage in society as usual.

Conclusion

In conclusion, thirty nursing university students perceived dating violence as serious violence both physically and sexually, but they were not aware of the seriousness of the mental side in this study. After rating Q cards from 1 to 9, many participants in their interviews said that they sometimes did some activities on the

Q cards and at the same time they did not recognize their behaviors were violent actions to their partners. This study shows two different factors. In Factors I with twenty four participants, there were the top four agreements of high scored Z-score and the bottom five disagreements. They thought physical damages more significantly. In Factor II with six participants, there were the top six agreements of high scored Z-score and the bottom six disagreements. They did not weigh on one factor as dating violence and they perceived various factors. Through this research, we understood how nursing university students perceived dating violence individually. Therefore, this study consequently will be a stepping stone for offering meaningful data.

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Analysis of LUCAS™ 2 and Standard Cardiopulmonary resuscitation results in VR-based Simulation Ambulance

Sang-Gyun Roh¹, Jee-Hee Kim²

¹Department of Emergency Medical Services, Sunmoon University, 70, Sunmoon-ro, 221 beon-gil, Tangjeong-myeon, Asan-si, Chungcheongnam-do, 31460, Korea; ²Include Department of Emergency Medical Services, Kangwon National University, 346, Hwangjo-gil, Dogye-eup, Samcheok, Gangwon-do, 25949, Korea

ABSTRACT

Background/Objectives: When chest compression is performed with two hands in a situation where the movement of the vehicle cannot be predicted, the hands-off time increased resulting in inadequate chest recoil.

Method/Statistical Method: VR-based ambulance simulation experiments were conducted from February 19 to 28, 2018 in the National Fire Service Academy. The mean and standard deviation of chest compression and artificial respiration were analyzed by descriptive statistics and t-test. The results were analyzed using SPSS software 12.0 (SPSS Ins., Chicago, IL, USA).

Findings: The results of Lucas (LUCASTM) and manual cardiopulmonary resuscitation of VR-based state showed better chest compression and less incomplete chest relaxation rate than the standard CPR of Lucas™ 2. In the VR-based condition, the respiration rate was better when the bag-valve mask was applied at a ratio of 30: 2 than in the case of continuous chest compression under the condition of special airway intubation. Therefore, chest compression using machine was more effective than cardiopulmonary resuscitation in transferring cardiac arrest patients, and it was more efficient to use bag-valve mask at 30: 2 in volume delivery.

Improvements/Applications: This study suggests to use automatic external defibrillator as an alternative to chest compression in transit ambulances.

Keywords: *Virtual Reality, Mechanical CPR, Manual CPR, Chest Compression, Ventilation.*

Introduction

It is known that the quality of cardiopulmonary resuscitation (CPR) performed during the transfer the patient to the ambulance at the site of the cardiac arrest has a great effect on the survival of the cardiac arrest patients^[1,2]. Paramedics are making efforts to implement good quality CPR with regular education and training, but it is difficult to perform CPR in the narrow and shaken ambulance, and the accumulation of fatigue by paramedics due to long transit time makes it difficult to provide high quality CPR^[3,4].

It is very difficult to transfer the patient to the hospital while conducting CRP in the ambulance. Although accurate chest compressions and relaxation are essential to increase cerebral blood flow and coronary artery perfusion pressure, if the transfer distance is long and the paramedic performing CPR is alone, effective chest compression and artificial respiration are not expected. Even if the chest compression is properly performed, the chest compression and relaxation have a significant effect on the prognosis of the cardiac arrest, although it is only 20 to 30% of the normal cardiac output. In order to provide professional treatment for cardiac arrest patients, transfer time to the hospital is important. Transfer time from site to hospital is 26.3% for less than 5 minutes, 31.5% for 6 minutes to 10 minutes, 25.5% for 11 minutes to 20 minutes, 10.7% for more than 21 minutes ~ 30 minutes and 6.0% for more than 31 minutes respectively^[5]. Cardiopulmonary resuscitation shall be performed every two minutes when there are

Corresponding Author:

Jee Hee Kim

Professor, Department of Emergency Medical Services,
Kangwon National University, Korea

Email: kjh1962@kangwon.ac.kr

more than two paramedics because of increased physical strength and increased fatigue over time. However, in a shaken ambulance, the location, depth, velocity and incomplete relaxation of chest compression may affect chest compression and artificial respiration quality.

Mechanical chest compression device was developed to overcome various problems of standard CPR and includes various models such as X-CPR, LUCAS and load-distributing band CPR. These mechanical chest compression devices can continue providing good quality chest compression and can be expected to deliver good results when used in-vehicle during movement or transfer between departments. According to previous studies, when CPR was performed using LUCAS or a load-distributing band, no advantages or disadvantages were found compared with the standard CPR [6, 7], and there was no difference in neurological outcome in the study [7]. On the other hand, some studies have shown that CPR using mechanical chest compression device has higher survival rate than standard CPR [8, 9]. In another study, it is not able to explain more clearly whether cardiopulmonary resuscitation using an mechanical chest compression device (LUCAS) affects survival, spontaneous circulation recovery and neurological outcomes than standard CPR [10-12] does.

This study assessed the chest compression and artificial respiration quality when using a mechanical chest compression device ("Lucas") two-person standard cardiopulmonary resuscitation (CPR) to propose a more effective CPR method during transfer.

Materials and Method

Study Design and Data Collection: This study compared the results of chest compression and artificial respiration in the mechanical chest compression device and the two-person standard CPR conditions within the VR-based simulation ambulance. For this purpose, VR-based simulation ambulance in the National Fire Service Academy was used and "Urban outskirts road scenario" was applied among the developed scenarios. The running time was maintained at 60-80 km/h for 6 minutes, and the chest compression and artificial respiration rates were analyzed for 15 cycles with 30:2 between chest compression and artificial respiration. VR-based simulation ambulance driving was conducted by one of the National Fire Service Academy's faculty of education and training department and used the same scenario.

Comparisons of chest compression and artificial respiration were made using a bag-valve mask applied to Lucas and 2-person standard CPR with bag-valve mask applied. When Lucas was used for chest compression, Lucas' compression pad was placed in the same place after prescribing the compression area under the half of the mannequin dressing bone. The standard CPR was performed by a professor of emergency department of the National Fire Service Academy, and performed CPR. Before the experiment, chest compression and artificial respiration were repeated 15 times at a ratio of 30: 2, which was repeated 10 time [Figure 1, Figure 2]. In both groups, only one-third of the bag-valve mask was squeezed.

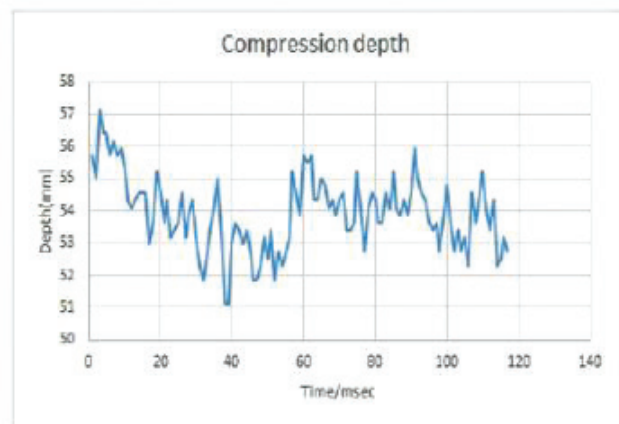


Figure 1: Pre-evaluation of Chest Compression Depth

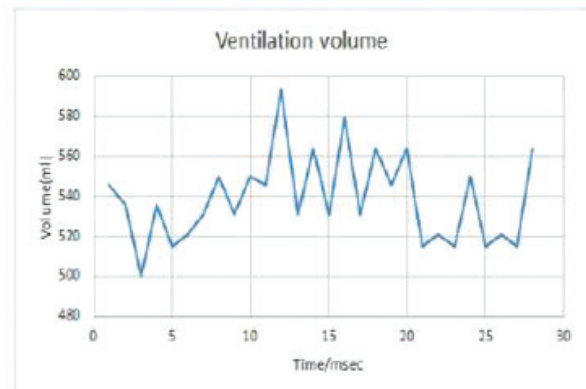


Figure 2: Pre-Evaluation of Ventilation Volume

Experimental Tools

VR Simulation Ambulance: VR simulation ambulance, developed to enable emergency service education and training in various road environments, was developed as a fire research and development (R&D) project. VR based simulation ambulance implemented VR by applying Ambulance Driving Simulation S/W to computer - controlled moving platform design [Figure 3]. Six

scenarios have been developed to suit the surrounding environment, such as rural, urban and suburban areas, and the driving is designed to be able to operate while monitoring scenarios set outside the ambulance.

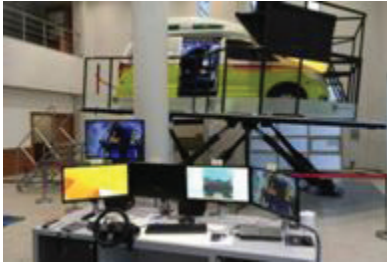


Figure 3: VR based Simulation Ambulance



Figure 4: LUCAS™ 2

Mechanical Chest Compression Device (LUCAS™ 2): Mechanical chest compression device was used with LUCAS™2 (Physio-control Inc, Reymond, USA) [Figure 4]. With a compression rate of $102 (\pm 2)$ per minute and a compression depth of $53 (\pm 2)$ mm, the ratio of chest compression to artificial respiration can be set to 30: 2, Lucas was fully secured to the manikin using shoulder straps and wrist straps, and pads were applied to both lateral chest areas of the manikin to minimize movement. Lucas is easy to use with a combination of back plate and body which is placed behind the patient's back and consists of the power button (1 time) on the top of the main unit, the button to pause the pressure (2 times), continuous chest compression and a button (3 times) that can select the chest compression and 30: 2.

Cardiopulmonary Resuscitation (CPR) Manikin: The manikin used for CPR is Resusci Anne QCPR® (Laerdal, Stavanger, Norway). The chest compression and specialized tracheal intubation are possible, and the depth, velocity, incomplete relaxation and artificial respiration rate of chest compression can be evaluated. Manikin and Sim Pad were connected to collect data.

Bag-valve Mask: Bag-valve mask (BVM) was attached to a Laerdal® Silicone Resuscitator with a storage bag and the bag volume was 1,600 mL.

Data Collection and Analysis

All experiments were conducted at the National Fire Service Academy from February 19 to 28, 2018 in VR based simulation ambulance. Data were collected using Vital Sim® during 15 cycles of 30: 2 ratio of chest compression to artificial respiration and data collected were analyzed using SPSS software 12.0 (SPSS Inc., Chicago, IL, USA). The mean and standard deviation of chest compression and artificial respiration were measured by descriptive statistics and t-test.

Results and Discussion

With VR based Lucas, the rate of chest compression was 110, min 97, and $101.87 (\pm .566)$ per minute, respectively. The depth of the chest compression was 55.24 mm at the maximum and 47.86 mm at the minimum. The average depth of the chest compression was $53.80 (\pm .98)$. In the case of the standard 2-Person CPR, the speed of chest compression increased to a maximum of 138 times per minute, a minimum of 93 times, and an average of 123 times (± 4.325) per minute. The depth of the chest compression was 61.59 mm at the maximum and 15.75 mm at the minimum, and the average was $48.30 (\pm 6.11)$ [Table 1].

Unstable posture in the ambulance can cause physical damage to paramedics, and there is no device to ensure safety. Especially, when chest compression is performed with two hands in a situation where the motion of the vehicle cannot be predicted, it can be exposed to the vehicle movement in a defenseless manner. As a result, the chest compression speed increased to 138, 93, and 123 (± 4.325) in the standard CPR state, as if compensating for the chest compression. In addition, the depth of chest compression was 61.59 mm at the maximum, 15.75 mm at the minimum, and $48.30 (\pm 6.11)$ in average, which indicates that inappropriate chest compression was maintained. Another problem with standard CPR status was incomplete chest relaxation in 33.4%.

The rate of proper chest compression, the exact compression location, the depth of sufficient chest compression, and complete relaxation are important techniques for increasing cerebral blood flow and coronary perfusion. According to the American Heart Association guidelines for 2015^[13], the rate of chest compression should be maintained at least 100 times per minute, not exceeding 120 times, maintaining a chest compression depth of at least 5 cm and chest

compression is recommended to minimize interruptions with complete compression and complete relaxation. Minimization of chest compression downtime affects cerebral blood flow, coronary perfusion pressure, spontaneous circulation recovery rate, survival rate, and good neurological outcome (CPC 1-2). A study

of the efficiency of CPR in moving ambulances was readily available^[14,15]. The depth of chest compression performed within the ambulance was deeper and faster in compression and relaxation than in the plain^[14], indicating that the chest compression in ambulance is much harder than that in the flat place^[16,17].

Table 1: Chest Compression Results in VR-based Lucas and Standard CPR States (N = 1800)

Variables	Mean	Minimum	Maximum	Standard Deviation	t	p
Chest Compression Depth (mm)						
LUCAS	53.80	47.86	55.24	0.98	37.660	.000
Standard CPR	48.30	15.75	61.59	6.11		
Chest Compression Velocity (minute)						
LUCAS	101.87	97.00	110.00	0.566	-211.891	.000
Standard CPR	123.66	93.00	4.325			

It is very difficult to conduct the standard CPR within a shaken ambulance. When the CPR was performed by the researcher, it was necessary to open the legs wide to maintain the center of the weight, and then the chest compression was performed with the knee leaning on the side of the cart where the patient was lying. In the case of rotation, chest compression was performed using only hands.

On the other hand, when Lucas was used, chest compression speed was 110 times, 97 times, 101.87 times ($\pm .566$). The depth of the chest compression was 55.24 mm, the minimum was 47.86 mm, and the average was 53.80 ($\pm .98$). In 1.4%, the incomplete chest relaxation was observed. Simulation studies using elevators in elevated buildings to deliver cardiac arrest patients indicated that the application of mechanical device may be effective during the transfer of cardiac arrest patients to ambulances^[18]. According to the results of a randomized controlled trial^[6-12], the use of mechanical device for adult CPR is not recommended as a standard CPR method in relation to whether it alters good neurological and functional outcomes in patients who survive after 30 days, 60 days, 180 days, or 1 year after discharge, or only contributes to a change in survival rate or spontaneous recovery rate, the CPR International Liaison Committee (ILCOR) proposed that an mechanical device could be considered as an alternative to high-quality chest compression. However, when three trained paramedics applied the load distribution band, an average of 39 seconds of chest compression discontinuity occurred, and this chest compression discontinuation time tended to decrease as the case repeated ^[19].

This study has the following limitations. First, this study is a VR based manikin study with CPR for 6 minutes. Second, whether the VR based urban road scenario fully reflects on-site road conditions, and whether the VR based computer - controlled moving platform design sufficiently reflects the suspension of the ambulance that actually drives.

Conclusion

Although CPR can restore spontaneous circulation in patients with cardiac arrest, CPR can be performed while transferring patients who have difficulty in resuscitation in the field. However, high quality CPR is difficult with standard CPR. The results of chest compression depth, velocity, and volume were better than the standard 2-person CPR using Lucas in the VR based state. Especially, since the incomplete relaxation rate is low after chest compression, using mechanical chest compression device (LUCAS) rather than standard CPR affects the result of CPR in positive way, so it is suggested to use mechanical chest compression device as an alternative of high quality chest compression. In addition, there should be regular training programs so that mechanical chest compression device can be used efficiently.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Types of Subjectivity for Images of Nurses in Small and Medium-Sized Hospitals

Hye-gyeong Cha¹, Young-hee Han¹

¹Assistant Professor, Department of Nursing, Namseoul University, South Korea

ABSTRACT

Background/Objectives: The purpose of this study was to provide basic data for improving the desirable nursing image by identifying subjectivity of the nursing image of Korean small and medium-sized hospitals.

Method: Final 57 Q-sample constructed of 267 Q-populations. P-sample collected by convenience sampling of 36 nurse in Korean hospitals. P-sample collection was from August 25, to 2017 September 15. Data analysis of the principal component factor analysis method based on PC-QUANL use

Findings: Results of this study among the small-medium sized hospital's nurses, three types of attitudes toward nursing images were identified: Type 1 (Caring provider with a mission); Type 2 (Professional health manager); and Type 3 (Responsible medical profession).

Improvements/Applications: The results of this study can be helpful in understanding the nursing image and this can be used as basic data for the establishment of desirable nursing image.

Keywords: *Q-methodological, Nursing-image, small and medium-sized hospital, Subjectivity, Type*

Introduction

In Korea, starting from 2018, the demand for medical care is expected to surge due to the introduction of an elderly society. and the demand of nurses is increasing in health care area^[1].

According to health care environment, the ratio of nurses which play a key role in patient care, accounts for more than 30-40%. In 2015, the government introduced a comprehensive nursing service system in order to solve the social problems caused by family care for private employment^[2].

The 21st century is to nurture competent nurses, provide to high quality nursing care. It is important for nurse practitioners to the image of a medical institution, the nurse's own image are perceived to have an ambiguity^[3].

The image of nursing is divided into social, traditional, professional, and personal images ^[4]. In the meantime, if it has responded to many social roles required by traditionally devoted person image ^[5], who are intelligent, logical, progressive, and sophisticated in their understanding of the other's feelings ^[6].

According to the Gallup Survey of the United States in 2010, nursing jobs ranked first among the most honest and ethical professionals in the profession, excluding 2001, during the period from 1999 to 2010. According to the survey results of the nurses perceived by the public conducted by the Korean Nursing Association, 9 out of 10 (91.1%) were 'socially recognized professions', 84% said 'nurses have expert knowledge the patient's problem is solved. Furthermore, 8 out of 10 people thought "a warm and kind person who can trust and believe in a nurse"'.

it deviates from the image which is in charge of the Today, however, nurses find it difficult to improve the image of themselves by the outside rather than the inner factor of nursing itself ^[7].

According to the Hospital Nursing Association Report in 2012, the turnover rate of nurses is more than

Corresponding Author:

Young-hee Han

Assistant Professor, Department of Nursing,
Namseoul University, Korea

Email: labri25@nsu.ac.kr

three times higher the small and medium size hospital than that of large general hospitals. The turnover rate of large general hospitals is 9.8%, while the turnover rate in small and medium size general hospitals in 200-399 hospitals is 23.2%.

Although small and medium hospitals are in an important position to meet the medical needs of the local residents by linking the large general hospitals and the primary medical institutions in the medical delivery system in Korea.

Thus, the purpose of this study is to provide basic data for establishing the image of nurses in small and medium hospitals by analyzing the types of nurses.

Research Method

Study Design: This is an exploratory study by Q-methodology to identify the subjectivity of the image of the nursing n in small and medium Korean hospitals.

Study Method

Composition of Q-sample: Concourse extraction conducted to overall through literature review and in-depth interviews. 12 nurses from were asked to participate in-depth interviews and consented, and then the interviews were conducted. The in-depth interviews were conducted in seminar rooms of for the data collection. We explained for research purposes only use. The interview was then conducted for 1 ~ 1.5 hour after obtaining consent. In this process, a total of 767 Q populations were extracted.

Among 767 Q populations extracted 62 statements were adopted by two nursing professors with experience in studying of Q methodology. The 62 statements adopted were drawn up to cards for each statement, followed by a preliminary survey of six subjects in order to identify the balance of positive, negative, and neutral statement. Then the statements verified the final 57 statements.

Selection of P-sample: The Q-methodology is a qualitative study that emphasizes the subjectivity of individuals by focusing on differences in meaning or importance within individuals, not the differences among individuals. And as a result of the small sample doctrine that when the P sample is enlarged, the characteristics of the P sample are not clearly apparent because several people are biased against one factor, so about 50 people are common ^[10].

The P sample of this study was collected from a convenience sample of 36 nurses working in small and medium hospitals in Korea. For the ethical protection of participants, the data collection was carried out with consent, participants were told that this study would be solely used for research purposes, that anonymity and the privacy would be guaranteed, and that their participation could be withdrawn during the course of the interview or questionnaire preparation by the participants, if desired.

Q-sorting: Q-sorting is a process of modeling the opinions or feelings of a subject on a subject and this study used the principle of Q methodology. Extracted Q sample was Sby forced distribution. The 57 samples, 2 cards that are most similar to your opinion in strongly Agree (+4), 5 in +3, 7 in +2, 9 in +1, and 11 in neutral (0), and then 22 cards that are furthest from your opinion in strongly Disagree (-4), 5 in -3, 7 in -2, 9 in -1 were distributed forcedly in the same way and the converted scores were assigned in order of 9 points. After the distribution of the Q sample, the reason why each of two cards were placed at +4 and -4 on each end of the Q distribution table was required to be recorded on the questionnaire. It applied later analysis of as a powerful and robust expression of the subject ^[10].

In this study, the follow-up statements were quoted directly in the type analysis, and the statements were not presented because they are not statistical data.

Data Analysis

The Principal Component Factor Analysis (PCA) method was used by the PC-QUANL program, which was produced by Norman Van Tubergen and coded in numerical order.

In order to determine the ideal number of factors and to increase the explanatory power, the number of factors was input based on Eigen value 1.0 or higher, among the calculated results, and the type that was judged to be ideal was finally selected.

Results

Composition of Q-factors: In this study, leading to three types factors to be found. In the first type, there were 17, the second type was 16, and the third type was 3.

The explanation power of each factor, the first factor was 26.1%, the second factor was 6.5%, and the third factor was 5.1%. The correlations among the three types and explanatory power of each type are shown in table 1.

Table 1: Correlation between Eigen Values and Factors by Type

	Type 1 (N = 17)	Type 2 (N = 16)	Type 3 (N = 3)
Eigen value	14.5353	1.9942	1.6585
Variance	.7992	.1096	.0912
Cumulative	.7992	.9088	1.000
Type 1	1.000		
Type 2	.733	1.000	
Type 3	.450	.489	1.000

In addition, the demographic characteristics and factor weights are show in Table.

Analysis of Characteristics by Each Type

Type 1: Caring Provider with a Mission: As shown in table 2, there were 17 subjects classified as type 1, with an average age of 37.6 years and the average clinical experience was 15.5 years, with 16 female and 1 male.

Table 2: Demographic Characteristics and Factor Weights of Each Type

Type	P No.	Factor weight	Age	Gender	Clinical experience (year)
Type I (n = 17)	17	2.0393	27	F	5
	11	1.7020	35	F	13
	36	1.6413	45	F	23
	27	1.4539	41	F	19
	32	1.3923	31	F	9
	31	1.3582	40	F	18
	28	1.2474	33	F	11
	29	1.1999	41	F	19
	5	1.1970	27	F	5
	18	1.1774	23	F	1
	33	1.1254	38	F	16
	26	1.0312	34	F	12
	24	0.9824	48	F	26
	15	0.8444	40	F	18
	2	0.8427	52	F	30
	22	0.7974	43	M	18
	19	0.5721	42	F	20
	23	1.3843	48	F	27
	30	1.2577	42	F	21
	16	1.2171	25	F	4

Conted...

Type II (n=16)	3	1.1809	52	F	31
	13	1.1179	50	F	29
	34	1.1044	34	F	13
	10	1.0862	30	F	9
	4	0.9886	38	F	17
	1	0.9605	40	F	19
	6	0.6900	44	F	23
	12	0.6613	38	F	17
	14	0.6171	45	F	24
	20	0.5318	47	F	26
	21	0.4704	35	F	14
	25	0.4653	41	F	20
	8	0.4322	30	F	9
Type III (n=3)	9	0.6600	26	F	5
	7	0.4296	44	F	23
	35	0.2381	25	F	4

As show table 3, the strongest positive items is a job with a mission ($Z = 1.19$), 'Nurse takes health as a top priority ($Z = 1.08$)', 'Nurse are the mental proponents of patient' ($Z = 1.06$)', 'Nurse are people who act as intermediaries for doctors and patients ($Z = 1.05$)', 'Nurse are the closest person to patients ($Z = 1.03$)', 'Nurse give patients faith ($Z=1.01$), whereas items with strong negative, 'Nursing is just a job in the hospital ($Z = -1.47$)', 'Nurses are assistants to doctors ($Z=-1.46$)', 'Nurses are the people who care for a patient ($Z = -1.44$)', and 'Nurses are people who perform the work according to the doctor's prescription ($Z = -1.33$)'.

Table 3: Statement of Z-score by Type $\geq |1|$

Type	Q-Statement		Z-score
1	Q19	Nursing is a job with a mission	1.19
	Q43	Nurses take health as a top priority	1.08
	Q47	Nurses are the mental proponents of patient	1.06
	Q57	Nurses are people who act as intermediaries for doctors and patients	1.05
	Q46	Nurses are the closest people to the patients	1.03
	Q08	Nurses give patients faith	1.01

Conted...

	Q45	Nurses are people who perform the work according to the doctor's prescription	-1.33
	Q42	Nurses are the people who care for a patient	-1.44
	Q25	Nurses are assistants to doctors	-1.46
	Q10	Nursing is just a job in the hospital	-1.47
2	Q24	A nurse is a professional health care provider	1.71
	Q07	Nursing is an accurate and smart profession	1.42
	Q05	A nurse is a person who cares for the patient	1.27
	Q31	A nurse is a health manager	1.27
	Q19	Nursing is a job with a mission	1.15
	Q30	A nurse is a hard worker	1.08
	Q12	Nurses are unfriendly	-1.16
	Q10	Nursing is just a job in the hospital	-1.39
	Q25	A nurse is an assistant to a doctor	-1.45
	Q42	A nurse is a person who attends to a patient	-1.67

Conted...

3	Q09	Nurses are always busy	1.85
	Q57	Nurses are people who act as intermediaries for doctors and patients	1.61
	Q23	Nurses have a strong sense of responsibility	1.56
	Q21	Nurses are people who help	1.37
	Q44	Nurses are sincere and must complete their work without making mistakes	1.17
	Q08	Nurses give patients faith	1.13
	Q37	A nurse is a person who cares for the patient	1.08
	Q56	Nursing is a patient-care job	1.03
	Q46	Nurses are the closest people to patients	-1.07
	Q05	A nurse is a person who cares for the patient	-1.12
	Q51	A nurse is on the side of the patient	-1.36
	Q25	A nurse is an assistant to a doctor	-1.36
	Q31	A nurse is a health manager	-2.24

Score difference between type 1 and the other types were shown' <Table 4>.

As show table 4, items that show a difference in scores in type 1 when compared to other types of items were 'The image of nurses is as a nightingale, a white

Table 4: Positive and Negative Statements Compared to Other Types

Type	Q-statement		Z-score	Others' Z-score	Difference
1	Q02	The image of a nurse is that of nightingale, a white angel	.790	-.437	1.227
	Q49	Nurses should resolve the patient's discomfort	1.083	-.053	1.135
	Q25	A nurse is a doctor's assistant	-.464	-.437	-1.027
	Q41	Nurses are passive	-1.549	-.187	-1.362
	Q01	Nursing is a stressful and hard job	.003	1.563	-1.561
	Q09	Nurses are always busy	-.366	1.391	-1.757
2	Q05	A nurse is a person who cares for the patient	1.274	-.357	1.631
	Q35	Nursing is a stable job	.953	-.450	1.403
	Q38	A nurse is an educator	.919	-.384	1.303
	Q24	A nurse is a professional health care provider	1.712	.469	1.242
	Q48	A nurse is devoted to patients	-.035	1.004	-1.039
	Q50	A nurse is the patient's messenger	-1.852	-.519	-1.333

Conted...

3	Q01	Nursing is a stressful and hard job	2.246	.815	1.431
	Q21	Nurses are people who help	1.368	.007	1.361
	Q48	Nurses are devoted to patients	1.564	.241	1.323
	Q57	Nurses are people who act as intermediaries for doctors and patients	1.612	.392	1.219
	Q50	A nurse is the patient's messenger	.052	-1.154	1.206
	Q09	Nurses are always busy	1.855	.651	1.204
	Q42	A nurse is a person who attends to a patient	-.387	-1.537	1.150
	Q43	Nurses takes health as a top priority	-.287	.797	-1.084
	Q51	Nurses are on the side of the patient	-1.360	.029	-1.389
	Q05	A nurse is a person who cares for the patient	-1.117	.440	-1.557
	Q46	Nurses are the closest person to patients	-1.069	.764	-1.833
	Q31	Nurses are health managers	-2.237	1.144	-3.382

Participants in Type 1 considered the nurse to be a person with a mission that considered the patient's health as a top priority. The first type strongly denied the images that nurses are always busy, stressed, and hard job, and it has been named as a "caring provider with a mission" because it has a mission and a recognition that a nurse should exist to promote patient's health and solve problems.

Type 2: Professional Health Manager: Type 2 classified 16 subjects with an average age of 39.9 years and the average clinical experience was 18.9 years. <Table 2>. Type 2 were 'Nurse is a professional health care provider ($Z=1.71$)', 'Nurse is a smart in professional ($Z=1.42$)', 'Nurse is a person who takes care of a patient ($Z=1.27$)', 'Nurse is a health manager ($Z=1.27$)' etc., while items showing strong negative were 'Nurse is a person who attends to a patient ($Z=-1.67$)', 'Nurse is an assistant doctor ($Z=-1.45$)', 'Nursing is just a job ($Z=-1.39$)', 'Nurses are unfriendly ($Z=-1.16$)' <Table 3>. Score difference between type 2 and the other types were shown' <Table 4>.

Type 3: Responsible Medical Profession: There were three subjects classified as type 3, with an average age of 31.7 years, an average clinical experience was 10.6 years, and all were of the female gender.

The most positive items of type 3 were 'Nurses are always busy ($Z=1.85$)', 'Nurses are people who act as intermediaries for doctors and patients ($Z=1.61$)', 'Nurses have a strong sense of responsibility ($Z=1.56$)', 'Nurses are people who help ($Z=1.37$)', 'Nurses are sincere and must complete their work without making mistakes

($Z=1.17$)', 'Nurses give patients faith ($Z=1.13$)', 'Nurse is a person who cares for the patient ($Z=1.08$)', 'A nurse is a patient-care job ($Z=1.03$)', On the other hand, items showing strong negative are 'Nurses are health care workers ($Z=-2.24$)', 'A nurse is an assistant to a doctor ($Z=-1.36$)', 'A nurse is on the side of the patient ($Z=-1.36$)', 'A nurse is a person who cares for the patient ($Z=1.12$)', 'A nurse is the closest person to patients ($Z=-1.07$)' <Table 3>. Score difference between 3 type and the other types were shown' <Table 4>.

Discussion

Nurses share the most time with patients in specialized department in the hospital. As a result, nurses themselves have a negative image of nurses ^[11]. This study was to investigate of nurse's subjectivity image in small and medium hospitals.

Type 1, "Caring Provider with Mission", responded to 17 of 36 participants, with an average age of 37.6 years and an average clinical career of 15.5 years. This group involved in the middle manager that is expect to have a profession job and a positive thinking in comparison with other types. On the other word, it was worth the image like 'Nightingale' which is the closest to the patient and serves as a healer for the patient without any mistake.

Type 2 was the "professional health manager" type, and 16 of 36 participants responded. The average age was 39.9 years and the average clinical career was 18.9 years. This group responded 16 of 36 participants responded. The average age was 39.9 years and the average clinical career was 18.9 years. The most positive

items in this type were ‘nurses’ ($n = 1.71$), ‘nurses’ ($n = 1.71$) ‘and’ nurses’ Attitudes and values are based on the recognition that nurses are more than just physical and mental care of patients as professional occupations.

Type 3 was “Responsible medical practitioner” with 3 out of 36 participants. The average age was 31.7 years and the average clinical career was 10.6. The most positive items were ‘Nurses are always busy ($Z = 1.85$)’, followed by nurses who answered ‘Nurse is a mediator between doctor and patient ($Z = 1.61$)’, Attitudes and values. This group focus on the patient rather than on the image of mission or profession, and the nurse is a stressful, busy and difficult occupation rather than had the image of a job to manage.

The results of this study are as follows. First, the study on the nursing work environment of small and medium hospitals shows that job satisfaction is low, delegation and confusion of informal roles among medical personnel, unfair reward system between job and job type, the results of this study were as follows. Second, the nurses of the small hospitals experienced low levels of nursing care for themselves ^[13]. Based on this study, it is necessary to provide policy support, education and counseling to solve problems of supply and demand of insufficient nurses in Korea and to provide high quality nursing care.

Conclusion

This study on the type of subjectivity for images of nurses in small-medium sized hospital identified three types: (1) caring provider with a mission, (2) professional health manager, and (3) responsible medical profession.

This study has significance that the image of nurse’s in small and medium hospital. But, the subjects of this study were limited Therefore, further research is required to understand the more diverse subjectivity of nurses, it is necessary to have a continuing interest in professional roles as well as nursing images of the nurses.

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Three-Dimensional Measurements of Pharynx Structures in Malocclusion

Jeong-hyun Lee¹, Sa-Beom Park¹, Eun-Young Jeon¹, Jong-Tae Park¹

¹Include Department, Dan-Kook University College of Dentistry, Korea

ABSTRACT

Background/Objectives: The present study was conducted to examine differences between malocclusion the pharynx by reconstructing 3D images from CBCT data using the Mimics program, which allows actual measurement values to be acquired that are not affected by image distortion.

Method/Statistical Analysis: The subjects were analyzed by dividing them into malocclusion of classes I, II, and III (with each group comprising five participants) according to their facial skeletal forms. DICOM images were 3-dimensional ones manufactured by using the 3-D image program(Mimics 17, Materialise, Leuven, Gelgium). Upper airways in subjects of class I,II and III were divided into rhinopharynx, oropharynx and laryngopharynx.

Findings: The volume of the nasopharynx was 11521.9600 for class I, 11925.5850 for class II, and 13167.2800 for class III; the corresponding values for the oropharynx were 10946.0500, 8547.6125, and 12126.3125, respectively, indicating no significant differences. The volume ratio of the nasopharynx was 51.0534 for class I, 58.1387 for class II, and 51.9762 for class III; the corresponding values for the oropharynx were 48.9466, 41.8613, and 48.0238, respectively, also indicating no significant differences

Improvements/Applications: However, the present 3D measurements based on data measured in two dimensions are expected to facilitate future studies and provide basic data for them.

Keywords: *pharynx, malocclusion, 3D, Pharyngeal, CBCT*

Introduction

The respiration function has a huge impact on maxillofacial growth and development, with the environmental factor of mouth breathing known to be closely related to malocclusion¹⁻². Mouth breathing is likely to result in problems related to occlusion, such as palatal stricture, posterior crossbite, and anterior open bite, and it also may increase the anterior facial height and lower the position of the tongue by affecting the skeletal structure³. These features have led to considerable interest in the relationship between mouth breathing and facial form, and the number of studies evaluating pharynges based on the skeletal form has been

increasing¹⁻¹¹. Mouth breathing and airway obstruction have been reported to be related to malocclusion of Angle class 2 and division 1⁴. Some studies have evaluated the pharynges according to malocclusion, with recent ones examining the relationship between breathing during sleep and the pharynx¹²⁻¹⁸.

A representative case is snoring sometimes being accompanied by sleep apnea and obstructive sleep apnea¹⁶. Such obstructive sleep apnea occurs as the pharyngeal airway is narrowed during sleep due to macroglossia, a posterior position of the mandible, and a receding chin¹⁷. Previous studies have found a high incidence of obstructive sleep apnea in malocclusion of Angle class 3¹⁹⁻²⁰. Sleep apnea may therefore seem to be significantly affected by the pharyngeal size, depending on the severity of the Angle malocclusion. Although previous studies have tended to measure the pharyngeal form using cephalometric images, recent studies have observed pharyngeal forms by building three-dimensional (3D) images based on CT and MRI¹⁻¹¹.

Corresponding Author:

Jong-Tae Park
Professor, Division of Dentistry,
Dan-Kook University, Korea
Email: Jongta2@dankook.ac.kr

However, there are some limitations when establishing pharyngeal forms based on constructing 3D images based on CT and MRI²¹. The present study was conducted to examine differences between malocclusion of classes I, II, and III and the pharynx by reconstructing 3D images from CBCT data using the Mimics program (version 17, Materialise, Leuven, Belgium), which allows actual measurement values to be acquired that are not affected by image distortion.

Materials and Method

Subjects: CBCT data of 15 male adults without missing or asymmetric teeth or psychological disorders from among orthodontics patients at Danguk University Dental Hospital were provided by the Department of Oral and Maxillofacial Radiology. The subjects were analyzed by dividing them into malocclusion of classes I, II, and III (with each group comprising five participants) according to their facial skeletal forms. This study was approved by the institutional review board of Danguk University Dental Hospital (approval no. DUDH IRB 2015-12-022).

Method

Reconstruction of Three-Dimensional Images: CBCT data of the subjects were obtained in DICOM format using a CBCT scanner (Alphard 3030, Asahi, Kyoto, Japan), and CT scanning was carried out with the following parameters: slice increment, 0.39 mm; slice thickness, 0.39 mm; and matrix, 512 px * 512 px.

The DICOM images were 3D images that were reconstructed using 3D image processing software (Mimics version 17, Materialise). The nasopharynx, oropharynx, and laryngopharynx parts of the upper airways of the subjects were categorized into malocclusion of classes I, II, and III.

Reference Points: The following reference points were measured [Figure. 1, Figure. 2, Figure. 3]:

1. **Nasopharynx:** from the posterior bone of the hard palate to the border below the sphenoid bone underneath the sinus.
2. **Oropharynx:** from the posterior end border of the soft palate to the middle and anterior borders of the second cervical vertebrae.
3. **Laryngopharynx:** from the posterior border of the hyoid bone to the low and anterior borders of the third cervical vertebrae.

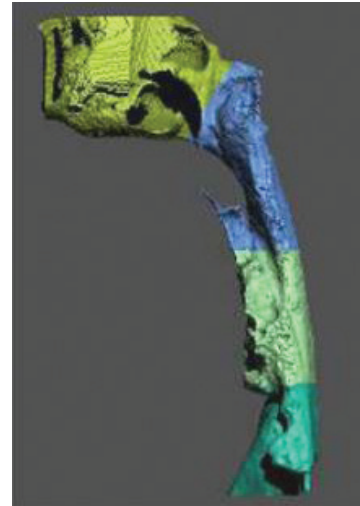


Figure 1: Three-Dimensional measurement of pharyngeal structures in malocclusion case (Class I)



Figure 2: Three-Dimensional measurement of pharyngeal structures in malocclusion case (Class II)



Figure 3: Three-Dimensional measurement of pharyngeal structures in malocclusion case (Class III)

Measurement Items

The following parameters were measured:

1. Nasopharynx volume.
2. Oropharynx volume.
3. Nasopharynx volume ratio.
4. Oropharynx volume ratio.

Statistical Analysis

The measurement items were analyzed using SPSS (version 23.0, SPSS, Chicago). The presence of significant differences was tested using a regularity test, and one-way ANOVA was applied due to a small number of the subjects. The average differences according to each class was tested by conducting a posttest with a 95% confidence interval ($p=0.05$).

Results and Discussion

The volume of the nasopharynx was 11521.9600 for class I, 11925.5850 for class II, and 13167.2800 for class III; the corresponding values for the oropharynx were 10946.0500, 8547.6125, and 12126.3125, respectively, indicating no significant differences. The volume ratio of the nasopharynx was 51.0534 for class I, 58.1387 for class II, and 51.9762 for class III; the corresponding values for the oropharynx were 48.9466, 41.8613, and 48.0238, respectively, also indicating no significant differences [Table 1].

The breathing function is one of the environmental factors of malocclusion that plays an important role in maxillofacial growth and development, and is also known to be closely related to the occurrence of malocclusion⁸⁻⁹. Lee et al.² reported that the presence of more-serious mandibular protrusion in patients with class III malocclusion resulted in a larger laryngopharyngeal width. Lee et al.¹¹ reported that maxillofacial growth can be affected by maxillary retrusion and mandibular posteroinferior rotation when mouth breathing is present.

In addition, pharynges related to the respiratory and digestive systems are also closely associated with maxillofacial growth and occlusal disorder, since they

are connected inside the mouth and to adjacent skeletal structures⁷. Ricketts⁸ reported that the pharyngeal effects on the skeletal structure may vary depending on size, and mouth breathing can occur if the adenoid of the nasopharynx is large. In addition, Lixa et al.¹⁴ reported that the size of the pharynx is associated with stroke, and Yun et al.¹⁴ also indicated that the size of the pharynx affects sleep apnea.

While many studies have investigated the pharynx, quantitative measurements have been lacking. Most of the preliminary studies measured the size of the pharynx using lateral cephalometric radiography, CT, or MRI¹⁻¹⁸. The present study therefore used the Mimics program in an attempt to identify differences between the pharynges in 3D images obtained from CBCT data and in the presence of malocclusion of classes I, II, and III.

This study found that the rhinopharynges are larger in malocclusion of class I than in classes II and III, whereas Lee et al.² reported that the rhinopharynges are larger in malocclusion of classes II and III than in class I. These discrepancies could have been due to errors in the measurements made on cephalometric radiographs²¹. The results of the present study are similar to those of Kim et al.¹, who found that the oropharynx was larger in class III than in class I, probably due to mandibular protrusion being more serious in class III skeletal structures¹¹. The present results are also similar to Fakhri et al.⁵ finding that the nasopharynx was larger in class II than in the other two classes, probably due to greater maxillary protrusion¹¹. Finally, the present study found that volume ratios of the oropharynx were higher in class I than in class III, whereas Kim et al.¹⁰ obtained the opposite result, probably due to errors.

The size of the pharynges appears to vary between skeletal structures of classes I, II, and III, and hence further studies are needed to clarify the situation. This study is considered to have been limited by the small number of subjects resulting in no statistically significant differences between the size of pharynges among classes I, II, and III. However, the present 3D measurements based on data measured in two dimensions are expected to facilitate future studies and provide basic data for them.

Table 1: Comparison of Pharynges According to Malocclusion Class

	Class I Mean (SD)	Class II Mean (SD)	Class III Mean (SD)	P*
Nasopharynx	11521.9600 (3595.04708)	11925.5850 (1306.05734)	13167.2800 (2089.73790)	0.643
Oropharynx	10946.05500 (2755.05117)	8547.6125 (539.30330)	12126.3125 (1689.51491)	0.067
Volume ratio of nasopharynx	51.0534 (2.46665)	58.1387 (3.97881)	51.9762 (5.33349)	0.074
Volume ratio of oropharynx	48.9466 (2.46665)	41.8613 (3.97881)	48.0238 (5.33349)	0.074

Conclusion

This study examined the size of the pharynges according to different classes of malocclusion by comparatively analyzing the pharyngeal forms in patients with malocclusion of classes I, II, and III by reconstructing images derived from CBCT into 3D ones. The results can be summarized as follows:

1. The size of the nasopharynx was 11521.9600 for class I, 11925.5850 for class II, and 13167.2800 for class III, with no significant differences ($p>0.05$).
2. The size of the oropharynx was 10946.0500 for class I, 8547.6125, for class II, and 12126.3125 for class III, with no significant differences ($p>0.05$).
3. The volume ratio of the nasopharynx was 51.0534 for class I, 58.1387 for class II, and 51.9762 for class III, with no significant differences ($p>0.05$).
4. The volume ratio of the oropharynx was 48.9466 for class I, 41.8613 for class II, and 48.0238 for class III, with no significant differences ($p>0.05$).

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Coping Strategies Influencing Role Conflicts among Clinical Nurses

Yoon Hee Cho¹, Miok Kim¹, Joohyun Lee²

¹College of Nursing, Dankook University, Cheonan-si, Chungnam, 31116, Korea; ²College of Nursing, Eulji University, Seongnam-si, Gyeonggi-do, 13135, Korea

ABSTRACT

Background/Objectives: This study was conducted to describe the level of role conflicts and coping strategies as well as the types of coping strategies influencing role conflicts among clinical nurses.

Method/Statistical Analysis: In this descriptive study, we enrolled 98 nurses in two hospitals in Korea. Role conflicts and coping strategies were assessed using a structured questionnaire. Data were analyzed using descriptive statistical analysis, independent t-tests, one-way ANOVA, Pearson's correlation, and multiple linear regression.

Findings: The overall mean score reflecting role conflicts was 3.41 ± 0.51 . The mean scores for four subcategories of role conflicts (lack of ability, role ambiguity, disturbance of environment, and lack of help) were 3.32 ± 0.61 , 3.36 ± 0.55 , 3.59 ± 0.65 , and 3.41 ± 0.77 , respectively. The overall mean score for coping strategies was 3.02 ± 0.38 . Among subcategories of coping strategies, the highest mean score was for tension reduction (3.29 ± 0.64), and the lowest mean score was for problem-focused coping (2.73 ± 0.53). Among subcategories of coping strategies, lack of ability was significantly correlated with wishful thinking ($r=.219$, $p<.05$), detachment ($r=.224$, $p<.05$), and seeking social support ($r=.263$, $p<.01$). Role ambiguity was significantly correlated with wishful thinking ($r=.236$, $p<.05$), seeking social support ($r=.305$, $p<.01$), and tension reduction ($r=.294$, $p<.01$). Both disturbance of environment and lack of help were significantly correlated with wishful thinking ($r=.306$, $p<.01$; $r=.365$, $p<.01$), seeking social support ($r=.328$, $p<.01$; $r=.316$, $p<.01$), and tension reduction ($r=.275$, $p<.01$; $r=.247$, $p<.05$). Multiple linear regression showed that role conflicts among nurses were coping strategies for seeking social support ($t=2.726$, $p=.008$).

Improvements/Applications: Nurses have been influenced by the help of people around them in reducing role conflicts. Therefore, it is necessary to build support infrastructure inside and outside the hospital.

Keywords: Role conflict, Coping strategy, Hospital, Nurse, Marital status

Introduction

In the hospital setting, nurses occupy the largest numbers and are directly responsible for providing health services to the clients. Thus, quality assurance of nursing largely determines the overall quality of health services provided by hospitals [1]. In a rapidly changing medical environment, nurses are constantly being asked to perform high-quality nursing services

and friendly care by patients or hospital organizations [2, 3]. However, nurses inevitably experience conflicts while coordinating and communicating their work between various professional responsibilities and patients.

Clinical nurses experience role conflicts due to inconsistencies between role expectations and role performance [4]. If role conflicts are not properly controlled, they can affect the quality of patient care by lowering job satisfaction and job performance [5]. It is important that nurses are satisfied with their jobs if the ultimate goal of nursing is to provide high-quality patient care. This is because quality nursing is influenced by job satisfaction, which allows the nurse to perform efficiently and positively the tasks given to nurses [6].

Corresponding Author:

Joohyun Lee
Associate Professor, College of Nursing,
Eulji University, Korea
Email: leejoohyun@eulji.ac.kr

Role conflicts need to be reduced in order to increase job satisfaction and nursing performance. In order to minimize the dysfunction caused by these role conflicts, clinical nurses are required to maintain a psychological, cognitive, and behavioral balance [5]. According to previous research, nurses in Korea have chosen to make concessions or compromises among various problem-solving methods to minimize the impact of role conflict situations [7]. However, it is not considered desirable for nurses to choose concessions or compromises to resolve conflicts, as problem-solving is a behavioral approach that seeks to find solutions that meet the interests of both the self and the other. Therefore, this study was conducted to describe the extent of role conflicts and coping strategies and examine correlations between role conflicts and coping strategies among clinical nurses.

Materials and Method

Design and Sample: This descriptive study was conducted to identify the levels of role conflicts and coping strategies as well as the types of coping strategies influencing role conflicts among clinical nurses in Korea. A total of 98 nurses participated in this study from two hospitals. Two nurses who had insufficient responses were excluded from the analysis. The minimum sample size was calculated using G* Power version 3.1.2, with an effect size of .15, significance level (α) of .05, statistical power ($1-\beta$) of .8, and the number of predictors set to 6 [8]. These settings generated a minimum sample size of 98 participants.

Ethical Considerations and Procedure: Fundamentally, the ethical implications of this study and the potential risks to the participants' human rights were minimal. Nonetheless, a research assistant provided a full explanation of the purpose, content, and methods of the study before the distribution of written consent forms to all participants. All subjects participated voluntarily. Data collection was carried out in May 2014.

Measures

Role Conflicts: Role conflicts were measured using the Korean Role Conflicts (KRC) tool, developed by Kim and Park [4], which consists of 40 items with four subcategories. The components of the KRC are lack of ability, role ambiguity, disturbance of environment, and lack of help, all of which are assessed using a 5-point Likert-type scale, ranging from 1 ('no conflict') to 5 ('very severe conflict'). Cronbach's α of the original scale was .93, while the corresponding Cronbach's α for this study was .91.

Coping Strategies: Coping strategies that nurses applied to stressful situations were measured using the Korean Way of Coping (KWC) tool, developed by Han and Oh [9], which consists of 32 items with six subcategories. The KWC sections are problem-focused strategy, wishful thinking, detachment, seeking social support, focusing on the positive, and tension reduction, which are assessed using a 5-point Likert-type scale, ranging from 1 ('never used coping strategies') to 5 ('used coping strategies a lot'). Cronbach's α of the original scale was .82, while the corresponding Cronbach's α for this study was .80.

Statistical Analyses: Using IBM SPSS Statistics, version 23.0 (IBM Corp., Armonk, NY, USA), general characteristics of subjects were analyzed by descriptive statistics. To analyze the differences in role conflicts and coping strategies among participants, independent t-tests and one-way ANOVA were applied, and Pearson's correlation coefficient was applied to assess the linear relationships among variables. Finally, multiple regression analysis was applied to explain the types of coping strategies influencing role conflicts among clinical nurses. The significance level for testing statistical significance was estimated lower than .05.

Results and Discussion

Table 1 shows the general characteristics of the 98 participants. Half of the respondents were 20-29 years old, and all respondents were female. In terms of marital status, 66.3% of the participants were single. Forty-four percent of the participants had less than 5 years of work experience as a nurse.

Table 1: General Characteristics of Subjects

Variables		N	%
Age	20-29 years	49	50.0
	30-39 years	33	33.7
	40 years and over	16	16.3
Marital status	Married	33	33.7
	Single	65	66.3
Duration of work	<5 years	43	43.9
	<10, and ≥ 5 years	37	37.8
	≥ 10 years	18	18.3
Education	4-year course	39	39.8
	3-year course	59	60.2

Table 2 shows the mean scores reflecting role conflicts and coping strategies among study participants. The overall mean score for role conflicts was $3.41 \pm$

0.51. The mean scores for the four subcategories of role conflicts (lack of ability, role ambiguity, disturbance of environment, and lack of help) were 3.32 ± 0.61 , 3.36 ± 0.55 , 3.59 ± 0.65 , and 3.41 ± 0.77 . The clinical nurses reported the highest level of role conflict in the environment category, including lack of time and nursing facilities, excessive workload, and atmosphere of the nursing unit.

The overall mean score reflecting coping strategies was 3.02 ± 0.38 . Among subcategories of coping strategies, the highest mean score was that representing tension reduction (3.29 ± 0.64) and the lowest mean score was for problem-focused coping strategy (2.73 ± 0.53). The clinical nurses were generally unable to use the most recommended problem-focused coping strategy.

Table 2: Role Conflicts and Coping Strategies of Clinical Nurses

Variables	M $\pm$ SD	Range
Total role conflicts	3.41 ± 0.51	1.78-4.50
Lack of ability	3.32 ± 0.61	1.90-4.50

Conted...

Role ambiguity	3.36 ± 0.55	1.60-4.67
Disturbance of environment	3.59 ± 0.65	1.80-5.00
Lack of help	3.41 ± 0.77	1.60-4.80
Total coping strategies	3.02 ± 0.38	1.88-3.81
Problem-focused	2.73 ± 0.53	1.63-4.13
Wishful thinking	3.25 ± 0.63	1.60-4.80
Detachment	3.00 ± 0.51	2.00-5.00
Seeking social support	3.05 ± 0.51	1.86-4.43
Focusing on the positive	3.06 ± 0.63	1.33-4.33
Tension reduction	3.29 ± 0.64	1.33-5.00

Table 3 shows differences in role conflicts and coping strategies according to general characteristics. Marital status had a statistically significant effect on role conflicts ($t=-2.224$, $p=.030$), but no other general characteristic was associated with significant differences in coping strategies.

Table 3: The difference of role conflicts and coping strategies of clinical nurses by general characteristics

Variables		Role conflicts			Coping strategies		
		M $\pm$ SD	t/F	p	M $\pm$ SD	t/F	p
Age	20-29 years	3.45 ± 0.48	0.219	.804	3.01 ± 0.42	0.896	.411
	30-39 years	3.37 ± 0.53			2.98 ± 0.34		
	40 years and over	3.40 ± 0.59			3.13 ± 0.33		
Marital status	Married	3.25 ± 0.54	-2.224	.030	3.03 ± 0.37	0.081	.935
	Single	3.49 ± 0.06			3.02 ± 0.39		
Duration of work	<5 years	3.47 ± 0.47	0.602	.550	3.08 ± 0.34	1.863	.161
	<10, and ≥ 5 years	3.40 ± 0.54			2.93 ± 0.41		
	≥ 10 years	3.31 ± 0.51			3.07 ± 0.39		
Education	4-year course	3.45 ± 0.51	-0.324	.746	3.06 ± 0.37	-0.808	.421
	3-year course	3.42 ± 0.48			3.00 ± 0.37		

Table 4 shows there was a significantly positive correlation between role conflicts and coping strategies. Specifically, lack of ability had significantly positive correlations with wishful thinking ($r=.219$, $p<.05$), detachment ($r=.224$, $p<.05$), and seeking social support ($r=.263$, $p<.01$). Role ambiguity had significantly positive correlations with wishful thinking ($r=.236$, $p<.05$), seeking social support ($r=.305$, $p<.01$), and tension reduction ($r=.294$, $p<.01$). Disturbance of environment had significantly positive correlations with wishful thinking ($r=.306$, $p<.05$), seeking social support ($r=.328$, $p<.01$), and tension reduction ($r=.275$, $p<.01$). Finally, lack of help had significantly positive correlations with wishful thinking ($r=.365$, $p<.01$), seeking social support ($r=.316$, $p<.01$), and tension reduction ($r=.247$, $p<.05$).

Table 4: Pearson's correlation coefficients between role conflicts and coping strategies of clinical nurses

	Lack of ability	Role ambiguity	Disturbance of environment	Lack of help
Problem-focused	.176	0.87	.018	.102
Wishful thinking	.219*	.236*	.306**	.365**
Detachment	.224*	.047	.148	.168
Seeking social support	.263**	.305**	.328**	.316**
Focusing on the positive	.089	.064	.103	.090
Tension reduction	.127	.294**	.275**	.247*

Table 5 shows the result of the multiple linear regression analysis to identify coping strategies influencing role conflicts among study participants. Categorical data (marital status) were converted into dummy variable. The variances inflation factors were estimated from 1.17 to 1.72, which were lower than the criterion value of 10. The tolerance limits among predictive variables were calculated from 0.58 to 0.86, which were over 0.1 of the criterion value. There was neither multicollinearity nor high autocorrelations among predictor variables because the value of the Durbin-Watson test for autocorrelations among residuals was 2.007.

The multiple linear regression analysis revealed that role conflicts of clinical nurses were influenced by marital status ($t=-2.487$, $p=.015$) and coping strategies (especially seeking social support; $t=-2.726$, $p=.008$).

Table 5: Coping strategies influencing role conflicts of clinical nurses

Variables	Role conflicts		
	β	t	p
Problem-focused	-.001	-0.008	.994
Wishful thinking	.059	0.494	.623
Detachment	-.022	-0.198	.843
Seeking social support	-.326	-2.726	.008
Focusing on the positive	-.037	-0.313	.755
Tension reduction	.194	1.889	.062
Marital status (married nurse)	-.245	-2.487	.015
F(p)	4.463 (<.001)		
Adj. R ²	.260		
Tolerance	.58-.86		
VIF	1.17-1.72		
Durbin-Watson	2.007		

Clinical nurses were experiencing more than moderate levels of role conflicts at a score of 3.41 out of 5. Particularly, scores for disturbance of environment

and lack of help were higher than for other subcategories. In other words, clinical nurses found that their working environments were not only unfriendly, but they also needed help and support from nearby people. The coping strategies used by nurses who experienced role conflicts were tension reduction and wishful thinking. Both methods are passive ways to make people feel less conflicted by modifying their thoughts rather than actively solving problems. Therefore, clinical nurses are likely to experience repeated role conflicts because the above strategies cannot solve fundamental problems ^[10].

After controlling general characteristics, the coping strategy of seeking social support influenced role conflicts among participants. Specifically, clinical nurses receiving support or help from nearby people experienced less role conflict than nurses who did not. However, the problem-focused strategy proposed to be the most effective in previous studies was not influenced by the role conflicts experienced by clinical nurses in this study ^[11, 12]. This was because most of the role conflicts experienced by the nurses were complicated organizational problems that were difficult to solve. Instead, the diverse support of the people who understand the conflict situation experienced by the nurses was considered to reduce the level of role conflicts among the nurses.

Conclusion

The purpose of this study was to identify the extent of role conflicts and coping strategies and examine how coping strategies influence role conflicts among clinical nurses. Participants showed the highest level of role conflict in the environment category, including lack of time and nursing facilities, excessive workload, and atmosphere of the nursing unit. Additionally, clinical nurses used wishful thinking and tension reduction—passive methods—to solve the role conflicts. Therefore, nurses need to learn more active problem-solving strategies.

Nursing administrators need to identify and improve the causes of nurses' the organizational problems that cause the strongest role conflicts. Moreover, nursing managers should be able to provide planned interventions in new nursing education initiatives, for example, to use effective coping strategies to overcome stressful situations.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Development and Validation of a Scale to Assess Dental Hygienists' Role as Knowledge Brokers in Korea

Seo-Ha Yun¹, Jong-Hwa Jang²

¹Assistant Professor Department of Dental Hygiene, Taegu Science University, 47 Yeongsong-ro, Buk-gu, Daegu, 41453, Rep. of Korea; ²Department of Dental Hygiene, College of Health Science, Dankook University 119, Dandae-ro, Dongnam-gu, Cheonan-si, Chungnam, 31116, Rep. of Korea

ABSTRACT

Objectives: In this study, we aimed to evaluate the validity and reliability of the scale for dental hygienists' role as knowledge broker, a tool potentially useful to help to develop dental hygienists' role as a knowledge broker that meet the needs of the field and include it in dental hygiene curricula.

Method: This manuscript reports on a complex descriptive study involving both qualitative and quantitative sub-studies. It also includes a methodological study aiming to develop and verify the content validity and reliability of a scale for dental hygienists' role as a knowledge broker. The survey questionnaire was distributed to 240 dental hygienists who currently work in care institutions, including private hospital, dental hospital, or general hospital for at least three months, between June 8, 2015 and July 13, 2015.

Findings: To verify the reliability, validity, and unidimensionality of the 40 questionnaire items, exploratory factor analysis was performed with Varimax rotation. The exploratory factor analysis led to 17 items for three factors. In the confirmatory factor analysis, the path coefficients for all items were significant, at .588-.857. Based on the results of exploratory and confirmatory factor analyses and literature review of the role of knowledge brokers, its subfactors 1, 2, and 3 were named "explain and promote understanding", "deliver knowledge", and "link to resources", respectively. The goodness of fit of the structural equation model was examined using the following indices: $\chi^2=3.066$, GFI=.860, AGFI=.805, TLI=.882, CFI=.904, RMSEA=.094

Applications: We developed and validated a scale to assess the roles of dental hygienists in Korea as a knowledge broker. Reflecting the newly demanded roles of knowledge brokers in educational curricula will surely help dental hygienists to advance and improve themselves as health professionals.

Keywords: Dental hygienist, Dental hygiene, Educational curricula, Knowledge Broker, Role

This paper is a part of the dissertation authored by Seo-Ha Yun of the Graduate School of Hanyang University

Introduction

Dental hygienists, along with dentists, play an essential role in preventing oral diseases and educating patients. Furthermore, they perform preventive treatments on dental patients, cooperate with dentists to promote efficient treatment, and instruct patients about oral management to prevent oral diseases^[1].

With increased economic standard and diverse medical demands in South Korea, the roles of dental hygienists are also expected to change. Professional dental hygienists are demanded to play a more diverse repertoire of roles, such as comprehensive dental hygiene treatment considering prophylactic treatment and aesthetic factors. As knowledge brokers, a recently emerged role, dental hygienists are required to equip the functions of questioning (plan on behalf of the patient), explaining (help patient to clearly understand healthcare information), and maintaining (hold onto the information delivered to the patient) ^[2,3].

Knowledge is information organized and analyzed to be used for problem-solving and decision-making^[4,5].

Corresponding Author:

Jong-Hwa Jang

Associate Professor, Department of Dental Hygiene,
Dankook University, Korea

Email: jhj@dankook.ac.kr

A broker is a mediator at the center of information delivery who provides knowledge, resolves conflicts with collected information, and connect the two groups participating in knowledge exchange. In other words, a broker does not prefer a specific individual over the others and instead satisfies the needs of all. A knowledge broker is a compound term with the words of knowledge and broker. In other words, a knowledge broker is an individual or organization that partakes in the bidirectional exchange of knowledge between two parties, who delivers the knowledge or practice of one group to the another and mediates and connects the two parties, thereby creating a new opportunity for learning and innovation ^[6,7].

The roles of dental hygienists in Korea can be broadly categorized into cooperation with dental treatment, preventive treatment for oral diseases, oral health education, and hospital coordinator. Currently, dental hygienists in Korea are mostly involved in aiding dental care, but changes in the dental clinic environment and the resulting diversification, departmentalization, and specialization of clinical tasks call for an expansion of dental hygienists' scope of work as well. If a dentist's main work is dental care, a dental hygienist's main work is to provide preventive education to patients. Nevertheless, dental hygienists in Korea have been mostly involved in the works in dental care, as their fundamental role was not established properly. Since dental hygienists perform the roles of organizational managers or care aids at the same time they provide preventive treatment to people, oral health education and patient counseling, it is important to identify the skills, knowledge, and attitudes required in the clinical setting. This knowledge is critical to plan the education

of new dental hygienists and dental hygiene students accordingly and empower them as professionals meeting the demands of the field.

South Korea's 2002 National Competency Standards (NCS) recommend scientific and systematic identification and education of the standardized work capacities (knowledge, skills, attitude) required for successful work performance. Therefore, there is a need for a new model that is commensurate with today's context to maintain a qualitative balance between theory and actual practice about the role of knowledge broker in educational institutions and in the field of employment. In order to develop the true role of dental hygienists, as opposed to merely giving theory education focused on delivering dental medical knowledge, and to reflect the roles of knowledge broker as demanded in the current era, it would be necessary to understand whether relevant knowledge is used or shared as a "common language" between dental hygienists and dental hygiene students.

In this study, we aimed to evaluate the validity and reliability of the Scale for Dental Hygienists' Role as Knowledge Broker, a tool potentially useful to help to develop dental hygienists' role as a knowledge broker that meet the needs of the field and include it in dental hygiene curricula.

Method

Study Design: This manuscript reports on a complex descriptive study involving both qualitative and quantitative sub-studies as shown in Figure 1. It also includes a methodological study aiming to develop and verify the content validity and reliability of a scale for dental hygienists' role as a knowledge broker.

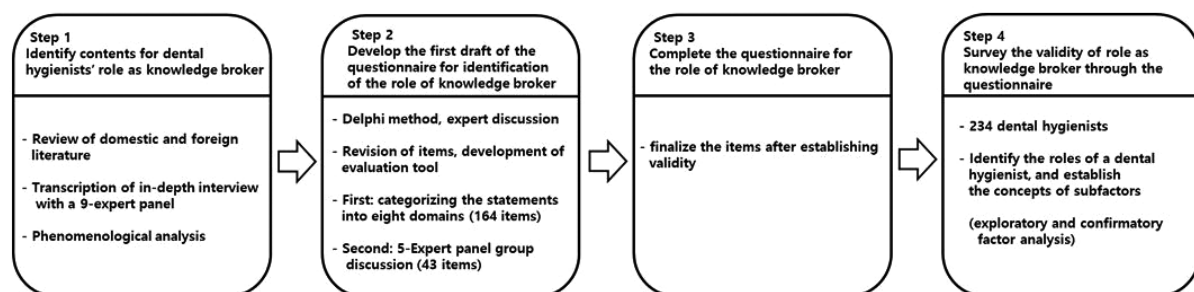


Figure 1: Study flowchart

Study Subjects: This study was approved by the Institutional Review Board at Hanyang University (IRB No: HYI-15-020-1). The survey questionnaire was distributed to 240 dental hygienists who currently

work in care institutions, including private hospital, dental hospital, or general hospital for at least three months, between June 8, 2015 and July 13, 2015. All participants consented to participate in the study. All

of the 240 questionnaires were retrieved, and after excluding three questionnaires completed by a male dental hygienist and three incomplete questionnaires, a total of 234 questionnaires were included in the final analysis. The sample size was computed according to [8] using G-power 3.1.7 for correlational analysis with a significance of 0.05, power of 80%, and medium effect size of 0.2. The calculated sample size after considering dropout and loss rates was 200, so the sample size used in this study was adequate.

Study Procedure

Development of questionnaire items for Dental Hygienists' Roles as Knowledge Mediators: After analyzing the tasks of dental hygienists and the definition and duties of a knowledge broker based on a review of national and international literature, we conducted an in-depth interview of three dental hygienists who have been working in a care institution for more than 10 years and six dental hygiene professors, from April 11, 2015 to May 17, 2015, using a semi-structured questionnaire asking the following questions: What is the role of knowledge broker to a dental hygienist? How does a dental hygienist perform the role of a knowledge broker? Why is the role of a knowledge broker important to a dental hygienist? When does a dental hygienist perform the role of a knowledge broker? Where does a dental hygienist perform the role of a knowledge broker? What obstacles hinder a dental hygienist from performing the role of a knowledge broker? With the participants' consent, the interview data were recorded and then transcribed. Based on [9] phenomenological methodology, 187 meaningful statements were identified and clustered with similar categories, resulting in 164 statements. Based on discussion and revision by five healthcare majors, including this author, 43 questionnaire items for "knowledge broker" were developed.

Validity verification of the knowledge broker and questionnaire structure: The content validity of the role model for the dental hygienists as a knowledge broker developed in this study was verified by nine experts. The cutoff for Content Validity Index (CVI) by experts is generally set at 70%, but considering the fact that "knowledge broker" may be a newly emerged concept, we set the cutoff at 55%. As a result, three items in the first draft were removed, resulting in a final tool with 40 items

Study Instruments: The final instrument included 40 items that were validated by experts. Both affirmative and negative statements were randomly arranged to eliminate careless uniform responses. The items were structured so as to be answered with 1-2-3-4-5, and negative statements were reverse-coded during analysis to match the direction of the questionnaire items. The reliability of the 40 items was identified to be high, Cronbach's $\alpha = .946$.

Data Analysis

Dental hygienists' general characteristics were analyzed to obtain descriptive statistics, including frequency and percentage, mean and standard deviation using SPSS 18.0 and AMOS 18.0. Dental hygienists' roles as a knowledge broker was examined with exploratory factor analysis and confirmatory factor analysis. The goodness of fit of the study model was analyzed with (Chi-square), TLI (Tucker-Lewis Index), CFI (Comparative Fit Index), and RMSEA (Root Mean Square Error of Approximation).

Results and Discussion

Participants' Demographic Characteristics: The mean age and mean career's length were 31.1 years and 4.28 years, respectively. 58.1% (n=136) of the participants were between 24-33 years old and 71.8% were single (n=168). With regard to the highest level of education, 72.2% had an associate degree (n=169), and 54.3% had a career of between 3-9 years (n=127). A total of 89.3% were under permanent employment (n=209). Most participants were single had an associated degree, and were in permanent positions. Further, 60.7% (n=142) worked in a dental clinic, 73.9% (n=173) worked in a treatment room, and 87.6% (n=205) were in charge of clinical work. About 54.3% (n=127) had taken a refresher course, while 79.5% (n=186) had never heard of the term knowledge broker. As shown here, most dental hygienists were in charge of clinical work in the treatment room in dental clinics.

Validity Analysis

Results of Exploratory Factor Analysis: To verify the reliability, validity, and unidimensionality of the 40 questionnaire items, exploratory factor analysis (principal component analysis) was performed with Varimax rotation. The cutoff for inappropriate items was set at .6 or below. The exploratory factor analysis led to 17 items for three factors

Results of Confirmatory Factor Analysis: In the confirmatory factor analysis, the path coefficients for all items were significant, at .588-.857. In general, a standardized factor loading between .50 and .95 is deemed good ^[10]. The t value shows the degree of agreement among various items that measure the same concept, and it must be greater than 1.96 ^[11]. All 17 items had a large t value, so the scale was considered unidimensional. An average variance extracted (AVE) of .50 or higher and a construct reliability of .70 or higher are considered to confirm the convergent validity. In the present study, the AVE ranged between .55 and .56 and the CR ranged between .83 and .89, confirming high convergent validity (Table 1 and Figure 2).

Based on the results of exploratory and confirmatory factor analyses and literature review of the role of

knowledge brokers, its subfactors 1, 2, and 3 were named “explain and promote understanding,” “deliver knowledge,” and “link to resources,” respectively. Our study model describes the complex mutual relationship among the sub-concepts. In the existing job model for dental hygienists, tasks such as: B3. establish project plan for local community oral health projects; B4. establish project plans for oral health projects by lifecycle; C1. enroll patients and prepare for care; C9. provide preventive dental care; and C33. launch local community oral health projects included similar concepts to the duties of a knowledge broker, but there is no specific job description for a “knowledge broker.” The duties of dental hygienists as a knowledge broker defined in this study are all under one dimension, which suggests that the scale we developed is appropriate as a measurement instrument for further studies.

Table 1: Results of Confirmatory Factor Analysis

N = 234

Factor		Variables	FL	t-value	CR	AVE
Factor 1 Explain and promote understanding	26	Repeatedly explain to help understanding.	.857	10.38	.89	.55
	14	Play a mediating role between dentists and employees and between patients and dentists.	.811	10.00		
	8	First understand the most pressing need of the patient.	.771	9.64		
	35	While explaining to the patient about what will happen before and after treatment, additionally explain and help patient understand when the patient asks questions.	.765	9.59		
	6	Explain to the patient about the treatment plan, process, and diagnosis.	.735	9.45		
	15	Try to create a comfortable, friendly, and satisfactory atmosphere for the patient.	.610	8.15		
	32	More senior dental hygienists should teach clinical work to younger dental hygienists.	.609			
Factor 2 Deliver knowledge	12	Develop education programs.	.803	10.20	.88	.56
	11	Create an online posting containing verified knowledge and share it via social media.	.801	10.19		
	24	Give 1:1 online consultation.	.792	10.18		
	10	Regularly manage the bulletin board and change the contents of the video shown in the waiting room.	.748	9.80		
	19	Explain using a computer.	.648	10.22		
	25	Regularly check recalls to deliver customized knowledge.	.646			
Factor 3 Link to resources	37	Fulfill the role of a knowledge broker regardless of the place of work, including dental hospitals and clinics, health examination centers, public health centers, and culture centers.	.837	9.07	.83	.56
	28	Explain and promote the dental medical system to community residents to help them receive the benefits.	.812	8.97		
	33	Provide knowledge sources to help decision-making.	.714	8.29		
	40	Gladly participate in small or large medical volunteering activities in Korea and abroad.	.588			

Goodness of Fit: The goodness of fit of the structural equation model was examined using the following indices: $\chi^2=3.066$, GFI=.860, AGFI=.805, TLI=.882, CFI=.904, RMSEA=.094 (Table 2).

Table 2: Goodness of fit

N = 234

Category	Recommended standard	Goodness of fit	Category	Recommended standard	Goodness of fit
/df	$3 \geq df \geq 1$	3.066	TLI	$TLI \geq .9$	.882
CFI	$CFI \geq .9$	.904	GFI	$GFI \geq .9$	.860
AGFI	$AGFI \geq .8$	.805	RMSEA	$RMSEA \leq .08$	.094

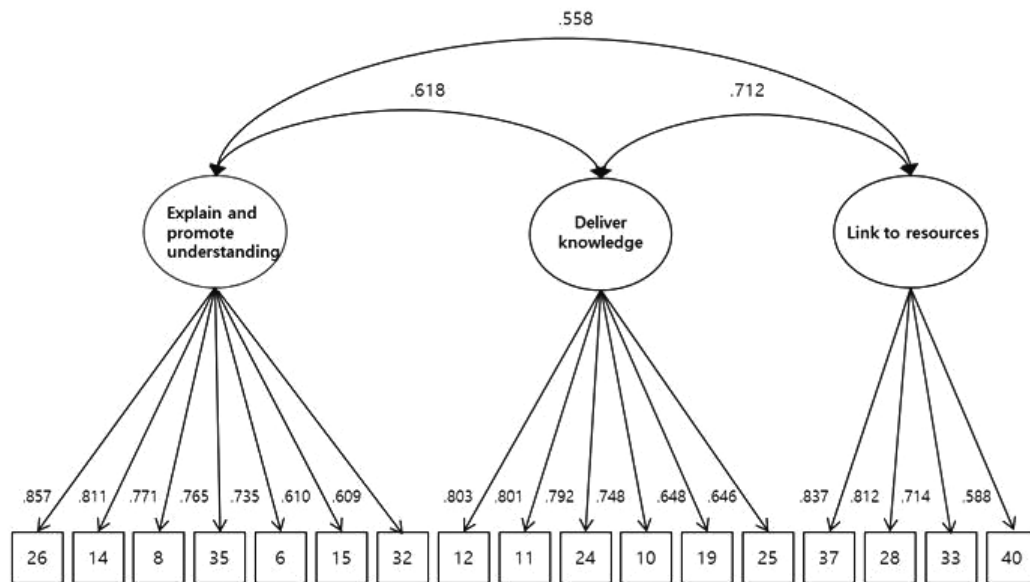


Figure 2: A Confirmatory Factor Analysis Model

Table 3 shows the results of the Pearson bivariate correlation analysis that was performed to analyze the correlations among each factor of the knowledge broker scale. There was a positive correlation between “explain and promote understanding” and “deliver knowledge” ($r=.54$, $q=.000$) and between “explain and promote understanding” and “link to resources” ($r=.58$, $q=.000$). Discriminant validity was tested with correlation coefficients and AVE values, where the correlation coefficient between each factor must be smaller than the AVE value. The correlation coefficients for the three factors ranged from $r=.54$ -. 59 , and they were smaller than the square root of AVE (.74-.75), thereby establishing discriminant validity.

Table 3: Correlations Among Factors and Discriminant Validity

N = 234

	Explain and promote understanding	Delivery of knowledge	Link to resources
Explain and promote understanding	.74		
Delivery of knowledge	.54**	.75	
Link to resources	.58**	.59**	.75
Cronbach's α	.89	.88	.82

* $p < .05$ ** $p < .01$ *** $p < .001$ (The shaded section: discriminant validity, The non-shaded section: correlation)

A knowledge broker mediates two separate sectors by learning and acquiring knowledge or information produced in one context or other types of resources and introducing them to the other sector in which they are yet unknown^[12,13]. In this study, we aimed to identify the roles of a knowledge broker, which would help us to establish the scope of oral hygiene services given by dental hygienists, and to develop relevant capacities that meet the needs of the healthcare field so as to include them in the dental hygiene curriculum. Currently, the national dental hygienist examination comprises a theoretical aspect focused on aiding in various types of care and a practical aspect that evaluates students' manipulation of particular devices. Due to the lack of education in regard to students' potential role as a knowledge broker, which is often demanded in the clinical setting, it takes a long time for newly licensed dental hygienists to adjust to their clinical work.

Identifying the duties of dental hygienists in the clinical setting and reflecting them in the educational curriculum to equip the prospective dental hygienists with the required skills is crucial if we want to develop education in dental hygiene. The ability to provide a comprehensive dental hygiene service, particularly by explaining and promoting understanding, delivering knowledge, and linking to resources, is a novel intellectual capacity and skill. "Explaining and promoting understanding" are important roles of knowledge brokers that could be separated from the existing health education. There is a need for professionals who mediate knowledge to assist dental hygiene consumers in making the correct choices and fulfill their rights and duties. The scale developed in this study can comprehensively assess the psychosocial factors and other factors involved in the development of dental hygienists' competence. We anticipate the scale can be applied in the clinical setting as well. However, given the dynamic nature of professional duties such as those discussed in this manuscript, replication studies should be conducted continually so as to keep abreast with the changes of jobs in this rapidly evolving healthcare environment

Conclusion

We developed and validated a scale to assess the roles of dental hygienists in Korea as a knowledge broker. The scope of dental hygienists' work, which had been largely focused on assisting in dental care, has

been diversified, subdivided, and specialized according to the needs of service consumers. Reflecting the newly demanded roles of knowledge brokers in educational curricula will surely help dental hygienists to advance and improve themselves as health professionals.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Emotional Labor, Burnout and Job Satisfaction among Korean Clinical Nurses

Joohyun Lee¹

¹College of Nursing, Eulji University, 553 Sanseongdaero, Sujeong-gu, Seongnam-si, 13135, Korea

ABSTRACT

Background/Objectives: This was a cross-sectional descriptive correlation study to understand the effect of clinical nurses' emotional labor on burnout and job satisfaction. factors affecting nurses' emotional labor, burnout, and job satisfaction were also investigated.

Method/Statistical Analysis: Ninety clinical nurses from two general hospitals located in S city were participated. Emotional labor was measured by a scale which consists of 19 items with subcategories of diversification, frequency, intensity, expression, and internalization. Burnout was measured by a scale which consists of 21 items with physical burnout, emotional burnout, and psychological burnout categories. Job satisfaction was measured by a modified scale which consists of 25 items in the area of work related environment, benefits, personnel system, peer and senior relationship. All measurements had 5 point Likert scale. The higher the total score meant the higher emotional labor, burnout, or job satisfaction.

Findings: Most of the participants aged less than 39 years and 61 participants (67.8%) were not married. Most of them graduated at least college level. The range of duration of work was various from less than 2 years to more than 10 years. Nurses' age, marital status, religions, educational level, work unit, position, and employment status did not significantly affect nurses' emotional labor, burnout, or job satisfaction. However, nurses in their 20s (68.20 ± 10.12 vs. 63.30 ± 8.51 , $t=2.392$, $p=.019$), and in two to five years of current unit experience (70.18 ± 8.75 vs. 58.60 ± 6.39 , $t=3.968$, $p=.010$), and 11 to 20 patients in their care (70.56 ± 10.09 vs. 63.68 ± 8.82 , $t=3.738$, $p=.027$) showed significant high levels of burnout. Also nurses in their 20s (73.24 ± 10.96 vs. 78.97 ± 10.77 , $t=-2.435$, $p=.017$) and salaries less than 2.5 million won (70.42 ± 7.56 vs. 79.86 ± 12.10 , $t=5.552$, $p=.005$) showed significantly lower levels of job satisfaction. Nurses' emotional labor did not correlate with burnout or job satisfaction. However, burnout had negative relationship with job satisfaction with moderate intensity ($r=-.487$, $p<.001$).

Improvements/Applications: Continuous effort to improve hospital work environment including salary and nurse-to-patient ratio would be beneficial to prevent nurses' burnout and increase job satisfaction. Furthermore, special educational or continuing programs or strategies for young and less experienced nurses should be developed and implemented.

Keywords: Emotional labor, Burnout, Job Satisfaction, Nurse, Correlation

Introduction

The basic purpose of the hospital is to provide quality medical cares to customers. With the activation of the

institutional quality of service assessment in South Korea, customers could select and evaluate medical institutions. Many hospital organizations are focusing on strategies for improving customer satisfaction in order to effectively cope with the changed medical environment^[1].

As an employee of a hospital, a nurse must constantly contact different levels of people with various health needs in a socially acceptable manner^[2]. Nurses should not only take care of the subject's physical illness, but also care about the emotional health of the subjects.

Corresponding Author:

Joohyun Lee
Associate Professor,
College of Nursing, Eulji University, Korea
Email: leejoohyun@eulji.ac.kr

Caring for emotional health of the subjects is also one of the evaluation items for hospital services.

In that situation, nurses' capabilities of dealing with emotion have become very important. For customer satisfaction, nurses must be able to control their negative feelings and understand patients, their families, and other medical staff's feelings and properly deal with [3]. Emotional labor was defined as the practice of managing and trying to express the desired emotion required by an organization [4]. In hospital services, emotional labor included everything that drives consumers to have a positive attitude toward hospitals, health cares and medical staffs. Nurses were required not to express individual feelings freely, but they had to show trained responses that assists in the management of patients' emotions.

However, the level of emotional labor affected emotional exhaustion, degradation of self-efficacy [3], which was found to have a direct and indirect impact on the effectiveness and benefits of the organization [4]. Excessive emotional labor at a nurse's personal level could increase work stress and burnout [5]. Increased job stress promotes professional exhaustion and reduces job satisfaction [6]. Furthermore, burnout was associated with mental health of the nurses. Also, it compromises productivity and performance as well as the quality of patient care.

The purpose of the study was to determine the effect of nurse emotional labor on burnout and job satisfaction. The general characteristics and job related characteristics of the subjects were identified and the degree of emotional labor, burnout, and job satisfaction was compared.

Materials and Method

Design and Sample: This was a cross-sectional descriptive correlation study in order to identify the relationships between emotional labor, burnout, and job satisfaction among Korean clinical nurses. The study participants were 90 nurses who worked in outpatients and wards of two general hospitals with more than 600 beds in S city and G province. Exclusion criteria were nurses with less than a year of service at the current units.

Ethical Consideration and Procedure: Researchers provided a full explanation of the purpose, content, and methods of the study before the distribution of survey

questionnaires. All subjects participated voluntarily and signed consent forms before answering the questionnaire. In the consent, the anonymity and academic use of the survey was guaranteed. A structured questionnaire was distributed to be filled out in person for honest answers. Data was collected from May 1st to 28th 2017. The completed questionnaires were sealed for protection and collected by the researchers.

Measures

Emotional Labor: Emotional labor was measured by a scale which consists of 19 items with 5 subcategories [7]. The original scale included six aspects of emotional expression such as diversification, duration, frequency, intensity, expression, and internalization. However, in this study, 5 subcategories excluding duration of emotional expression were used. It consists of 5 point Likert scale of 19 items. The higher the total score meant the higher the level of emotional labor. The Cronbach's alpha for original scale was .78 and for this study was .79.

Burnout: Burnout was measured by a scale which consists of 21 items with physical burnout, emotional burnout, and psychological burnout categories [8]. Each category consists of 7 items of 5-point Likert scale. The higher the total score means the higher the level of burnout. The Cronbach's alpha for original scale was .90 and for this study was .90.

Job Satisfaction: Job satisfaction was measured by a modified scale by a researcher. The original scale consisted of 30 items to measure nurse's satisfaction with their work situation [9]. However, the subcategories of scale changed to 25 items of 5-point Likert measurement in the area of work related, work environment, benefits, personnel system, peer and senior relationship. The higher the total score means the higher the level of job satisfaction. The Cronbach's alpha for original scale was .83 and for this study was .88.

Statistical Analyses

Using IBM SPSS Statistics, version 21.0, general characteristics of participants were analyzed by descriptive statistics. Independent t-tests and one-way ANOVA were applied in order to identify the differences in emotional labor, burnout, and job satisfaction according to participants' characteristics. Pearson's correlation coefficient was applied to identify the

relationships among emotional labor, burnout, and job satisfaction of Korean clinical nurses. The significance level for testing statistical significance was estimated lower than .05.

Results and Discussion

Participants in the study were 90 clinical nurses with at least one year of service in two hospitals. As shown in Table 1, most of the participants aged less than 39 years and 61 participants (67.8%) were not married. Most of them graduated at least college level and half of them did

not have any religions. Half of them received between 2 million won to 2.5 million won as their monthly salary. Eight one participants (90%) were hired as full-time nurse.

Work units were various from medical-surgical to outpatient clinics. The range of duration of work was various from less than 2 years to more than 10 years. However, most of them have worked current units less than 10 years. Seventy seven (85.6%) were working as a shift nurse. Most of them were staff or charge nurses. More than half of them were taking care of more than 16 patients per a nurse.

Table 1: General characteristics of clinical nurses (N = 90)

Characteristics		n	%	Characteristics		n	%
Age (years)	20~29	54	60.0	Work experience (months)	< 24	24	26.7
	30~39	33	36.7		25~48	20	22.2
	40~49	3	3.3		49~72	14	15.6
Married	Yes	29	32.2		73~96	15	16.7
	No				97~120	7	7.7
Education	College	24	26.7		≥121	10	11.1
	University	58	64.4	Current work unit experience (months)	< 24	24	26.7
	Graduate School	8	8.8		25~48	20	22.2
Religion	None	45	50		49~72	14	15.6
	Christian	30	33.3		73~96	15	16.7
	Catholic	12	13.3		97~120	17	18.8
	Buddhist	3	3.3		≥121	0	0
Salary (million won per month)	< 2	7	7.8	Position	Staff nurse	75	83.3
	2~2.49	45	50		Charge nurse	13	14.4
	2.5~3	23	25.6		Head nurse	2	2.2
	≥3	15	16.7	Type of work	Shift work	77	85.6
Employment status	Full-time	81	90.0		Day work	13	14.4
	Part-time	9	10.0	Number of patients per a nurse	<5	2	2.2
Work Units	Medical	14	15.6		6~10	41	45.6
	Surgical	3	3.3		11~15	4	4.4
	Maternal-Pediatrics	27	30.0		16~20	21	23.3
	Intensive Care Unit	9	10		≥ 21	22	24.4
	Emergency Unit	10	11.1				
	Outpatient clinic	27	30.0				

In order to compare the level of emotional stress, burnout, and job satisfaction according to general characteristics of the participants, statistical analysis was done as shown in Table 2. Nurses' emotional labor did not differ significantly depending on age, but the

level of burnout and job satisfaction was found to be significantly different. Nurses less than 30 years old showed high levels of burnout (68.20 ± 10.12 vs. 63.30 ± 8.51 , $t=2.392$, $p=.019$) and low levels of job satisfaction (73.24 ± 10.96 vs. 78.97 ± 10.77 , $t=-2.435$, $p=.017$).

These results are similar to low job satisfaction among nurses with less than three years of work experience in other study [10]. According to the researcher's theory, the timing of adaptation which usually less than 3 years of work experience increased job stress and exhaustion and also increased the likelihood of changing jobs. However in this study, marriage, educational level, work unit, position, and employment status did not significantly affect nurses' emotional labor, burnout, or job satisfaction.

Interestingly, there was no significant difference between emotional labor and burnout depending on the level of salary. However the high salaried nurses showed a high level of job satisfaction (79.86 ± 12.10 vs. 70.42 ± 7.56 , $t=5.552$, $p=.005$). This finding is consistent with the result that a professional nurse worked longer when an annual salary was high [11].

Also, the current work unit experience has a significant impact on burnout. Nurses with more than 10 years of experience have shown significantly lower levels of burnout than nurses with two to five years of experience (70.18 ± 8.75 vs. 58.60 ± 6.39 , $t=3.968$, $p=.010$). This is believed to be associated with an increased ability to deal with various nursing situations as they entered a career stabilization stage after more than a decade of work experience [10].

The number of patients per nurse also had a significant impact on the nurses' burnout (70.56 ± 10.09 vs. 63.68 ± 8.82 , $t=3.738$, $p=.027$). Interestingly, caring for more than 10 patients had shown that the level of burnout increased and then decreased with 20 or more patients. Although detailed factors were not investigated in this study, the severity of the patients is also likely to have affected the nurses' burnout. If the patients are less severe, nurses usually take care of more patients, but their emotional stress would not that high.

Table 2: The levels of emotional labour, burnout, job satisfaction according to characteristics

Characteristics		Emotional Labor M $\pm$ SD	t or F (p)	Burnout M $\pm$ SD	t or F (p)	Job Satisfaction M $\pm$ SD	t or F (p)
Age (years)	< 29	52.59 $\pm$ 1.53	-.299 (.766)	68.20 $\pm$ 10.12	2.392 (.019)	73.24 $\pm$ 10.96	-2.435 (.017)
	$\geq$ 30	52.69 $\pm$ 1.65		63.30 $\pm$ 8.51		78.97 $\pm$ 10.77	
Married	Yes	52.55 $\pm$ 1.61	-.337 (.737)	64.13 $\pm$ 8.02	-1.554 (.125)	78.48 $\pm$ 10.12	1.731 (.087)
	No	52.62 $\pm$ 1.56		67.24 $\pm$ 10.40		74.15 $\pm$ 11.46	
Education	College	52.83 $\pm$ 1.52	.724 (.471)	66.60 $\pm$ 10.23	-.142 (.887)	74.04 $\pm$ 11.06	-.777 (.439)
	University	52.56 $\pm$ 1.59		66.33 $\pm$ 9.66		76.12 $\pm$ 11.26	
Salary (10,000 won)	< 200	53.00 $\pm$ 1.41	.202 (.817)	68.14 $\pm$ 9.92	.976 (.381)	70.42 $\pm$ 7.56	5.552 (.005)
	200-250	52.60 $\pm$ 1.57		67.35 $\pm$ 10.52		72.65 $\pm$ 9.63	
	$\geq$ 250	52.60 $\pm$ 1.63		64.57 $\pm$ 8.75		79.86 $\pm$ 12.10	
Work Units	General	52.47 $\pm$ 1.46	.223 (.800)	64.64 $\pm$ 7.18	.276 (.760)	78.82 $\pm$ 11.91	.893 (.413)
	Pediatrics	52.55 $\pm$ 1.60		66.62 $\pm$ 10.77		74.92 $\pm$ 9.16	
	Special	52.73 $\pm$ 1.62		66.60 $\pm$ 10.09		74.71 $\pm$ 11.94	
Position	Staff	52.72 $\pm$ 1.55	1.169 (.245)	67.01 $\pm$ 9.49	1.687 (.095)	74.89 $\pm$ 11.20	-1.310 (.194)
	Charge	52.20 $\pm$ 1.65		62.40 $\pm$ 10.51		79.14 $\pm$ 10.76	
Employment status	Full-time	52.64 $\pm$ 1.58	.155 (.877)	66.59 $\pm$ 9.63	.913 (.384)	75.83 $\pm$ 11.53	.967 (.352)
	Part-time	52.55 $\pm$ 1.58		63.11 $\pm$ 10.98		73.11 $\pm$ 7.52	
Current work unit experience (years)	< 2	52.50 $\pm$ 1.95	.653 (.583)	65.16 $\pm$ 10.83	3.968 (.010)	76.00 $\pm$ 9.55	2.532 (.062)
	2-5	52.70 $\pm$ 1.29		70.18 $\pm$ 8.75		72.07 $\pm$ 10.44	
	5-10	52.86 $\pm$ 1.38		66.10 $\pm$ 9.24		75.85 $\pm$ 12.83	
	$\geq$ 10	52.10 $\pm$ 1.85		58.60 $\pm$ 6.39		83.10 $\pm$ 8.99	
Number of patients per nurse	<10	52.69 $\pm$ 1.71	2.065 (.132)	65.04 $\pm$ 9.43	3.738 (.027)	75.44 $\pm$ 11.58	.648 (.525)
	11- 20	53.00 $\pm$ 1.52		70.56 $\pm$ 10.09		73.87 $\pm$ 12.45	
	$\geq$ 20	52.09 $\pm$ 1.23		63.68 $\pm$ 8.82		77.63 $\pm$ 8.87	

In correlation between emotional labors, burnout, job satisfaction, emotional labor of clinical nurses did not correlated with burnout or job satisfaction. These results could be considered together with the results of no differences in emotional labor depending on the general characteristics of the participants. Repeated study with different measurements or larger or different sample could be used to clarify clinical nurses' emotional labor and burnout.

However, burnout had negative relationship with job satisfaction with moderate intensity ($r = -.487$, $p < .001$). Other study reported that nurses' work related stress and burnout could be associated job satisfaction and even nurses' physical and mental health status [6]. One study reported that among 198 Portuguese family care nurses, 28% present emotional exhaustion and there was intention of leaving current work [12]. Since the working areas of study participants were not limited, it could be thought that clinical nurses' burnout from emotional labor decreases job satisfaction rather than emotional labor itself.

Table 3: Relationships between emotional labour, burnout, job satisfaction

	Emotional Labor r(p)	Burnout r(p)
Burnout	-.168(.114)	
Job Satisfaction	-.015(.890)	-.487(<.001)

Conclusion

In this study, 90 Korean clinical nurses' emotional labor, burnout, job satisfaction were investigated. Interestingly, the emotional labor of clinical nurses was found to be consistent with the general characteristics including age, marital status, educational level, salary, work unit, position, employment status, current work unit experience, number of patients per nurse. Nurses' emotional labor was also not related with burnout and job satisfaction. Repeated studies with different methods or participants might be useful to identify causes of these findings.

However, there were significant differences in nurses' burnout and job satisfaction according to age, current unit experience, number of patients per nurse, and salary. Nurses in their 20s and in two to five years of current unit experience and 11 to 20 patients in their care showed significant high levels of burnout. Also,

job satisfaction levels of clinical nurses significantly lowered when nurses were in their 20s and wages were below 2 million won.

Therefore, it is necessary to develop various support programs to prevent burnout of nurses with less than five years of work experience and in their 20s. In addition, to enhance job satisfaction of young nurses, continuing efforts to improve hospital working environment in terms of economic aspects and help with early professional adaptation should be provided.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Pre-therapeutic Device for Post-stroke Hemiplegic Patients' Wrist and Finger Rehabilitation

Jihun Kim¹, Eun-Taek Woo¹, Jae-Won Seo¹, Jaehyo Kim¹

¹*School of Mechanical and Control Engineering, Handong Global University, Pohang, Republic of Korea*

ABSTRACT

Background/Objectives: This paper suggests a pre-therapeutic device for post-stroke hemiplegic patients' wrist and finger rehabilitation both to decrease and analyze their muscle tones before the main physical or occupational therapy.

Method/Statistical Analysis: We designed a robot which consists of a BLDC motor, a torque sensor, linear motion guides and bearings. Mechanical structure of the robot induces flexion and extension of wrist and finger (MCP) joints simultaneously with the single motor. The frames of the robot were 3D printed. During the flexion/extension exercise, angular position and repulsive torque of the joints are measured and displayed in real time.

Findings: A prototype was 3D printed to conduct preliminary experiment on normal subject. From the neutral joint position (midway between extension and flexion), the robot rotated 120 degrees to extension direction and 30 degrees to flexion direction. First, the subject used the machine with the usual wrist and finger characteristics without any tones. Second, the same subject intentionally gave strength to the joints in order to imitate affected upper limb of a hemiplegic patient. During extension exercise, maximum repulsive torque of the normal hand was 2 Nm whereas that of the firm hand was almost 5 Nm. The result revealed that the device was capable enough to not only rotate rigid wrist and fingers with the novel robotic structure, but also present quantitative data such as the repulsive torque according to the joint orientation as an index of joint spasticity level.

Improvements/Applications: We are planning to improve the system by applying torque control and arranging experiments at hospitals to obtain patients' data and feedbacks to meet actual needs in the field.

Keywords: *Stroke, Hemiplegia, Rehabilitation, Robotics, Wrist, Finger*

Introduction

Thanks to advanced medical treatments, the death rate of chronic and acute stroke has been gradually reduced. Since the brain injury usually accompanies loss of motor functions, increasing population of hemiplegic patients is naturally inevitable. More than months or even years of rehabilitation is mandatory because repetitive movements of affected joints and muscles

practiced in hospitals stimulate neuroplasticity so that normal neurons nearby damaged ones would replace the lost functions^[1,2,3].

The ultimate purpose of post-stroke hemiplegia rehabilitation is to recover performance of activities of daily lives(ADL) improving patient's quality of life (QoL)^[4]. Recovery of wrist and finger functions is important to QoL because use of the joints is closely related to interactions with objects. However, those joints are considered most time-consuming and difficult to be fully recovered because restoration of upper limb functions starts from mesial to distal joints, hence from shoulder, arm, wrist, and finally to fingers. In addition, since wrist and fingers have multiple degree-of-freedom actuated by multiple musculoskeletal systems and since they are quite sensitive compare to other upper limb

Corresponding Author:

Jaehyo Kim
Professor,
School of Mechanical and Control Engineering,
Handong Global University, Korea
Email: jhkim@handong.edu

joints, it is demanding both to patients and therapists to practice physical and occupational therapies on the very specific joints^[5].

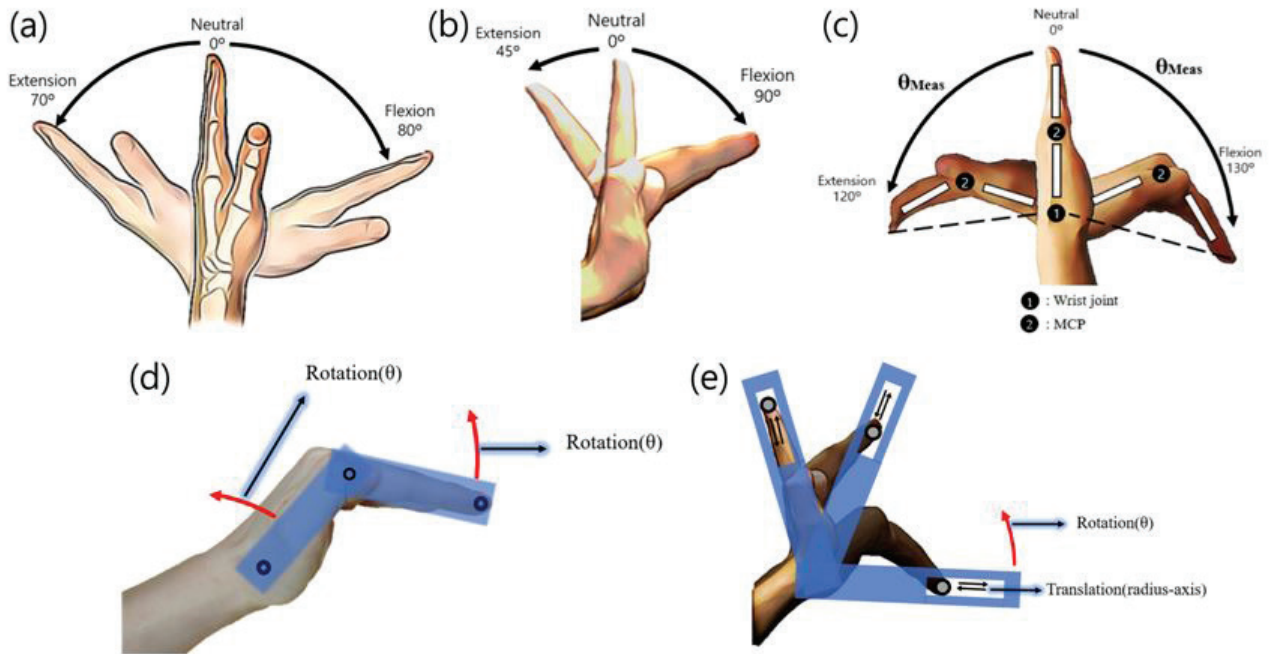


Figure 1: Target ROM of wrist and MCP joints and possible mechanical structures of therapeutic robots.

(a) Wrist flexion/extension ROM. (b) MCP flexion/extension ROM. (c) Combined joint ROM. (d) Conventional exoskeleton structure. (e) Proposing structure. Conventional exoskeleton robots restrict all skeletal joints to the robot linkage, so they usually lack flexibility regarding user's body size. The proposing structure let MPC joint free and allow the tips of fingers slide back and forth. Therefore, the new robot has increased flexibility.

Today, more and more therapeutic robots are introduced to relieve their burden. The robots are considered useful because they 1) provide intensive and repetitive trainings, 2) suggest quantitative assessment about patient's motor functions, and 3) help build database^[6]. However, complex structure of the robots and expensive prices make them impractical to use at small or medium hospitals. As a result, simple therapeutic robots are reported to be more patient- and therapist-friendly as well as easier to commercialize than complex robots^[6]. In addition, a recent study on robot-assisted exercise suggests that 10 minutes of simple wrist flexion/extension are sufficient enough to temporarily reduce the joint tone of patients especially on Brunnstrom stage 3^[8]. Therefore, we propose a simple and affordable robot that helps reduce the high wrist and finger spasticity before the main physical or occupational therapies.

Materials and Method

Mechanical Structure: One of the easiest yet effective ways to design a therapeutic robot would be following a similar pattern of physical therapy practiced by therapists

over the past decades. When they perform the basic wrist/finger stretching exercise on patients, they gently and quite evenly apply a pushing force on the patients' palm and fingers. As a result, wrist joint is fully extended followed by finger joint extension. The target range of motion (ROM) of wrist and MCP is presented in figure 1 (a) and (b) ^[7]. To imitate the stretching exercise, we considered the combined ROM of the therapeutic robot as shown in figure 1 (c).

Conventional exoskeleton-type finger robots locate their actuators right beside desired human joints to apply torque thus to induce rotational movements^[4,5]. The basic operation algorithm of the conventional method is shown in figure 2 (a). Although this method is intuitive to engineers, the robots become rather inconvenient for most hemiplegic patients with distorted joints. In addition, since users have different hand sizes, alignments between the robot linkages and human joints take too much time. Therefore, most exoskeleton robots are difficult to commercialize^[6]. To overcome the difficulties, we considered a novel mechanical structure presented in figure 2 (b). Rather than restricting MCP

joint to the robot, we let them free. Instead, we installed linear motion guides to allow the fingertips freely move back and forth. Finally, wrist joint shares the same rotational axis with BLDC motor. Due to this mechanical structure, it is possible to move the two degrees of freedom with one driving actuator.

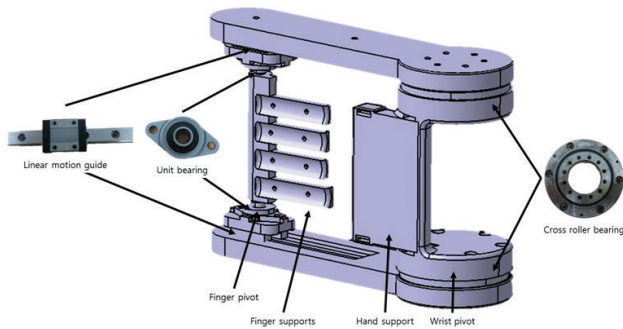


Figure 2: 3D model of the therapeutic robot frame and its mechanical components

When turned upside down, since the robot frame becomes symmetrical, it can be used for both hands.

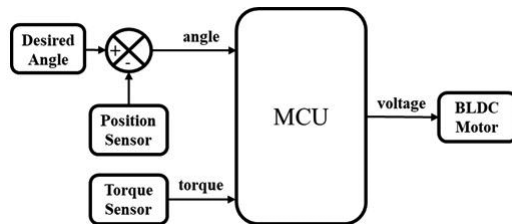


Figure 3: System control block diagram

USB-6009 was used as MCU to control the motor and collect the sensor data with a sample rate of 100 hz.

System Components: To implement the mechanical structure, we designed a robot frame as shown in figure 2. The robot frame consists of fingers, hand supports and a wrist pivot. According to human body size measurement by

Statistics Korea, the average hand width of male is 8.2cm, female 7.3cm, and top 5% 9.5cm. Therefore, the width of the hand support is designed to be 10cm. Two linear motion guides, two unit bearings, and two cross roller bearing were assembled with the frame to induce wrist and finger flexion/extension using a single BLDC motor.

The power of the motor was selected based on the maximum wrist torque of healthy person^[9,10]. A BLDC motor MW-VBL24D030S-M-G with rated torque of 24Nm and rated rotational speed of 12.5 rpm was used. Too fast rotational speed is unnecessary to give patients a sense of safety and comfort. A torque sensor TCN16 (Dacell) with capacity of 49.03N-m was used in order to monitor and collect user's repulsive torque applied to the wrist pivot. The motor is linked to the torque sensor by coupling. A variable resistor was installed on the wrist pivot as a position sensor. Based on the torque and the joint angle data, spasticity level of the patient is expected to be estimated.

Control Algorithm: For wrist and finger flexion/extension exercise, angular position PID control was implemented to the BLDC motor. Underdamped control usually provides a fast response with low rising time and settling time, but overshoots should always be avoided due to a possible risk of fracture since most patients' joints are distorted. Since the maximum angular speed of the motor was quite slow (12.5 rpm) with a very high gear ratio (1:200), stable overdamped control was promising. Therefore, PID parameters were carefully chosen to be overdamped response. As shown in figure 3, USB-6009 (National Instrument) with C language on Visual Studio (Microsoft) was used to collect sensor data and control the motor with a sample rate of 100 Hz.

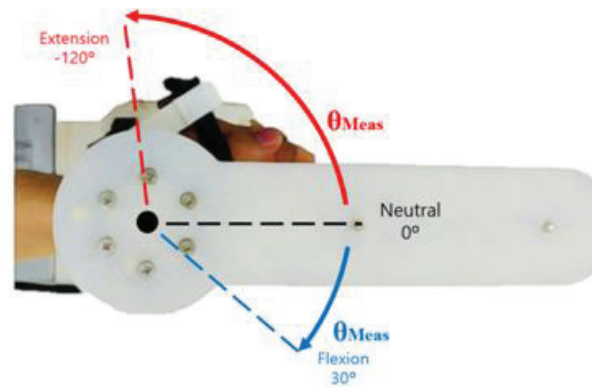
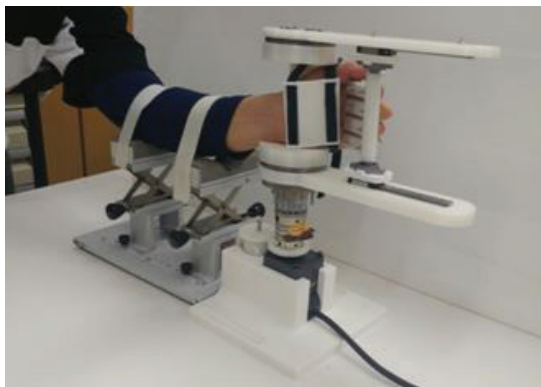


Figure 4: Prototype of the therapeutic robot

The prototype was 3D printed and tested by a normal subject beforehand. Over 60 seconds, the device rotated to 120 degrees toward extension direction and 30 degrees toward flexion direction with constant rotational speed of 7.5 deg/s.

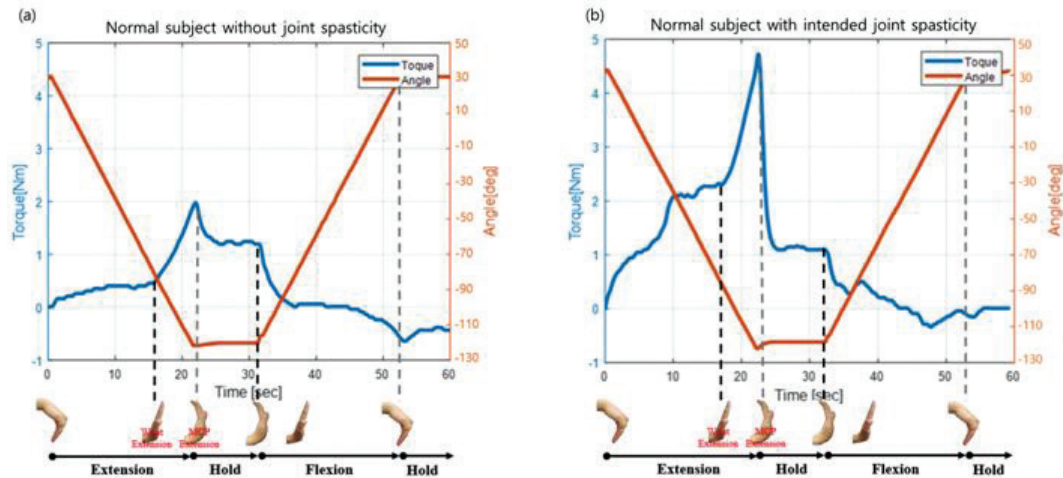


Figure 5: Preliminary experimental results with and without joint tones
(a) Normal subject without joint spasticity. (b) Normal subject with intended joint spasticity

Results and Discussion

Preliminary Experiment: Base on the hardware model in figure 2, a prototype was 3D printed as presented in figure 4. Prior to performing clinical trials on hemiplegic patients, we conducted a preliminary usability evaluation. From the neutral position, the device rotated 120 degrees to extension direction and 30 degrees to flexion direction with a constant speed of 7.5 deg/s over 60 seconds. First 22 seconds were assigned to full extension, next 10 seconds to holding, and last 28 seconds to full flexion.

Two preliminary experiments were conducted on a normal subject. A 25-year-old, right-handed man equipped the therapeutic robot on his left hand. First, the subject used the therapeutic device normally. Second, the same subject used the robot again with a moderate repulsive torque as if he had spasticity on his wrist and finger joints.

Torque and angular position data collected during the two experiments are depicted in figure 5. Figure 5 (a) shows data on ordinary joint stiffness in normal subjects during the first experiment. As the robot rotate to the extension direction, only wrist is extended and small increase in repulsive torque up to 0.5 Nm is observed. After the angular position pass by -90 degree, fingers start to extend as well. Together, wrist and fingers show maximum repulsive torque of 2 Nm at full extension position of -120 degrees. The repulsive torque slowly reduces to zero as the joints come back to the neutral position.

Figure 5 (b) illustrates data on moderate joint stiffness intended by the normal subjects during the

second experiment. Up to -90 degrees, wrist alone shows a higher repulsive torque of 2 Nm. As the wrist and fingers start to stretch out together, the repulsive torque increase almost to 5 Nm which is 2 times more than the normal joints without spasticity in figure 5 (a). The result show that our device is possible to extend paralyzed wrist and fingers with spasticity as well as monitor tone characteristics based of robotic measures in terms of repulsive torque according to joint orientation.

Future plans and Improvements: We categorized our robot as a pre-therapeutic device because we know that robots cannot perform perfect wrist and finger treatments due to complex and sensitive characteristics of the joints. Therefore, the role of therapists and conventional therapies are still very important. Thus, what we are looking forward with our robot is to reduce the tones of the joint even temporarily before the main therapies to ease therapists' work load. The research about decrease in wrist stiffness after 10-minute robot-assisted exercise suggests the basis for the concept our robot^[8].

We expect that our robot would also provide a quantitative assessment about user's joint condition and even motor function ability based on the short pre-therapeutic exercise. The data collected during the exercise is expected to be further processed. A research on cerebellum patients suggest that one's angular stiffness and viscosity can be derived from angular position, velocity, and torque data^[11]. We can directly apply the method to our data to present spasticity in terms of the kinematic constants. A patient with severe spasticity would show a high magnitude in the kinematic constant

particularly a high stiffness due to spring-like nature of the affected joints. The quantitative assessments would help therapists evaluate patient's current condition and suggest future treatment direction.

In wrist and finger physical and occupational therapies, thumb is an important joint. Since tones of the other joints vary significantly depending on the thumb position, it should also be extended during extension exercise. Our device as of now does not have such component. Therefore, in order to provide more effective therapeutic device to hospitals, we should consider an appropriate thumb rest in the future.

More importantly, feedbacks from therapists and patients at local hospitals are important. Although MOU has been established with a rehabilitation hospital to conduct joint research, consistent comments on the specific robot is still in sufficient. The prototype we developed should be tested to hemiplegic patients, our target, before we finally confirm our hardware model before main clinical test. For example, safety considerations regarding the device are very important because the patients' hands are passively extended by the robot. Figuring out combination of suitable motor speed and position controls comfortable to patients would be necessary. Although we designed the frame size based on recommended measures from Statistics Korea, the national department of statistics, we observed that patients' hands were usually swollen due to edema. Therefore, fine tuning of the robot size must be considered.

A long term study should be carefully planned on actual post-stroke hemiplegic patients. Most case studies conduct clinical tests on their therapeutic device more than a month. We should recruit specific subject groups in terms of Brunnstrom stage, Fugl-Meyer assessment, or Modified Ashworth Scale through meetings with hospital doctors and therapists. Comparison between clinical and robotic measurements regarding motor control during and after the experiment would reveal validity and effectiveness of our robot. Also we expect task-oriented comparative experiment between normal people and patients using the robot.

Conclusion

In this study, we suggested a therapeutic robot to help hand and finger rehabilitation of post-stroke hemiplegic patients. Unlike previous studies on hand-finger

exoskeleton robots, the proposing device was designed to extend the two joints with one actuator thus increasing flexibility and making more affordable to small and medium rehabilitation hospitals. Repulsive torque and angular position are collected by sensors to monitor exercise. A preliminary experiment was conducted on a healthy subject while applying a repulsive torque to the robot as if it was affected. The test revealed that not only the device is useful enough to stretch out the wrist and fingers similar to conventional physical therapies, but also help gather quantitative characteristics about the affected joints.

Acknowledgment

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Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Factors Affecting Satisfaction in Major of Male Nursing Students

Eun-Ju Kim¹, Seung-Ju Kang², Hae-Jin Shin², Ja-Ok Kim³

¹Professor, Dept. of Nursing, Jeonbuk Science College, Korea; ²Professor, Dept. of Nursing Chunnam Techno University, Korea; ³Professor, Dept. of Nursing Wonkwang Health Science University, Korea

ABSTRACT

Background/Objectives: The purpose of this study was to examine the relation among Emotional Intelligence, General Mental Health, Academic Emotion Regulation, Stress in Clinical Practice and Satisfaction in Major of male nursing students.

Method/Statistical Analysis: A cross-sectional survey was conducted. 146 participants were selected from department of nursing or nursing college in G city, J city of J area, I city of J area. structured questionnaires were used as a study instrument which included general characteristics, WLEIS, KGHQ, Academic Emotion Regulation, Stress in Clinical Practice, Satisfaction in Major. Independent t-test, one-way ANOVA, Pearson correlation coefficient and multiple regressions were used for analysis.

Findings: It is revealed that the higher emotional intelligence, general mental health, academic emotion regulation is respectively and the lower stress in clinical practice is, the higher satisfaction in major, additionally in order of stress in clinical practice, general mental health, emotional intelligence, academic emotion regulation in terms of extent of influence, these factors have a big effect on satisfaction in major

Improvements/Applications: Judging from these findings, it should be required to develop program for stress control and counsel the male students about stress, because stress in clinical practice is the biggest factor to affect satisfaction in major.

Keywords: Male Nursing Students, Satisfaction in Major, Emotional Intelligence, General Mental Health, Academic Emotion Regulation, Stress in Clinical Practice.

Introduction

The Need of This Study: Satisfaction in major is a subjective experience that a student feels and is largely divided into the emotional part such as how much the student is contented with the major and the cognitive part such as value judgement on the major^[1]. When the students are well informed of the related occupation, satisfaction in major is created and affects their attitude toward the occupation and career path^[2]. Thus, when the students majoring in nursing science are well informed of nursing, satisfaction in major is created and affects their attitude as the professional nurse^[3]. Indeed, according to

the study of Lim(2014), when the students majoring in nursing feel dissatisfaction in major, their dissatisfaction has a bad effect on not only their university life but also nursing in a hospital in the future and eventually degrade the quality of nursing^[4].

Thus, it is very important to conduct the study on satisfaction in major of the students majoring in nursing. According to an education statistics service data released by the Korean Educational Development Institute, as of the first half of 2018, the number of the male students majoring in nursing is 21,659 and occupies 20% of the total students majoring in nursing. Compared to the number of the male students majoring in nursing in 2013, the number of the male students in 2018 is up 5%, compared to the number in 2008, the number in 2018 is up as many as 13%. Though considering that the total number of the students majoring in nursing increased around 1.4 times compared with 2013, increased roughly 2.4 times compared with 2008, the proportion of the male

Corresponding Author:

Eun-Ju Kim
Professor, Dept. of Nursing,
Jeonbuk Science College, Korea
Email: ejkim3223@jbsc.ac.kr

students to the total students rapidly rose^[5-7]. The increase of the number of the male students majoring in nursing means that the increase of the number of the male students who acquire the nurse license on their graduation. The most of the studies on satisfaction in major of the student majoring in nursing is currently related with the effect of satisfaction in major on the view of the professional, career preparation behavior and adaptation in campus life^[8-9]. In regard to the study on the factor affecting satisfaction in major, the study of Cho(2015) focusing on gender stereotype and military obligation plan is cited as the example of the study^[10], but other studies are rarely found. Thus, it is needed to conduct the study on the factor affecting satisfaction in major of the male student majoring in nursing. Therefore, this study intends to look into the factors influencing satisfaction in major of the male student majoring in nursing.

This study examines the extent of satisfaction in major of the male students majoring in nursing, the correlation between emotional intelligence, general mental health, academic emotion regulation, stress in clinical practice as the mental and emotional factor and satisfaction in major and the factors affecting satisfaction in major. Ultimately through these examinations, this study intends to suggest the basic data for the development of the program aimed at improving satisfaction in major of the male students majoring in nursing.

Materials and Method

The Design of This Study: This study is the descriptive correlation study conducted in order to find out the correlation between emotional intelligence, general mental health, academic emotion regulation, stress in clinical practice and satisfaction in major of the male students majoring in nursing.

The Subject of This Study: The study chooses the male students majoring in nursing at the universities located in G city, J city, J province, I city and J province as the subject, offer sufficient information about this study to them and select the students who agree to participation in this study. The data are collected from Oct. to Nov., 2017. The researchers fully explained prior to filling in the questionnaire that in case of the students who feel the negative feelings such as difficulty in impulse control and depression while filling in the questionnaire related to satisfaction in major, emotional intelligence,

general mental health, academic emotion regulation and stress in clinical practice, they stop participation in this study immediately. In addition, the researcher paid careful attention to it in preparation for the case that any subject might need treatment or guidance based on the result figure of general mental health obtained in the questionnaire.

The Tool of This Study: This study inquiries into age, grade level, reason for application, satisfaction in decision of department and grade as the general characteristic variable and includes satisfaction in major, emotional intelligence, general mental health, academic emotion regulation and stress in clinical practice as other variables.

Satisfaction in Major: The researchers use Lee(2004)'s tool that extracts the questions related with satisfaction in major from satisfaction in department(faculty)-related tool invented by Ha(2000) in order to measure satisfaction in major of the male student majoring in nursing^[2].

Emotional Intelligence: In this study, the researchers use WLEIS, Wong and Law(2002) Emotional Intelligence scale adapted by Jung(2007) in order to measure emotional intelligence of the male student majoring in nursing^[11].

General Mental Health: The researchers use The Korean General Health Questionnaire-20(KGHQ-20) standardized and adapted by Shin(2001) with The General Health Questionnaire(GHQ) used globally since 90's in order to measure general mental health of the male student majoring in nursing^[12]

Academic Emotion Regulation: This study uses the academic emotion regulation scale invented by Yu(2012) in order to measure academic emotion regulation of the male student majoring in nursing^[13].

Stress in Clinical Practice: This study uses stress in clinical practice scale invented by Hwang(2006) in order to measure stress in clinical practice of the male student majoring in nursing^[14].

Data Analysis

SPSS WIN 18.0 Version program is used for data analysis. General characteristic of the subject is used for frequency analysis and descriptive statistic. T-test, ANOVA, Pearson's Correlation Coefficient, Stepwise multiple regression analysis are used for analysis.

Results and Discussion

General Characteristic: Total 146 male students majoring in nursing join in this study as the subject. Their average age is 24.5. 135 students at the age of 20-29 occupy the majority(92.5%). 11 students over 30 account for 7.5%.

95 students(65.1%) are junior, 51 students(34.9%) are senior. Regarding the reason for application, 82 students(56.2%) applied following the recommendation of others, 64 students(43.8%) applied of their own will. In regard to satisfaction in decision of department, 90 students(61.6%) answer “satisfaction”, 43 students(29.5%) answer “so so”, 13 students(8.9%) answer “dissatisfaction”. In regard to grade of the student, 115 students(78.8%) got the grade of “3.0-3.9” out of 4.5. 23 students(15.8%) got the grade of “over 4.0”. 8 students(5.5%) got “2.0-2.9” as shown in Table 1.

Table 1: General Characteristic of Participants (n = 146)

Characteristics	Categories	n (%)
Age	20-29	135(92.5)
	over 30	11(7.5)
Grade level	junior	95(65.1)
	senior	51(34.9)
Reason for application	recommendation of others	82(56.2)
	one's own will	64(43.8)
Satisfaction in decision of department	satisfaction	13(8.9)
	so so	43(29.5)
	dissatisfaction	90(61.6)
Grade	over 4.0	23(15.8)
	3.0-3.9	115(78.8)
	2.0-2.9	8(5.5)

Emotional Intelligence, General Mental Health, Academic Emotion Regulation, Stress in Clinical Practice and Satisfaction in Major of the Male Student Majoring in Nursing: When it comes to looking into emotional intelligence, general mental health, academic emotion regulation, stress in clinical practice and satisfaction in major of the male student majoring in nursing, the result shows that the score of emotional intelligence is at $4.85 \pm .72$, the score of general mental health is at $2.68 \pm .20$, the score of academic emotion regulation stands at $3.34 \pm .51$, the score of stress in clinical practice is at $2.87 \pm .57$ and the score of satisfaction in major is at $3.71 \pm .55$ as indicated in Table 2.

Table 2: The Score of Emotional Intelligence, General Mental Health, Academic Emotion Regulation, Stress in Clinical Practice and Satisfaction in Major (n = 146)

Variables	M $\pm$ SD	Range
Emotional Intelligence	$4.85 \pm .72$	1-7
General Mental Health	$2.68 \pm .20$	1-4
Academic Emotion Regulation	$3.34 \pm .51$	1-5
Stress in Clinical Practice	$2.87 \pm .57$	1-5
Satisfaction in Major	$3.71 \pm .55$	1-5

Satisfaction in Major Depending on General Characteristic: With regard to the difference in satisfaction in major made depending on general characteristic, the result show grade level($t=-4.143$, $p<.001$), reason for application($t=-4.471$, $p<.001$), satisfaction in decision of department($F=16.684$, $p<.001$), which mean statistically significant difference, but age($t=1.152$, $p=.133$), grade($F=1.948$, $p=.146$), which mean to be not significant difference as shown in Table 3.

Table 3: Differences of the Satisfaction in Major Level by Characteristics (n = 146)

Characteristics	Categories	N	M $\pm$ SD	t Or F	P
Age	20-29	135	$3.72 \pm .56$	1.512	.133
	Over 30	11	$3.46 \pm .45$		
Grade Level	Junior	95	$3.48 \pm .59$	-4.143	.000**
	Senior	51	$3.16 \pm .52$		
Reason for Application	Recommendation of Others	82	$2.67 \pm .94$	-4.471	.000**
	One's Own Will	64	$3.47 \pm .55$		

Conted...

Satisfaction in Decision of Department	Dissatisfaction	13	3.41 ± .55	16.684	.000**
	So So	43	3.78 ± .46		
	Satisfaction	90	3.43 ± .56		
Grade	Over 4.0	23	3.42 ± .52	1.948	.146
	3.0-3.9	115	3.43 ± .49		
	2.0-2.9	8	3.43 ± .49		

In regard to the difference in satisfaction in major of the male student majoring in nursing made depending on general characteristic, there is the significant difference in grade level, reason for application and decision of department, by contrast the significant difference was not found out in age and grade. Judging from these findings, it is inferred that in case that the students voluntarily choose nursing as the major, they have the positive mind for their future and career path and the positive mind has a great effect on their belief and desire, thus significant difference is made in the reason for application and decision of department. However, the significant difference is not found out in grade and age. The result is in agreement with the result of Cho's study(2015) on the factor affecting satisfaction in major of the male student majoring in nursing^[10]. It is thought that though the students are satisfied with the major, they get poor grades because of difficulty in studying the major.

The Correlation between Emotional Intelligence, General Mental Health, Academic Emotion Regulation, Stress in Clinical Practice and Satisfaction in Major of the Subject: When it comes to looking into the correlation between emotional intelligence, general mental health, academic emotion regulation, stress in clinical practice and satisfaction in major of the male student majoring in nursing, the result show that correlation between satisfaction in major and emotional intelligence($r=.231$, $p<.001$), general mental health($r=.164$, $p=.009$), academic emotion regulation($r=.207$, $p=.001$), which mean significant positive correlation, but stress in clinical practice($r=.207$, $p=.001$), which means significant negative correlation. In other words, it means that the higher emotion intelligence is, the higher general mental health is, the better academic emotion regulation is, the lower stress in clinical practice, the higher satisfaction in major as illustrated in Table 4.

Table 4: Correlations among Emotional Intelligence, General Mental Health

	EI ¹	GMH ²	AER ³	SCP ⁴	SM ⁵
EI ¹	1	.122 (.143)	.625** (.000)	-.231** (.005)	.447** (.000)
GMH ²		1	-.127 (.127)	-.150 (.070)	.306** (.000)
AER ³			1	-.300** (.000)	.425** (.000)
SCP ⁴				1	-.491** (.000)
SM ⁵					1

¹: EI, Emotional Intelligence,
²: GMH, General Mental Health,
³: AER, Academic Emotion Regulation,
⁴: SCP, Stress in Clinical Practice
⁵: SM, Satisfaction in Major

Academic Emotion Regulation, Stress in Clinical Practice and Satisfaction in Major: In regard to the correlation in this study, it is revealed that the higher emotion intelligence, general mental health, academic emotion regulation is respectively and the lower stress in clinical practice is, the higher satisfaction in major is. First, regarding emotional intelligence, the findings of this study are in agreement with the findings of Kim et al's study(2017) on satisfaction in clinical practice^[15]. It is thought that the student who possesses high emotional intelligence has a capability to understand well one's innermost feelings, control one's life effectively and make and implement a plan, In regards to general mental health, the findings of this study are in agreement with the findings of Jung & Kwon's study(2013) on stress, self-esteem and mental health^[16]. The better general mental health is, the higher satisfaction in major is, because the student who has healthy mental thinks positively in all aspects.

Regarding stress in clinical practice, the result of this study is in line with the result of Lee et al's study(2016) on emotional labor, stress in clinic and satisfaction in clinical

practice^[17]. It is deduced that the student of high emotion index improves ability to communicate and eases stress in clinical practice, thus satisfaction in major rises.

The Factor Affecting Satisfaction in Major: To grasp what factor affects satisfaction in major, the researchers analyze the regression model with the independent variable such as emotional intelligence, general mental health, academic emotion regulation and stress in clinical practice. As a result of the analysis, it turns out that the regression model is significant ($F=28.134$, $p<.001$) and adjusted coefficient of determination to represent validness of the model $R^2=.428$.

The result shows that in order of stress in clinical practice ($\beta=-.336$, $p=.000$), general mental health ($\beta=.253$, $p=.000$), emotional intelligence ($\beta=.239$, $p=.005$) and emotion regulation ($\beta=.206$, $p=.018$), these factors have an influence on satisfaction in major as illustrated in Table 5.

The researchers test the condition of multicollinearity, independence, normality and homoscedasticity before conducting multiple regression analysis. the result of testing multicollinearity is that a tolerance limit is .533~.884, which is over 0.1 and Variance Inflation Factor, VIF is 1.131~1.877, which is not over 10. In addition, the result of testing autocorrelation of error (independence) confirms that there is no autocorrelation because Durbin-Watson statistics is at 1.916, which is close to 2. The result of conducting residual analysis is that standardized residual range is $-3.215 \sim 2.251$, which satisfies homoscedasticity and confirms normality.

Table 5: Influencing Factors on Satisfaction in Major

Variable	B	SE	β	t	p
Emotional Intelligence	.184	.064	.239	2.873	.005**
General Mental Health	.686	.181	.253	3.788	.000**
Academic Emotion Regulation	.223	.093	.206	2.399	.018*
Stress in Clinical Practice	-.324	.065	-.336	-4.994	.000**
Adjusted $R^2=.428$, $F=28.134$, $p<.001$					

The result of regression analysis conducted to grasp the factor affecting satisfaction in major shows that in order of stress in clinical practice, general mental health, emotional intelligence and academic emotion regulation in terms of extent of influence, these factors have a effect on satisfaction in major. The findings are in agreement with Kim et al's study(2017) on the factor affecting satisfaction in clinical practice^[15]. Thus it is supported by these findings that stress in clinical practice of the male student majoring in nursing is the biggest factor to affect satisfaction in major

It is thought that particularly, the male student has a tendency to have difficulties in talking about different health problem of others and communicating with others including medical personnel during clinical practice, for this reason, stress in clinical practice becomes the biggest factor to influence satisfaction in major. In addition, low stress in clinical practice makes the male student have healthy general mental health and help ease stress in positive mind. High emotional intelligence helps to improve the communication ability and reduce stress in clinical practice, thus to raise satisfaction in major. Academic emotion regulation makes the student control himself so that he study in an active attitude, but if he fails to control academic emotion regulation, he feels anxiety and falls into a lethargy, accordingly his satisfaction in all aspects lowers. Thus, it is thought that the decreased satisfaction affects satisfaction in major.

Conclusion

This study is the descriptive correlation study conducted in order to grasp the relation between emotional intelligence, general mental health, academic emotion regulation, stress in clinical practice and satisfaction in major of the male university students majoring in nursing at the universities located in G city, J city, J province, I city and J province.

The findings of this study are as follows. In regard to satisfaction in major measured depending on general characteristic, there is significant difference in grade level, the reason for application and decision of department, by contrast there is no significant difference in age and grade. It is revealed that the higher emotional intelligence, general mental health, academic emotion regulation is respectively and the lower stress in clinical practice is, the higher satisfaction in major, additionally in order of stress in clinical practice, general mental

health, emotional intelligence, academic emotion regulation in terms of extent of influence, these factors have a big effect on satisfaction in major.

The researchers suggest that lots of studies are required to be carried out with various subjects in order to generalize the result of this study and the studies on diverse affecting factors of the male students majoring in nursing are required to be conducted in order to examine concrete satisfaction in major, additionally, it is needed to develop and use the program aimed at controlling stress in clinical practice and counsel the male students about stress in clinical practice.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Factors Affecting Implementation of Evidence-Based Fall Guidelines among Long-term Care Hospital Nurses

Hyun Jeong

College of Nursing, Deajeon Health Institute of Technology, Republic of Korea

ABSTRACT

Objectives: This study was designed to identify the factors affecting nurses' implementation of evidence-based fall guidelines in long-term care hospitals.

Method: Using a descriptive study design, the participants were 217 nurses from long-term care hospitals in Korea. The data were used descriptive analysis, correlation, and multiple regression. The survey was designed to investigate nurses' EBP beliefs, EBP organizational culture, EBP implementation regarding implementation of evidence-based fall guidelines.

Findings: EBP beliefs ($\beta = .23$, $p < .001$), EBP organizational culture ($\beta = .49$, $p < .001$), and EBP implementation ($\beta = .15$, $p = .025$) were significant predictors which explained 57.6% of the variance reported in implementation of evidence-based fall guidelines.

Improvements/Applications: The results of this study support the need for nursing organizations to create cultures that promote EBP and to encourage nurses' beliefs about their confidence and capability to implement upon implementation of evidence-based fall guidelines. This could enhance patient care and outcomes, as well as organizational outcomes.

Keywords: *Evidence-based practice, Organizational Culture, Belief, Guidelines, Long-term care hospitals*

Introduction

Falls are considered one of the most common health problems among older adults in long-term care settings^[1]. Even minor fall damage can cause morbidity^[2] or mortality^[3]. Therefore, it is important to implement fall prevention strategies to improve patient safety and nursing quality in long-term care settings^[4]. Nurses play an active and essential role in fall prevention^[1].

Worldwide, healthcare organizations aim to improve patient outcomes and quality and stability of care through the application of evidence-based practices (EBP)^[5]. In addition, evidence-based guidelines are developed through a systematic review of literature to aid

decision-making in specific clinical settings, facilitating the delivery of effective quality care^[6], and evidence of recommendations and recommended grades are provided to guide scientific practice^[7]. EBP guidelines can be used in clinical and community nursing practice and can improve the variability of specific nursing practice^[7]. Therefore, the development and application of EBP guidelines have been increasing in clinical practice^[8].

In a study implementing EBP for falls in long-term care nursing, the use of evidence-based fall guidelines was found to be effective not only in reducing fall incidences, but also in reducing medical costs^[9]. Therefore, it is imperative to develop a strategy for extending the implementation of evidence-based fall guidelines. Although the Institute of Medicine aims for 90% of clinical decisions to be evidence-based by 2020^[10], the performance rate of EBP guidelines in the health care field is low^[11], particularly in long-term care settings, such as long-term care hospitals^[12]. Nurses tend to utilize their own experiences or other resources rather than implementing guidelines based on scientific evidence^[11].

Corresponding Author:

Hyun Jeong

Assistant Professor, College of Nursing,
Deajeon Health Institute of Technology,
Republic of Korea

Email: hyunjeong@hit.ac.kr

The variables influencing the implementation of EBP guidelines are organizational culture, competence^[12], personal knowledge, beliefs^[13], and scope of implementation^[14]. Because there are multiple influencing variables, it is necessary to identify which individual and organizational factors influence the implementation of evidence-based fall guidelines.

This study attempts to provide the basic data necessary for the development of strategies to increase EBP fall performance by identifying factors affecting the implementation of evidence-based fall guidelines by long-term care hospital nurses. The purposes of this study are:

- (a) to examine the implementation of evidence-based fall guidelines by long-term care hospital nurses,
- (b) to identify correlations between EBP beliefs, EBP organizational culture, EBP implementation, and implementation of evidence-based fall guidelines, and
- (c) to identify factors affecting the implementation of evidence-based fall guidelines by long-term care hospital nurses.

Materials and Method

Research Design/Subjects: A secondary analysis of an EBP survey of fall management in geriatric hospitals (EBPSFM), sorted from primary data sets consisting of self-descriptive data, was carried out^[15]. The questionnaire was distributed to all nurses (n = 217) in long-term care hospitals in South Korea.

Research Tool

EBP Beliefs Scale: The EBP beliefs scale consists of 13 questions with a 5-point recount response scale measuring participants' beliefs in the importance of EBP. Each item consists of a five-point Likert scale, with a total score ranging from 13 to 65 points^[10]. A higher score reflects a stronger belief in EBP. In a study conducted by Melyn^[13], Cronbach's α was .90; in this research, Cronbach's α was 0.93.

EBP Organizational Culture Scale: The EBP organizational culture scale also utilizes a five-point Likert scale, with 15 questions exploring the organization's characteristics, including benefits and opportunities to encourage EBP within the medical

institution. The total score range of 15 to 75 points^[16]. A higher score indicates a system that is moving toward embracing organizational EBP implementation. The Cronbach's α for internal consistency reliability was 0.95^[16]; Cronbach's α in this study was 0.95.

EBP Implementation Scale: The EBP implementation scale consists of 10 items and evaluates the frequency of EBP-related activities performed during a nurse's working hours^[13]. Each item consists of a five-point Likert scale, with a total range of 10 to 50 points. A higher score indicates more frequent EBP in practice. In a study by Melyn^[13], Cronbach's α was .96; Cronbach's α in this research was 0.95.

Implementation of the Evidence-based Fall Guidelines Scale: The implementation of the evidence-based fall guidelines scale extracted recommendations for fall prevention and management of elderly adults based on EBP guidelines^[17]. They were used after being reviewed for content validity by one rehabilitation clinic doctor, two senior nursing professors, two senior nurses, and one physical therapist. This scale consists of 30 questions; each scored on a five-point Likert scale, with total score range of 30 to 150 points. A higher score indicates that nurses are moving toward embracing EBP guidelines. The Cronbach's α for internal consistency reliability was 0.95^[17]; Cronbach's α in this study was 0.96.

Results and Discussion

Sample Characteristics: This study included nurses working in long-term care hospitals. A total of 217 participants were eligible nurses and self-reporting questionnaires were completed at the beginning of the EBP survey^[15]. The average age of participants in the study was 37.4 years (SD = 8.9), and most were women (98%, n = 213). The overall clinical experience of the study participants was approximately 9 years (SD = 7.7) and the clinical experience average for the current department was 3 years (SD = 2.1)[Table 1].

Table 1: Demographic Characteristics (N = 217)

Characteristic	N(%)
Gender	
Women	213(98.1)
Men	4(1.9)

Conted...

Age(Years)	
19-25	10(4.6)
26-35	91(42.0)
36-45	76(35.0)
46-55	32(14.7)
56 and Over	8(3.7)
Years of nursing experience	
0-5	53(24.4)
6-10	109(50.2)
11-15	24(11.1)
16-20	21(9.7)
Over 20	10(4.6)
Highest nursing degree learned	
College	153(70.5)
BSN	59(27.2)
MSN & PhD	5(2.3)
Education in fall management	
Yes	143(65.9)
No	74(34.1)
Education needed in fall management	
Yes	209(96.3)
No	8 (3.7)

Conted...

Experience with patient falls	
Yes	172(79.3)
No	45(20.7)
Use of EBP guidelines	
Yes	100(46.0)
No	117(54.0)

Correlations among Variables: EBP implementation and implementation of evidence-based fall guidelines were significant correlations($r = .58$, $p < .001$), where high levels of EBP implementation were associated with implementation of evidence-based fall guidelines. EBP beliefs and implementation of evidence-based fall guidelines were significant positive correlation($r = .65$, $p < .001$), where high levels of EBP beliefs were associated with implementation of evidence-based fall guidelines. EBP organizational culture and implementation of evidence-based fall guidelines were significant positive correlation($r = .73$, $p < .001$), where high levels of EBP organizational culture were associated with implementation of evidence-based fall guidelines [Table 2].

Table 2: Correlations among Variables (N = 217)

	EBP beliefs	EBP organizational culture	EBP implementation	Implementation of evidence based fall guidelines
EBP beliefs	1			
EBP organizational culture	.679***	1		
EBP implementation	.686***	.596***	1	
Implementation of evidence based fall guidelines	.648***	.727***	.581***	1

Note: *** $p < .001$

Predictor of Implementation of Evidence- based fall Guideline: The multiple regression analysis found that EBP beliefs, EBP organizational culture, and EBP implementation contributed to the prediction of implementation of evidence-based fall guidelines ($F = 58.324$, $p < .001$, $R^2 = .582$, R^2 adjusted = .576). Although all variables made statistically significant contributions to the regression equation, the EBP organizational culture standardized beta was highest. The significant predictors were EBP organizational culture ($\beta = .49$, $p < .001$), EBP beliefs ($\beta = .23$, $p < .001$), and EBP implementation ($\beta = .15$, $p = .025$), which combined, explained for 57.6% of the variance in the implementation of evidence-based fall guidelines [Table 3].

Table 3: Factors Influencing Implementation of EBP guidelines (N = 217)

	B	β	p
EBP Belief	.766	.225	.001
EBP Organizational culture	.860	.485	<.001
EBP Implementation	.364	.145	.022
$F = 58.324$, $p < .001$, $R^2 = .582$, R^2 adjusted = .576			

Discussion

In this study, EBP beliefs, EBP organizational culture, and EBP implementation were significant

predictors which explained 57.6% of the variance reported in implementation of evidence-based fall guidelines.

Stronger perceptions of EBP organizational culture were positively related to implementing evidence-based fall guidelines, suggesting that it is important to encourage an EBP organizational culture. These results are similar to the findings on strong perceptions of EBP organizational culture, which increase adherence to EBP guidelines by nurses [5, 12]. Therefore, it is necessary to establish a positive EBP organizational culture in addition to the provision of various organizational supports so that nurses can implement EBP guidelines. This may include providing opportunities for regular access to nursing journals and data. Organizations will also need to participate in academic and educational activities on EBP. Mentors have been proposed as a key element in forming and maintaining EBP organizational culture [5]. EBP mentors can help overcome individual and organizational barriers to the utilization and dissemination of evidence-based fall guidelines.

In this study, stronger EBP beliefs were associated with greater compliance with baseline fall guidelines, consistent with the results of previous studies suggesting that EBP beliefs are linked to clinical practice guidelines [18]. These results are important because individual beliefs can change through intervention. EBP beliefs can be improved through a variety of educational trainings and workshops, increasing positive attitudes toward and confidence in EBP.

In this study, EBP implementation was identified as a factor influencing evidence-based fall guidelines. Milner et al. [19] found that nurses with more active attitudes toward reading research articles performed EBP more often. The more EBP guidelines a nurse uses, the more they implement, resulting in greater attention to EBP research and insights, and more practical applications to prevent falls, through environmental strategies and trainings. In order to ensure optimal evidence, nurses should strive to read papers efficiently and foster knowledge of criticisms.

In addition, approximately 50% of the participants in this study found that they do not use evidence-based fall guidelines. This is the result of insufficient information and knowledge to implement evidence-based fall guidelines [20]. Individual or organizational factors in the

guidelines may act as barriers for nurses to implement evidence-based guidelines [21]. Therefore, it is necessary for organizations to accept and establish a standard for patient safety, such as the medical institution certification system, for the implementation of evidence-based fall guidelines in nursing. Hospital executives will also need to establish and support budgets for the development and application of evidence-based fall guidelines.

Conclusion and Suggestion

To improve the implementation of evidence-based fall guidelines, an organizational culture should be established that facilitates the implementation of the guidelines and recognizes its performance with organization-wide support. It should also provide EBP education and access, thereby enhancing EBP beliefs and implementation.

This study has some limitations. Self-reporting questionnaires may overestimate or underestimate participants' perceptions of EBP beliefs, EBP organizational culture, EBP implementation, and implementation of evidence-based fall guidelines.

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Source of Funding: Self

Conflict of Interest: Nil

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Comparison of Nursing College Students and Other Major College Students Before and After Education on Bioethical Consciousness

Hee-Sun Ko¹, Kwang-Ok Lee², Myoungjee Jung³, Sarah Jeong⁴

¹Nursing Department, Kyungdong University, 815 Kyunwhanro Munmakub Wonjusi Kangwondo, 26495, South Korea; ²Nursing Department, Sangmyung University, 31 Sangmyungdae-gil Dongnam-gu Cheonan-si Chungnam, 31066, South Korea; ³Medical College, Yonsei University, 1 Yonseidae-gil Wonju-si Gangwon-do, 26493, South Korea; ⁴School of Nursing and Midwifery, University of Newcastle, University Drive, Callaghan, NSW2308, Australia

ABSTRACT

Background/Objectives: Preliminary health care ethics education is important for improving the ethical values in the field. This study examined the effects of ethics education on college students through various learning methods.

Method/Statistical Analysis: This study was an design with an 272 students in the first year of nursing college students of experimental group and 277 students in the first year of nursing college students of control group. Experimental groupwho undertook bioethics education, and control group who did not. The bioethics education was taught using textbooks, PPT, and video materials for two hours per week for 15 weeks. A post-questionnaire survey was conducted to measure the changes in the awareness of bioethics in before and after the training.

Findings: The correlation coefficient of 0.335 ($p = .000$) confirmed the improvement in bioethical consciousness and the necessity of bioethics education for college students. In addition, the correlation coefficient between the necessity of bioethics education in college and the self - ethics of the day was positively correlated with 0.233 ($p = .000$).

Improvements/Applications: These results show that bioethics education is an essential tool in improving bioethics awareness.

Keywords: Health care, Bioethics, Consciousness, education, College student

Introduction

The rapid development of modern scientific and medical technology has brought about changes in human morals and ethical values. Prior to the development of medical technology for the elderly, birth and death were believed to be natural and only artificially transformable. On the other hand, recent advances in medical technology

based on science have brought tremendous changes to previous fixed beliefs. Current medical technology has made birth by artificial manipulation possible, as well as the possibility to artificially extend and shorten human life ^[1]. These changes have offered hope to mankind, but behind it are new ethical and moral problems that could not even be imagined in the past. In current society, the life-time trend due to the development of medical technology is prevalent and accelerating. Recently, issues concerning the ethics of life care include issues of human embryos, artificial abortion, prenatal diagnosis, life support, animal cloning and genetic manipulation, organ transplantation, and death. These issues have made it impossible to apply existing ethical judgments

Corresponding Author:

Kwang Ok Lee,
Associate Professor, Nursing Department,
Sangmyung University, Korea
Email: kolee@smu.ac.kr

or assessments as they are, thereby calling for confusion in values and changes in ethics. The correct choice is difficult to make if one experiences an ethical conflict situation without the ethical value of the individual in the confused reality. Therefore, education on health and medical care, which nurture prospective health care providers, is strengthening education on biomedical ethics based on human respect [2, 3, 4]. In other words, education and training on biomedical ethics are very important for ethical value judgments in the medical field^[5, 6, 7].

In addition to the development of information and communication technology, various educational methods have been emphasized in accordance with the educational needs of the students, and education using movies is also recommended [8, 9]. This can be used as very effective educational material in relation to a complex subject, such as biomedical ethics. Therefore, in this study, movie appreciation and evaluations related to the subject were written during the curriculum.

Bioethics education is an essential element for people living in this period to escape chaos and consolidate their values. The education of bioethics in universities positively influences moral judgments and ethics, and the education effect will be stronger than in any other period of life [10]. Nursing college students require education to develop biomedical ethics consciousness [10] because it is based on decision-making at the time of clinical practice^[3].

The aim of this study was to identify the degree of biomedical ethics of nursing college students and non - nursing college students, compare them with the degree of education regarding biomedical ethics, and contribute to the development of the biomedical ethics consciousness.

Materials and Method

Research Design: This study is a narrative comparative study to compare the perceptions of the overall biomedical ethics of nursing college students and non-nursing college students and to compare the changes with education.

Research Subjects and Contents: The experimental group consisted of 272 students in the first year of nursing college students and control group consisted of 277 students in the first year of non-nursing college students. The first year of nursing college students in

nursing college(272 students) who were participating in bioethics education and the first year of non-nursing college students(277 students) were not participating in bioethics education.

In the experimental and control group, a preliminary questionnaire on bioethics was conducted, and the experimental group underwent the biomedical ethics education for each subject for two hours per week for 15 weeks. Topics included education on bioethics, education on human embryos, artificial abortion, antenatal diagnosis, lifesaving, organ transplantation, suicide, brain death, and euthanasia. A post-questionnaire survey was conducted to measure the changes in the awareness of bioethics before and after the training in biomedical ethics education.

Research Tools

The tools developed by Lee [11] were revised and supplemented. Each item was scored on a 5-point Likert scale and scored from 1 'totally disagree' to 5 'strongly agree'. The higher the score of each item, the higher the respect for life and the higher the awareness of biomedical ethics. Three items of brain death, three items of euthanasia, three items of euthanasia, three items of suicide, four items of animal cloning and genetic manipulation, one item of human embryo, four items of artificial abortion, one item of prenatal diagnosis, three items of organ transplantation, and three items of death. The reliability of this study was Cronbach's = 0.749.

Data Analysis

The frequency and percentage (%) were calculated and the homogeneity was verified to understand the general characteristics of the subjects. The mean and standard deviations were tested and analyzed by t-test to see if there was any differences in the perception level of bioethics before and after the education of bioethics. Correlation analysis on the ethics and the need for education was also conducted using the SAS 9.4 program.

Results and Discussion

Awareness Distribution on General Bioethics: As shown in <Table 1>, the distribution of the pre-cognition survey results on bioethics was examined by dividing the subjects into an experimental group (nursing college

students) and control group (non-nursing college students). No difference was observed between the two groups in terms of evaluating their own bioethics. In addition, experience in bioethics education was highest in the school that was experienced through the media and books, and there was no difference in the general characteristics between the two groups.

Comparison of Bioethics Perceptions: The average of the items of bioethics education in the pre experimental group (nursing college students) and control group (non-nursing college students) were surveyed (Table 2). The prenatal diagnosis and postnatal survey showed the

most significant difference in the diagnosis of antenatal diagnosis among the subjects related to reproduction. The preliminary survey of prenatal diagnosis revealed 2.61 ± 0.93 for the experimental group and 3.00 ± 0.99 for the control group.

In the problems with abortion area, the experimental group showed 2.80 ± 0.61 , 2.61 ± 0.58 , and 2.71 ± 0.64 , respectively, compared to the control group: 2.69 ± 0.64 and 2.73 ± 0.64 , respectively. There was little change in the post - war ethics, but the control group showed a significant decrease in the consciousness of ethics in the post - test.

Table 1: General Characteristics of Bioethics

	Experimental Group		Control Group		
Religion					
Christian	68	12.4%	66	12.0%	x² =2.79 P=0.59
Catholic	18	3.3%	30	5.5%	
Buddhism	21	3.8%	17	3.1%	
Atheism	162	29.5%	159	29.0%	
Other	3	0.5%	5	0.9%	
Ethics					
Very Ethical.	29	5.3%	41	7.5%	x² =4.84 P=0.183
Little Ethical	152	27.7%	120	21.9%	
Average	90	16.4%	113	20.6%	
Little Unethical	0	0.0%	3	0.5%	
Very Unethical	1	0.2%	0	0.0%	
Life Ethics Experience Medium					
School	145	33.5%	96	22.2%	x² =8.32 P=0.215
Media	83	19.2%	58	13.4%	
Book	15	3.5%	18	4.2%	
Parents	3	0.7%	2	0.5%	
Friend	0	0.0%	1	0.2%	
Other	7	1.6%	5	1.2%	

Table 2: Comparison of the Before and After Items According to Bioethical Consciousness Items

		Pre-test	Post-test	t	p
		Mean $\pm$ SD	Mean $\pm$ SD		
Problems with Human Embryos	Experimental Group	3.72 ± 1.12	3.84 ± 0.98	1.347	0.180
	Control Group	3.85 ± 1.02	3.63 ± 1.07	3.482	0.001
Problems with Abortion	Experimental Group	2.48 ± 0.61	2.61 ± 0.58	-0.913	0.363
	Control Group	2.69 ± 0.64	2.73 ± 0.64	-0.808	0.420
Problems of Prenatal Diagnosis	Experimental Group	2.61 ± 0.93	3.19 ± 0.93	3.792	<.001
	Control Group	3.00 ± 0.99	2.97 ± 0.96	0.691	0.490

Conted...

Problems with Brain Death	Experimental Group	3.60 ± 0.68	3.63 ± 0.57	1.845	0.067
	Control Group	3.49 ± 0.65	3.46 ± 0.63	1.924	0.056
Issues Relating to Netting Therapy	Experimental Group	3.59 ± 0.74	3.59 ± 0.64	-0.371	0.711
	Control Group	3.55 ± 0.72	3.46 ± 0.64	1.984	0.048
Problems with Euthanasia	Experimental Group	2.12 ± 0.69	2.37 ± 0.68	-2.680	0.008
	Control Group	2.19 ± 0.63	2.38 ± 0.66	-3.281	0.001
Problems with Suicide	Experimental Group	3.57 ± 0.86	3.21 ± 0.87	-0.368	0.714
	Control Group	3.56 ± 0.86	3.36 ± 0.87	-0.714	0.476
Problems with Organ Transplantation	Experimental Group	3.13 ± 0.63	3.02 ± 0.55	0.835	0.405
	Control Group	3.12 ± 0.62	3.11 ± 0.58	0.196	0.845
Animal Reproduction and Genetics	Experimental Group	3.46 ± 0.65	3.27 ± 0.69	2.127	0.035
	Control Group	3.41 ± 0.67	3.28 ± 0.69	1.495	0.136

As a result of observing the pre- and post – change shown in table 3 of the subject of the bioethical consciousness of the group of nursing university students who received the education of bioethics and the experimental group(nursing students) without bioethics education, 3.21 ± 0.53 in the nursing college students, 3.21 ± 0.50 in the experimental group, and 3.10 ± 0.54 in the control group, respectively. In the bioethics survey, the experimental group was 3.18 ± 0.31 , the control group was 3.27 ± 0.34 , and the nursing college students were 3.20 ± 0.31 and 3.17 ± 0.30 , respectively. Significant results were displayed in the Anim production, Bioetics area.

Table 3: Pre-post Comparison of Bioethics Topics

		Pre-test	Post-test	t	p
		Mean ± SD	Mean ± SD		
Reproduction	Experimental Group	2.92 ± 0.51	3.21 ± 0.50	1.77	0.080
	Control Group	3.21 ± 0.53	3.10 ± 0.54	-1.30	0.197
Death	Experimental Group	3.18 ± 0.29	3.15 ± 0.26	-0.81	0.417
	Control Group	3.17 ± 0.28	3.15 ± 0.25	-1.02	0.310
Animal Reproduction	Experimental Group	3.46 ± 0.65	3.27 ± 0.69	2.13	0.036
	Control Group	3.41 ± 0.67	3.28 ± 0.69	0.59	0.556
Bioethics	Experimental Group	3.18 ± 0.31	3.20 ± 0.31	2.41	0.019
	Control Group	3.27 ± 0.34	3.17 ± 0.30	1.77	0.080

Sub-domain Correlation of Biomedical Ethics: The views on the enhancement of bioethical consciousness were analyzed according to the items. The subjects with the view that bioethical consciousness should be strengthened in the era of genetic engineering were more likely to have bioequivalence education at university with a correlation coefficient of 0.335 ($p = .000$) as shown in table 4. In addition, the respondents who answered that it is essential for the education of bioethics in school showed a positive correlation with 0.233 ($p = .000$).

Table 4: Analysis of the Need for Ethics and Education

		Ethics	Past change	Ethics Education
Ethics	Pearson Correlation Coefficient	1	.155**	.233**
	Significance Level (Both Sides)		.000	.000
Past change	Pearson Correlation Coefficient	.155**	1	.335**
	Significance Level (Both Sides)	.000		.000
Ethics Education	Pearson Correlation Coefficient	.233**	.335**	1
	Significance Level (Both Sides)	.000	.000	

** . The correlation is significant at 0.01 level (both sides).

Discussion

This study examined the effect of biomedical ethics education on the improvement of biomedical ethics consciousness. In a previous study, the experimental group with biomedical ethics education increased from 3.07 before training to 3.31 after ($p < .001$). In the non-nursing college students, however, the consciousness of medical ethics decreased from 3.08 in the dictionary to 3.05 in the post^[12]. In previous studies, nursing college students, who were experienced in participating in education related to biomedical ethics as well as the quality of life and ethics education, had a high ethical awareness of biomedical ethics^[13, 3]. This shows that bioethics education is an essential tool for improving bioethical consciousness. As new-generation students want something new, they require new ways of teaching^[9]. To educate biomedical ethics, it is essential not to inject ethics awareness or values but to teach various kinds of teaching and learning aimed at improving their thinking ability^[14]. Moreover, it is necessary to develop an education program that can effectively improve the awareness of biomedical ethics. In this study, indirect experience using movies provides an easy understanding of clinics in those who are not experienced, such as first year students, and is advantageous as a tool of biomedical ethics education, but the movies may affect the ethics^[12] when cultivating the judgment ability. In addition, there are some parts where it is difficult to maintain the sustainability of the instruction using only the video media, and the application effect of image data differ according to the subject. Using these tools, the implications for the theme that the film delivers were clarified.

Students are encouraged to participate actively in their lectures on biomedical ethics education, so that they have a good understanding of the concepts, such as knowledge and actual experiences on themes, discussions, and clinical activities.

Conclusions

This study examined the degree of bioethical consciousness among college students. In addition, the effects of education and biomedical ethics education were analyzed. The purpose of this study was to highlight the necessity and direction of biomedical ethics education to be provided to future medical practitioners. The subjects of education, which was applied only to experimental nursing college students, was biomedical ethics education related to human embryos, abortion,

surrogate mothers, prenatal diagnosis, brain death, lifetime treatment, suicide, euthanasia, and organ transplantation. No training on animal cloning and genetic manipulation was conducted by any group. Before and after training, the same questionnaire was given to the students to understand the improvement of the biomedical ethics consciousness. In terms of the items and subjects in which nursing students were educated, the score of bioethical consciousness regarding the prenatal diagnosis was highest in the post-survey based on the preliminary survey, and the number of nursing college students was lower. In animal cloning and gene manipulation, in which no education was carried out, nursing students and nursing college students had lower scores in the post - test than pre - test. According to the themes, the scores on bioethical consciousness in the post-survey were increased based on the preliminary survey on reproductive health. The scores on overall bioethical awareness also tended to be higher in the post-survey than in the pre-study. In conclusion, biomedical ethics education has proved to be an essential tool for enhancing the awareness of biomedical ethics.

Based on these results, it is necessary for experts to fully research and discuss the direction of improvement and the development of the application of biomedical ethics education. In addition, the emphasis was on the necessity of implementing biomedical ethics education more effectively for prospective healthcare workers who will be working in the medical field in the age of chaos, where medical science and science are developing rapidly and their contents are difficult to predict. Follow-up research on educational tools and effective new educational methods to improve understanding and interest of nursing students' bioethics will be needed.

Ethical Clearance: Not required

Source of Funding: Self

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Analysis of Learning Effect in Neonatal Practice of Nursing Students-Utilization of Evaluation Criteria in Clinical Practice Guide

In-Ok Sim¹, Ok-YeonBae¹

¹Department of Nursing, Chung-Ang University 84 Heukseok-ro, Dongjak-gu Seoul, 156-756, Korea

ABSTRACT

Background/Objectives: The purpose of this study is to analyze the process related to the acquirement of the concept through the self - evaluation analysis that practical guidelines of the nursing student in practicing neonatal and neonatal intensive care unit.

Method/Statistical Analysis: A descriptive research design was used for this study. All 109 nursing students were obtained by from neonatal and neonatal Intensive Care Unit Nursing practice in one university located in Seoul. The Data was collected for from 2014 to 2015 by the checklist of practice guideline. Collected data was analyzed on SPSS Win 21.0

Findings: In the method of learning, it was confirmed that they learned the concept through most observation method. Handwashing, breastfeeding and elimination were the most frequently performed items, and pollution inspection, injection/syringe pump and TPN management were the lowest.

Improvements/Applications: In order to improve the quality of clinical practice education and improve the effectiveness of practical training, it is necessary to actively review and improve the use of practical training guideline so that students can receive training in clinical practice and practical courses in the class.

Keywords: Learning effect, Neonate Practice, Nursing Students, Self-evaluation, Practice guidebook

Introduction

The nursing curriculum to strengthen the professional competence of nursing requires very diverse and complex educational goals. In addition to theoretical education, clinical practice is indispensable to develop practical skills to solve the subject's health problems, especially in the clinical field for integrated nursing^[1]. This can be done by applying theoretical knowledge through clinical practice education to they have attitudes and values necessary for nursing practice^[1]. The goal of nursing education is to acquire skills based on professional knowledge and to have the ability and ability to cope with various clinical situations

and needs of nursing subjects^[2]. In particular, clinical practice education can be said to be a core curriculum that has the ability to solve critical thinking and creative problem solving based on prior knowledge of theories^[3].

However, most of the clinical practice of nursing college students is focused on observation-based practice rather than actual nursing behavior^[4], and they are doing simple and low-risk nursing activities such as measuring vital signs and patient movement^[5] And it is difficult to acquire enough nursing care skills necessary for patient care^[6]. It is difficult to obtain active cooperation and support for the clinical practice education because the hospital is established for the purpose of patient care and nursing, not an institution established and operated for nursing university students' practical training^[7]. In addition, among the practical subjects, child nursing practice is a practice that includes vulnerable subjects such as neonatal and pediatric patients and their parents, so it is difficult to carry out direct nursing more than other subjects^[8]. And due to the social problems of

Corresponding Author:

Ok-Yeon Bae

Lecturer, Department of Nursing,
Chung-Ang University, Korea
Email: dhrfus119@naver.com

low fertility and the structure of the medical field that operates a small number of pediatric wards, it is difficult to secure an environment that allows a lot of experience in clinical practice.

Recently, in Korea, due to excessive nursing, new and expansion, sudden quantitative expansion has occurred in a short period of time^[9]. However, there are only 41 schools with affiliated hospitals that can link clinical practice. Schools without attached hospitals are struggling to secure clinical training hospitals for students, and hospitals that must to educate them feel burdened by clinical training^[8]. For this reason, the child nursing practice curriculum is the school's own hands-on training is important. In order to reinforce this, it is necessary for the students themselves to acquire knowledge and skills related to the hospital practice through self-study, observation, Learning is being applied. The most typical example of the learning method is the practice guideline. The Practice Guide line provide information for students to utilize the core information related to the practical exercises in which the objectives of the practical training and contents and methods of practical training are embedded. Practice Guidelines Self-evaluation is conducted according to the acquired method (observation, performance, self-learning) of each concept in learning contents.

However, for nursing college students, the practice guideline is not a tool for learning, but just for submitting a report. Therefore, it is not utilized as a material to provide sufficient information for strategic practice. There insufficient is research to review the composition of the contents of the practice guideline and to find ways to improve it and there is a lack of professional knowledge and basic data that will be a rational and standardized basis for constructing the content of the Practical Guides.

In this study is to investigate how to learn the contents of the practice guide line of neonatal and high-risk neonatal care. It for items that lack practical experience and learning, I would like to provide basic data for supplementing and improving the curriculum so that I can get the education in the practical course in the school.

Materials and Method

Design: This study was the analysis of learning process of practical intervention through self-evaluation in

hospital clinical practice based on neonatal and neonatal intensive care unit. Based on this, a descriptive research was performed to provide basic data for future nursing practice improvement

Participants: The subjects are 3rd grade nursing students in nursing college of J university in S city who took an elective course of Newborn Department and Newborn Intensive Care Unit training and experience during 2014~2015. A total of 109 students who faithfully filled in the information in the final evaluation study were analyzed in this study.

Instruments: In order to collect the data of this study, the practical guideline used and described by students in clinical practice education were used as basic research data. The two tools used in this study are "Check list for learning concepts", and "self-evaluation." 'Clinical Nursing Skills Checklist', which is a self-learning evaluation sheet for each concept to be learned and practiced and 'Self-evaluation', which scored meaning the self-evaluation of the students in the overall practice by performing clinical practice.

Data Collection and Data Analysis

A total of 109 practice guideline were collected from the neonatal and neonatal intensive care unit from 2014 to 2015. The collected data were analyzed using SPSS WIN 21.0. Frequency, percentage, and mean were used.

Ethical Considerations: The study was approved by the IRB(1041078-201609-HRSB-170--01) of the relevant institution and analyzed the data. We explained that the content collected for the study was not used for any purpose other than research and that the participant could withdraw the participation at any time if desired. There was no disadvantage without participating in the study, and personal identification information was encrypted and statistically processed to protect the privacy and confidentiality of the subject. The collected data will be kept sealed in the research director's data archive for three years according to the data storage deadline, and then the information will be discarded.

Results and Discussion

General Characteristics: General characteristic is shown in table 1. The gender of 109(100%) students is females. There were 88 (80%) regular interdisciplinary

undergraduates who were incorporated into nursing program and 21 (20%) nursing program students. The number of students who had prior clinical practice experience was 99 (90%). The remaining 10 students (9.2%) had no prior clinical practice experience. Regarding to hospital type, 78 (71.6%) were assigned to Enterprise hospitals, 20 (18.3%) were assigned to Teaching hospitals, and 11 (10.1%) were assigned to tonational public hospitals.

Table 1: General Characteristics of Participants

Characteristics	Categories	n (%)
Gender	Male	0(0)
	Female	109(100)
Educational System	University	88(80.7)
	Transferred	21(19.3)
Semester (3rd grade)	1st semester	44(40.4)
	2nd semester	65(59.6)
Complete subject (Newborn Nursing)	Yes	65(59.6)
	No	44(40.4)
Experience Nursing Practice	Yes	99(90.8)
	No	10(9.2)
Hospital	Enterprise Hospital	78(71.6)
Ownership	National/Public Hospital	11(10.1)
	Teaching Hospital	20(18.3)
Hospital Type	Tertiary Hospital	0(0)
	General Hospital	61(56)
	Special Hospital	48(44)

Clinical Nursing Skills Checklist: The Clinical Nursing Skills Checklist as shown in table 2. The Clinical Nursing Skills Checklist was divided into three types according to the types of learning that can be practiced in clinical practice. Observations is learned by observing behavior, experience is the actual experience of nursing skills and Self-Study is self-learning for that want concepts. The average score for types of learning was 2.25 time/2weeks points. in the item of subscale, average Observations was 4.03 times/2 weeks, average experience 1.44 times/2 weeks and average Self-Study 1.27 times/2 weeks indicating significantly high points with observation compared with average experience and self-study.

Clinical Nursing Skills Checklist: Observation: The Clinical Nursing Skills Checklist: Observation as shown in table 2. Observation of the type of clinical practice

showed a total average of 4.03 cases. Among the total 36 items, 'Washing' was the highest among the items of 'Observation', 'Hand washing' was the highest at 7.89, 'Neonatal Vital Signs Measurement' was average 6.59, 'Newborn Observation Record' was average 6.45, 6.31 times, and 6.26 times in 'Nutrition-Breast feeding, Formula feeding'. The lowest level of observation method was 'indoor pollution check 'average of 0.94,' infusion pump 'average 1.28 times,' TPN management 'average 1.31,' therapeutic diet management 'average 1.93 times,' Gavage feeding 'Average 1.97 times.

Observation among the methods of learning was the highest in 4.03 times. The present study supports the results of Joe Mi-hye and Kwon In-su ^[10] study that the education through observation is performed rather than the performance - oriented education in which clinical nursing students directly participate. Nursing students have little opportunity to apply theoretical knowledge directly to the practice^[5] and It is also interpreted as reflecting the reality that observation-oriented practice is still maintained. Therefore, it is necessary to construct a learning strategy and a variety of learning environments that fully reflect the interests and needs of the students, not just the assessment of educational situation and design characteristics and educational performance^[11]. It is also necessary to prepare and improve measures to learn items such as 'indoor pollution check', 'infusion pump', 'TPN management', 'treatment diet management', 'Gavage feeding'. I think that it will be possible to increase the quality of clinical practice education by increasing the learning effect to understand and integrate comprehensive clinical practice and clinical field.

Table 2: Clinical nursing skill: Observation

Observation	Average (Number of times)/ Practice session (2weeks)	Rank
Categories		
- Infection control method: Hands washing	7.89	1
- Vital sing check	6.59	2
- Administration of newborn	6.45	3
- Positioning (Nesting)	6.31	4

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- Nutrition: Breast feeding/ Formula feeding	6.26	5
- Gavage feeding	1.97	32
- Nutrition: oro/naso-gastric tubes	1.93	33
- TPN management	1.31	34
- Infusion pump	1.28	35
- Indoor pollution check: air culture)	0.94	36
Total Average/Practice session	4.03/2weeks	

Clinical Nursing Skills Checklist: Experience: The Clinical Nursing Skills Checklist: Experience as shown in table 3. Experience of the type of clinical practice showed a total average of 4.03 cases. In the total of 36 items, the highest level of learning method was ‘hand washing’ (9.28), ‘Nutrition (Breast feeding, Formula feeding)’ was 5.72 and ‘meconium’ was 3.72, 3.46

times in ‘keeping the position’ and 3.40 times in ‘using standardized terms’. The lowest score was 0.06 for ‘TPN management’, 0.06 for ‘other’ (newborn immunization and congenital anomaly) and 0.06 for ‘infusion pump’. The mean number of treatment regimens was 0.08, that of ‘Oxygen therapy’ was 0.11, and that of ‘Syringe pump’ was 0.11.

Experience Among the methods of learning, hand washing items showed the highest average of 9.28. As the importance of hospital infection is emphasized, it is interpreted that nursing college students are also aware of infection management. Hand washing is the most basic and essential way to reduce hospital infection and it can be interpreted that the hand washing is performed because it emphasizes^[12] and education that all hospital workers are important activities to performance. If active interactions between clinical and schools are strengthened, we can get more opportunity to practice more items, and at the same time, we will be able to play a more systematic and active role as a nursing student in the clinical field.

Table 3: Clinical Nursing Skill: Experience

Experience	Average (Number of times)/ Practice session (2weeks)	Rank
Categories		
- Infection control method: Hands washing	9.28	1
- Nutrition: Breast feeding/Formula feeding	5.72	2
- Elimination: meconium, diaper	3.72	3
- Positioning (Nesting)	3.46	4
- Standardized terminology	3.40	5
- Oxygen therapy (O ₂ hood, respirator)	0.11	31
- Syringe pump	0.11	31
- Dietary Therapy Management (Parenteral nutrition)	0.08	33
- TPN management	0.06	34
- Infusion pump	0.06	34
Total Average/Practice session	1.44/2weeks	

Clinical Nursing Skills Checklist: Self-Study: The Clinical Nursing Skills Checklist: Self-study as shown in table 4. Self-study of the type of clinical practice showed a total average of 1.27 cases. In the total of 36 items, the highest level of self-study was ‘average of standardized usage’ 1.96, ‘1.83 times of knowledge and theory related to nursing practice’ and 1.83 times of ‘neonatal vital signs’, ‘Physical assessment’ average 1.79 times, and ‘Body measurement’ average 1.64 times.

The lowest intake of self-study items was ‘indoor pollution check’ at the lowest 0.70, ‘infusion pump’ average 0.79, ‘syringe pump’ 0.83, ‘gavage feeding’ 0.88, ‘infant care system’ Application and monitor ‘average of 0.91.

Self-study 1.27, indicating the lowest level of learning. Although they are expecting to acquire concepts through self-study, students may not be able to use time and clinical practice autonomously in clinical

practice, suggesting that there is a limit to effective learning. It can be expected that the granting of learning time during the practice can link intellectual curiosity to learning motivation, and the effect of the practice will be enhanced. In addition, it can be a strategy to increase the utilization of the practice guide, improve the confidence and coping ability of the new situation faced by nursing students, and improve the skills of professional nursing^[13].

Table 4: Clinical nursing skill: Self-study

Self-study	Average (Number of times)/ Practice session (2weeks)	Rank
Categories		
- Standardized terminology	1.96	1
- Nursing knowledge and theory: Newborn nursing	1.83	2
- Hypothermia, radiant warmer	1.36	3
- Physical assessment	1.79	4
- Growth measurements: BW, Length, HC, CC, AC	1.64	5
- Infant care system monitoring	0.91	32
- Gavage feeding	0.88	33
- Syringe pump	0.83	34
- Infusion pump	0.79	35
- Infection control guidelines (Indoor pollution check: air culture)	0.70	36
Total Average/Practice session	1.27/2weeks	

Self-Evaluation: Self-Evaluation as shown in table 5. Self-evaluation of students performing clinical practice assessed themselves on questions about nursing ability, communication, performance, and attitude Score. The average score was 24.72 points out of 30 points and 1.65 points out of 2 points for each item. The average score for 24.72 points in 30-point scale, in the item of questions, 'structure and understanding of the neonatal and neonatal intensive care unit' showed the highest points with 1.98 and 'Ability to cope with problem situation' showed the lowest Points with 1.27.

The self-evaluation showed an average of 1.65 points out of 2 points, The highest item was 'Understanding the Structure and Function of the Ward' with an average of 1.98 points. This is considered to be a result of the orientation of the practical guidance professor before the training and the sufficient pre-training through the field manager during the training period. On the other hand, the lowest item was 'Ability to deal with problem situations', with an average of 1.27 points. This is because the actual nursing in the clinical field is not simply performed in a single nursing area but is performed in a complicated and dynamic nursing environment ^[14], it is considered to be a result of the fact that practical training alone can't be enough to improve adaptation and practical ability of clinical field. It is that the program can be modified and supplemented so that students can experience various kinds of practical education and if they are improved by reflecting the needs of the students, it will be possible to cope effectively with nursing in the clinic by cultivating critical thinking ability.

Table 5: Self Evaluation

Categories	Good n(%)	Moderate n(%)	Failing n(%)	Average (2 points)
1. Nursing assessment skills	83(76.2%)	24(22.0%)	2(1.8%)	1.74
2. Comfort care	79(72.5%)	27(24.8%)	3(2.7%)	1.68
3. Ability to use the equipment and drug	56(51.4%)	49(44.9%)	4(3.7%)	1.48
4. Performing nursing skills	60(55.1%)	43(39.4%)	6(5.5%)	1.50
5. Communication skills	64(58.7%)	37(33.9%)	8(7.4%)	1.51
6. Newborn department of structure and function	107(98.2%)	2(1.8%)	0(0%)	1.98
7. Infection control	89(81.7%)	20(18.3%)	0(0%)	1.81
8. Educational needs	59(54.1%)	47(43.2%)	3(2.7%)	1.51
9. Priorities of nursing job	69(63.3%)	37(34%)	3(2.7%)	1.60
10. Ability to apply nursing process	68(62.4%)	38(34.9%)	3(2.7%)	1.60

Conted...

11. Reporting skill	87(79.8%)	21(19.3%)	1(0.9%)	1.79
12. Ethical principles and accountability	93(85.3%)	16(14.7%)	0(0%)	1.85
13. Coping skill	41(37.6%)	56(51.4%)	12(11.0%)	1.27
14. Clinical data identification	66(60.6%)	41(37.6%)	2(1.8%)	1.59
15. Discussions and feedback skill	85(78.0%)	24(22.0%)	0(0%)	1.78
Total (Score/Average)	24.72 /			1.65

Conclusion

The purpose of this study was to analyze the process related to the acquisition of the concept through the self - evaluation analysis in the practice guide for the nursing students of the clinical practice nursing department of neonatal and neonatal intensive care unit. Nursing college students were learning the concepts to be learned in clinical practice mainly through observation methods and found that it is confirmed that there is a limit to the sufficient practical training. In order to improve the quality of clinical practice education and improve the effectiveness of the practical training, it is necessary to make efforts to supplement the course of practical training so as to be able to receive training in practical training courses and to prepare improvement plans. Based on the results of this study present above, suggest to necessity of research to verify the effectiveness of repetitive research and to verify the practical use of clinical guidelines.

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Conflict of Interest: Nil

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Study of Social Distance and Knowledge on Attitude toward Mental Illness in University Students

Young-Hee Cho¹, Hae-Ryoung Park²

¹Professor, Dept. of Nursing, ²Professor, Dept. of General Education, Kwangju women's University, Korea

ABSTRACT

Background/Objectives: Mental illness was one of the major health problems in modern society. The purpose of this study was to investigate knowledge, social distance, and attitude toward mental illness in university students, determine correlation among these variables, and analyze their effects on the attitude toward them mental illness. It intended to identify the factors for the attitude toward mental illness and provide basic data that could help develop research and programs to form positive attitude toward them.

Method/Statistical Analysis: Participants were 482 university students in G metropolitan city. The collected data were analyzed using SPSS/win 23.0 program. The general characteristics of the subjects were frequency, percentage, mean and standard deviation. Data were analyzed with independent t-test, ANOVA and Pearson's correlation coefficients and multiple regression analysis.

Findings: The participants were aged 21.89 ± 3.20 on average, 72.7% were female. The most frequent major was public health 48.1%, followed by science and engineering 37.1%, humanities 10.7%, and art 42.0%. The most frequent channel of getting information about mental illness was media 41.5%, followed by voluntary service 26.8%, practical training 10.6%, someone around them 10.6%, education 6.4%, a mental illness person 4.1%. The level of knowledge was 10.52 ± 2.04 , the minimum value was 0.00, and the maximum value was 15.00. Social distance was 2.61 ± 0.56 , the minimum value was 1.00, and the maximum value was 4.67. Attitude toward mental illness was 3.59 ± 0.35 , the minimum value was 2.88, and the maximum value was 4.70. The mean score of knowledge was 10.52 out of 15.00, social distance was 2.61 out of 5.00 and attitude toward mental illness was 3.59 out of 5.00. Attitude toward mental illness was positively correlated with knowledge ($r=.212$, $p<.001$) and was negatively correlated with social distance ($r=-.603$, $p<.001$). The more knowledgeable and shorter the social distance was the more positive attitudes toward mental illness. The stepwise regression analysis found that knowledge ($\beta=.195$, $p<.001$), social distance ($\beta=-.590$, $p<.001$), and having a mental illness person around ($\beta=.075$, $p=.039$), significantly affected the attitude toward mental illness, with the variables accounting for 40.5%.

Improvements/Applications: It has confirmed that correct knowledge and decrease in social distance are factors for positive attitude toward mental illness in the respect of research. Further studies are necessary to develop an effective educational and experiential program that can help get knowledge and reduce social distance.

Keywords: Attitude toward mental illness, Community attitude, Knowledge, Social Distance, University Students

Introduction

Mental illness was one of the major health problems in modern society. For the South Korean people, in 2016, the lifelong prevalence of mental illness was 23.1% and its one-year prevalence was 11.9%; in other words, about 47,000 persons reportedly experienced mental illness during the year^[1]. What is problematic

Corresponding Author:

Hae-Ryoung Park
Professor, Dept. of General Education,
Kwangju Women's University, Korea
Email: hrpark@kwu.ac.kr

is that only about 9% of them made an attempt to get positive treatment from a psychiatrist or a mental health professional^[1]. They avoid counseling with an expert or positive treatment, despite such an increase in the number of mental health problems, probably because the members of the society lack correct knowledge of mental illness and have prejudices and negative attitude toward it^[2,3]. Knowledge of mental illness universally means contents regarding the causes, symptoms, and treatment of mental illness^[4]. Those more knowledgeable about mental illness are more likely to be positive or compassionate toward the mental illness, whereas poor knowledge about symptoms or treatment of disease can make it hard to predict and fearful^[4]. In particular, unreliable, wrong information about mental illness from an uncertain source can increase distorted knowledge and prejudices and lead to negative awareness of mental illness. Social distance generally means the degree of personal permission of social interactions or relations in many different areas^[5]. Putting emphasis on the subjective aspect rather than on the objective aspect of individuals, this concept means individuals' subjective feelings of the members of a certain group or class. Therefore, social distance that the members of society have from the mental illness serves as a crucial predictor of how they illness s act for interaction or exchange^[6,7]. Attitude means a mental and psychological state directly affecting individuals' response to a certain object or situation. So an attitude that the members of society have from the mental illness can have a significant impact on vocational rehabilitation as well as on early detection and proper treatment of the diseases^[8]. A negative attitude toward mental illness prevents them from getting a chance to exert their ability as a member of society fully and makes them hardly return and adapt themselves to the community, consequently having adverse effects on treatment^[9,10,11,12]. This study aimed to investigate knowledge, social distance, and attitude toward mental illness in university students, determine correlation among these variables, and analyze their effects on the attitude toward the mental illness. It intended to identify the factors for the attitude toward the mental illness and provide basic data that could help develop research and programs to form positive attitude toward them.

Materials and Method

Participants & Data Collection: The purpose of this study was to investigate knowledge, social distance, and

attitude toward mental illness in university students, determine correlation among these variables, and identify the factors for the attitude toward mental illness. The subjects were 482 students. The data collection period was from June 1, to July 30, 2017.

Instrument

General Characteristics: The general characteristics are 9 items including age, gender, major, grade, religion, mental illness person around them, experience of learning mental health, experience of contacting with a mental illness person, channel of getting information about mental illness.

Knowledge: The existing measurement tools were used^[4]. A total of 15 items were composed of 1 points scoring of 'correct answer = 1 point', 'wrong answer = 0 points', 'don't know = 0 points' scale. Reliability analysis showed Cronbach's α coefficient was .71.

Social Distance: The existing measurement tools were used^[13]. The 12 items were composed of 5 points scoring of 'strongly disagree = 5 point', 'disagree = 4 points', 'normal = 3 points', 'agree = 2 points', and 'strongly agree = 1 points' scale. It has two sub-areas: physical distance and interpersonal distance. The higher score means longer social distance. Reliability analysis showed Cronbach's α coefficient was .89.

Attitude toward Mental Illness: The existing measurement tools were used^[14,15]. The 40 items were consisted of 5 points scoring. It has four sub-areas authoritarianism, benevolence, social restrictiveness, and community mental health with negative items reversely calculated. The higher score means more positive attitude. Reliability analysis showed Cronbach's α coefficient was .71.

Data Analysis

The collected data were analyzed using SPSS/win 23.0 program. The general characteristics of the subjects were analyzed using descriptive statistics. T-test and ANOVA were used to analyze knowledge, social distance, and attitude toward mental illness by the general characteristics, and sheffe's test was used for post-hoc test. Pearson's correlation coefficient was used to determine inter-variable correlation, and stepwise multiple regression was used to identify the factors for attitude toward mental illness.

Results and Discussion

The participants in this study were aged 21.89 ± 3.20 on average, 72.7% were female. The most frequent major was public health 48.1%, followed by science and engineering 37.1%, humanities 10.7%, and art 42.0 %. Freshmen 31.1%, sophomores 23.9%, juniors 34.6%, and seniors 10.4%. Had no religion 72.6%, had no mental illness person around them 90.9%. Had experience learning about mental health 41.7% and had no such experience 58.3%. Had experience of contacting with a mental illness person 68.2% and had no such experience 31.8%. The most frequent channel of getting information about mental illness was media 41.5%, followed by voluntary service 26.8%, practical training 10.6%, someone around them 10.6%, education 6.4%, a mental illness person 4.1%, as shown in table

1. Knowledge differed by major ($F=6.823$, $p<.001$), grade ($F=11.208$, $p<.001$). Had learning about mental health ($t=3.152$, $p=.002$), and had contacting with a mental illness person ($t=2.123$, $p=.034$), the channel of getting information by voluntary ($F=2.635$, $p=.016$), scored higher for knowledge. Social distance differed by major ($F=3.371$, $p<.001$). Had a mental illness person around them ($t=-2.802$, $p=.005$), had learning about mental health ($t=-4.077$, $p<.001$), had contacting with a mental illness person ($t=-3.516$, $p<.001$), showed shorter social distance. Attitude toward the mental illness differed by had a mental illness person around them ($t=3.277$, $p=.002$), had learning about mental health ($t=2.032$, $p=.040$), and had contacting with a mental illness person ($t=3.620$, $p<.001$), showed more positive attitude toward mental illness. There was a significant difference as shown in table 1.

Table 1: General Characteristics and Variables differences according to the General Characteristics

Characteristics	Category	N(%) or M(SD)	Knowledge		Social distance		Attitude toward the mental illness	
			M(SD)	t or F (p)	M(SD)	t or F (p)	M(SD)	t or F (p)
				Scheffe		Scheffe		Scheffe
Age (yr)		21.89(3.20)						
Gender	Male	131(27.2)	10.12(3.02)	-1.323 (.187)	2.63(0.58)	1.446 (.856)	3.50(0.40)	-1.394 (.164)
	Female	351(72.7)	10.54(2.21)		2.61(0.58)		3.58(0.34)	
Major	Health ^a	232(48.1)	11.12(2.12)	6.823 ($<.001$) a>b,c,d	2.60(0.58)	3.371 (.001) a<b,c,d	3.69(0.34)	1.310 (.192)
	Science, Engineering ^b	156(37.1)	10.29(2.20)		2.91(0.80)		3.62(0.35)	
	Humanities ^c	52(10.7)	10.11(1.47)		2.74(0.82)		3.65(0.31)	
	Art ^d	42(8.71)	9.98(1.88)		2.81(0.90)		3.64(0.41)	
Grade	1st ^a	150(31.1)	10.17(1.79)	11.208 ($<.001$) a,b<c,d	2.55(0.61)	3.286 (.061)	3.59(0.34)	0.845 (.470)
	2nd ^b	115(23.9)	9.89(2.20)		2.61(0.55)		3.57(0.35)	
	3rd ^c	167(34.6)	10.89(1.47)		2.60(0.49)		3.58(0.31)	
	4th ^d	50(10.4)	11.74(1.88)		2.44(0.59)		3.66(0.41)	
Religion	Yes	132(27.4)	10.50(2.22)	-1.499 (.135)	2.58(0.52)	-0.399 (.690)	3.59(0.37)	0.336 (.737)
	No	350(72.6)	10.87(1.75)		2.61(0.58)		3.57(0.34)	
Mental illness person around	Yes	44(9.1)	10.13(2.19)	-0.853 (.394)	2.40(0.58)	-2.802 (.005)	3.75(0.41)	3.277 (.002)
	No	438(90.9)	10.55(2.22)		2.63(0.55)		3.57(0.35)	
Experience learning about mental health	Yes	201(41.7)	10.90(1.90)	3.152 (.002)	2.48(0.60)	-4.077 ($<.001$)	3.63(0.37)	2.032 (.040)
	No	281(58.3)	10.24(1.87)		2.70(0.51)		3.56(0.32)	
Experience of contacting with a mental illness person	Yes	329(68.2)	10.67(1.94)	2.123 (.034)	2.55(0.58)	-3.516 ($<.001$)	3.63(0.36)	3.620 ($<.001$)
	No	153(31.8)	10.20(1.79)		2.75(0.52)		3.50(0.29)	

Conted...

Channel of getting Information about mental illness	Media ^a	200(41.5)	10.73(1.88)	2.635 (.016) b>f	2.69(0.58)	1.826 (.092)	3.57(0.30)	0.813 (.561)
	Voluntary ^b	129(26.8)	11.91(1.44)		2.53(0.54)		3.61(0.36)	
	Practical training ^c	51(10.6)	10.64(1.72)		2.44(0.58)		3.65(0.37)	
	Mental illness patient ^d	20(4.1)	10.23(1.67)		2.69(0.68)		3.54(0.37)	
	Education ^e	31(6.4)	10.54(2.19)		2.60(0.50)		3.53(0.31)	
	Surrounding people ^f	51(10.6)	9.45(2.06)		2.55(0.44)		3.61(0.37)	

They scored an average of 10.52 ± 2.04 out of 15 for knowledge about mental illness. They scored an average of 2.61 ± 0.56 out of 5 for social distance. Of its sub-areas, they scored an average of 2.63 ± 0.74 for physical distance and 2.58 ± 0.52 for interpersonal distance. They scored an average of 3.59 ± 0.35 out of 5 for attitude toward the mental illness; of its sub-areas, they scored 3.70 ± 0.41 for authoritarianism, 3.68 ± 0.43 for benevolence, 3.58 ± 0.45 for social restrictiveness, and 3.38 ± 0.04 for community mental health ideology as shown in table 2.

Table 2: Degree of Knowledge, Social Distance and Attitude toward Mental Illness

Variables	M $\pm$ SD	Max	Min
Knowledge	10.52 ± 2.04	15.00	0.00
Social distance	2.61 ± 0.56	4.67	1.00

Conted...

Physical distance	2.63 ± 0.74	5.00	1.00
Interpersonal distance	2.58 ± 0.52	3.83	1.00
Attitude toward mental illness	3.59 ± 0.35	4.70	2.88
Authoritarianism	3.70 ± 0.41	5.00	2.30
Benevolence	3.68 ± 0.43	4.80	2.27
Social restrictiveness	3.58 ± 0.45	5.00	2.10
Community mental health ideology	3.38 ± 0.04	4.80	1.90

Attitude toward mental illness was positively correlated with knowledge ($r=.212$, $p<.001$) and was negatively correlated with social distance ($r=-.603$, $p<.001$). That is, the more knowledgeable and the shorter social distance, the more positive attitude toward the mental illness as shown in table 3.

Table 3: Correlation among Knowledge, Social Distance and Attitude toward Mental Illness

Variables	Knowledge r(p)	Social Distance r(p)	Attitude toward Mental Illness r(p)
Knowledge	1	-.041(.365)	.212(<.001)
Social Distance	-.041(.365)	1	-.603(<.001)
Attitude Toward Mental Illness	.212(<.001)	-.603(<.001)	1

To determine the predictability of the factors for the attitude toward the mental illness, those general characteristics having a mental illness person around, experience of learning mental health, and contacting mental illness person which made statistical differences in the attitude toward mental illness were treated as dummy and processed by stepwise multiple regression analysis along with principal variables, such as knowledge and social distance. When the basic assumption of the regression analysis was reviewed,

there was autocorrelation with Durbin-Watson 1.994, no variable exceeded multicollinearity among independent variables with the Variance Inflation Factor (VIF) ranging from 1.029 to 1.2161. The regression model was significant ($F=66.366$ $p<.001$). The stepwise regression analysis found that knowledge ($\beta=.195$, $p<.001$), social distance ($\beta=-.590$, $p<.001$), and having a mental illness person around ($\beta=.075$, $p=.039$) significantly affected the attitude toward the mental illness, with the variables accounting for 40.5% as shown in table 4.

Table 4: Influencing Factors on Attitude toward Mental Illness

Measuring Items	B	S.E	β	t	p
	4.199	.086		46.909	<.001
Knowledge	.032	.006	.195	5.475	<.001
Social Distance	-.368	.023	-.590	-16.322	<.001
Mental illness person around	.095	.046	.075	2.073	.039
R ² : .411, Adj R ² : .405, F : 66.366, p<.001					

The efforts to raise the level of empathy and understanding through knowledge about mental disorder and to increase many different types of contact, including voluntary service, are associated with formation of a positive view of mental disorder^[16].

Knowledge, social distance, and having a mentally ill person around were found to be factors for the attitude toward the mental illness, with these variables accounting for 40.5%. It is crucial to give university students many different types of education so that they can have a good understanding of mental disorder and accept it as disease with the objective of forming positive attitude toward the mentally disordered and changing their attitude. Therefore, the efforts to give good publicity related to mental disorder and give more chances to be taught by a relevant expert with the aim of giving a better understanding of the mental illness, including basic human rights and rights to social participation, as well as knowledge-based education are expected to contribute to formation of positive attitude toward the mental illness. The efforts to give more chances to have an empathic talk and form a friendly and positive relationship with them by giving chances for stable contact through various types of small service groups and circle activity to reduce social distance are expected to make positive changes in the attitude toward the mental illness. Since having a mental illness person around also has effects, the efforts to assist the mentally ill with rehabilitation, direct rehabilitation, and social adjustment through various community mental health measures as well as through policies for helping them adapt themselves to the community are expected to facilitate changes in the attitude toward the mentally disordered.

This study is significant in that: First, it has confirmed that theoretical education and experience of contact aimed at forming positive attitude toward mental illness are important in the educational respect. Second, it has confirmed that correct knowledge and decrease in

social distance are factors for positive attitude toward mental illness in the respect of research. Third, it is expected to help university students accept the life of the mental illness and help them return to the community by providing basic data that are useful to develop a program.

Conclusion

Knowledge, social distance, and having a mental illness person around were found to be factors for the attitude toward the mental illness, with these variables accounting for 40.5%. It is crucial to give university students many different types of education so that they can have a good understanding of mental disorder and accept it as disease with the objective of forming positive attitude toward the mental illness and changing their attitude. Therefore, the efforts to give good publicity related to mental disorder and give more chances to be learned by a relevant expert with the aim of giving a better understanding of the mental illness, including basic human rights and rights to social participation, as well as knowledge-based education are expected to contribute to formation of positive attitude toward the mental illness. The efforts to give more chances to have an empathic talk and form a friendly and positive relationship with them by giving chances for stable contact through various types of small service groups and circle activity to reduce social distance are expected to make positive changes in the attitude toward the mental illness. Since having a mental illness person around also has effects, the efforts to assist the mental illness with rehabilitation, direct rehabilitation, and social adjustment through various community mental health measures as well as through policies for helping them adapt themselves to the community are expected to facilitate changes in the attitude toward the mental illness.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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Exploring the Influence of Safety Perception and Safety Control on Clinical Performance Ability and Self Confidence in Patient Safety in Korean Nursing Students

Dahye Park¹, Eun-hee Jang²

¹Department of Nursing, Semyung University, 65 Semyungro, Jecheon-si, Chungbuk, 27136, Korea;

²Department of Nursing, Incheon Catholic University, 12 Haesongro, Yeonsu-gu, Incheon, 22000, Korea

ABSTRACT

Background/Objectives: This study aims to explore the effect of increased awareness of safety perception and safety control in providing self confidence in patient safety and clinical trials for Korean nursing students.

Method/Statistical Analysis: The data were gathered using several questionnaires that were surveyed by 309 students located in C,I,J cities who gave their permission to participate in this study. To identify the correlations among clinical performance ability, self confidence in patient safety, safety perception and safety control, SPSS 20.0 correlation program was used. We applied descriptive statistics, which include t-test, analysis of variance(ANOVA_Scheffe), Pearson's correlation coefficient analysis, and multiple-regression analysis.

Findings: There was a statistically significant positive correlation among safety perception, safety control, self confidence in patient safety and clinical performance ability. The regression model explained approximately 54.0% of self confidence in patient safety. Meanwhile, safety perception($p<.001$), safety control($p<.001$), experience of incident($p<.001$), academic record(Less 3.0)($p=.008$), clinical performance ability($p=.008$), and major satisfaction(Satisfaction)($p=.045$) were determined to influence factors on self confidence in patient safety. The multiple-regression analysis model explained approximately 53.0% of clinical performance ability. Furthermore,safety control($p<.001$), major satisfaction(Moderate)($p<.001$), safety perception($p=.012$), self confidence in patient safety ($p=.012$), and academic record(3.0-3.5)($p=.019$) were determined to be influencing factors on clinical performance ability.

Improvements/Applications: The results are anticipated to be utilized as a reference basis for devising strategy for self confidence in patient safety and clinical performance ability for prospective nursing students.

Keywords: *Clinical Performance Ability, Self Confidence in Patient Safety, Safety Perception, Safety Control, Nursing Students*

Introduction

Recently more patients expect to receive high-quality medical services in a safe environment^[1]. These changes in the hospital require nursing students to possess the ability to quickly identify and resolve complex problems that are inherent in clinical trials^[2].

Nowadays, patient safety is an important part of nursing, and medical practitioners should consider patient safety first. The focus on patient safety prevents unexpected injuries or accidents from happening to patients while receiving medical services^[3]. In order to provide patient safety, improvement of awareness through education is important, and the number of safety education a nursing student participates is an important factor^[4]. Furthermore, the efforts to increase awareness of safety in an organization are necessary to create an environment that nurtures patient safety^[5]. In particular, as a nurse after graduation nursing students will be in charge of practical affairs in hospital. Nursing students are a group that

Corresponding Author:

Eun-hee Jang

Assistant Professor, Department of Nursing,
Incheon Catholic University, Korea

Email: cartooneh@hanmail.net

can directly affect patient safety because they received systematic education from the undergraduate courses to maximize patient safety capability to contribute to patient safety^[6]. Therefore, this study examines the relationship between the patient's safety capability and the degree of care performance among nursing students by examining the degree of safety awareness, safety control, and patient safety.

This study aims to accomplish the following goals: first, to identify the level of nursing students' safety perception, safety control, self-confidence in patient safety and clinical performance ability; second, to identify differences in nursing college students' safety perception, safety control, self-confidence in patient safety and clinical performance ability according to their general characteristics; third, to identify the correlation between safety perception, safety control, self-confidence in patient safety and clinical performance ability as perceived by nursing students; fourth, to identify the influence of the safety perception, safety control and clinical performance ability on self-confidence in patient safety and clinical performance ability; fifth, to identify the influence of the safety perception, safety control and self-confidence in patient safety on clinical performance ability.

Materials and Method

Study Design: This study is on a descriptive correlation model that examines the factors affecting clinical performance ability and self confidence in patient safety among nursing students.

Participants and Data Collection: The data were gathered using several questionnaires that were surveyed by 309 nursing students located in C,I,J cities who gave their permission to participate in this study. The all participators were comprised of Juniors and Seniors in nursing college who already had extensive experience involving in clinical trials, so it was not too difficult to make them understand the research goals. As it is a customary practice, we obtained approval from department chairs and student representatives for participators. The data were collected for a period of 60 days, from September 2016 to October 2016. The sample size calculation was performed using G*Power 3.1.3 program, which was 267 with an effect size of 15%, a significance level of 5%, and a power of 95%^[7]. The calculations yielded a total minimum sample size of 267 participants, which proved that our sample size was sufficient for data analysis.

Ethical Concerns: The data used for this study (IRB No: SMU-2015-06-003; SMU-2018-05-003) were collected following the approved IRB guidelines and screening procedures of "S" university located in J city. We described the purpose of the study to participants and informed they could choose to not participate. For those who participated gave their written consent, and the process was directed in accordance with the Helsinki Declaration. All participants were given some small token of gratitude.

Research Variables: All instruments used in this study were validated in previously published works. Among those published works, Korean-translated versions continue to possess acceptable validity and reliability.

Safety Perception: The safety perception questionnaire was developed by Ramanujam, Abrahamson and Anderson^[8,9]. For the safety perception questionnaire, there were 5 questions and the responses follow a five-point scale. The sum of response scores can be between 5 to 25, in which higher the score, higher the safety perception for patients. Cronbach's α was 0.74 in the original scale and 0.71 in the present study.

Safety Control: The safety control questionnaire was developed by Anderson. For the safety control questionnaire, there were 7 questions and the responses follow a five-point scale. The sum of response scores can be between 5 to 35, in which higher the score, higher the safety control for patients. Cronbach's α was 0.84 in the original scale and 0.84 in the present study.

Self Confidence in Patient Safety: The self confidence in patient safety questionnaire was developed by Park. For the self confidence in patient safety questionnaire, there were 10 questions and the responses follow a five-point scale. The sum of response scores can be between 10 to 50, in which higher the score, higher the self confidence in patient safety. Cronbach's α was 0.86 in Park's research conducted by this measure and 0.85 in the present study.

Clinical Performance Ability: The clinical performance ability questionnaire was developed by Choi. For the clinical performance ability questionnaire, there were 45 question and the responses follow a five-point scale. The sum of responses can be between 45 to 225, in which higher the score, higher the clinical performance ability. Cronbach's α was 0.92 in the original scale and 0.97 in the present study.

Method of Data Analysis

The PASW (Predictive Analytic SoftWare) 20.0 was used to analyze the data. The general characteristics of the participants were identified using descriptive statistics, which include average, standard deviations, frequency distribution, and percentages. The characteristics of participants can be categorized into safety perception, safety control, clinical performance ability and self confidence in patient safety, and the characteristics were analyzed with t-test, ANOVA, and post hoc analysis was guided with Scheffe's. Pearson's correlation coefficient analysis was used to identify the effect of clinical performance ability with regard to safety perception, safety control and self confidence in patient safety. The multiple-regression analysis was used to determine the influence of clinical performance ability and to determine its correlation with safety perception, safety control and self confidence in patient safety.

Results

General Characteristics: In regards to general characteristics, 211 people (68.3 percent) have received training on patient safety, and 200 people (64.7 percent) have experienced patient safety related campaigns (poster, patient safety events, videos, etc.). 180 people (58.3 percent) have witnessed medical errors during clinical practice, 62 people (20.1 percent) were reported to the professor after witnessing medical errors, 33 people (10.7 percent) reported medical errors during clinical practice[Table 1].

Table 1: Socio-demographic Characteristics of Subjects

Characteristics	Categories	n (%)
Experience of Safety education	Yes	211(68.3)
	No	98(31.7)

Conted...

Experience of Safety campaign	Yes	200(64.7)
	No	109(35.3)
Experience of Incident	Yes	129(41.7)
	No	180(58.3)
Experience of Reporting Incident (academic adviser)	Yes	62(20.1)
	No	247(79.9)
Experience of Reporting Incident (medical team)	Yes	33(10.7)
	No	276(89.3)

Differences of Self Confidence in Patient Safety and Clinical Performance Ability according to Socio-demographic Factor:

No significant difference was detected in the self confidence in patient safety of clinical performance satisfaction, experience of safety campaign, experience of reporting incident(academic adviser), or experience of reporting incident(medical team). On the contrary, there was a significant difference by major satisfaction($F=12.65$, $p<.001$), academic record($F=5.60$, $p=.001$), experience of safety education($t=2.58$, $p=.010$), and experience of incident($t=-3.16$, $p=.002$).

No significant difference was found in the clinical performance ability in regards to experience of incident, experience of reporting incident(academic adviser) or experience of reporting incident(medical team). However, a significant difference was demonstrated by major satisfaction($F=18.71$, $p<.001$), clinical performance satisfaction($F=11.71$, $p<.001$), academic record($F=10.11$, $p<.001$), experience of safety education($t=2.66$, $p=.008$) and experience of safety campaign($t=1.99$, $p=.047$)[Table 2].

Table 2: Differences of self confidence in patient safety and Clinical Performance Ability according to Socio-demographic Factor

Characteristics	Categories	self confidence in patient safety		Clinical Performance Ability	
		Mean $\pm$ SD	t or F (p)	Mean $\pm$ SD	t or F (p)
Major Satisfaction	Very Satisfaction	4.43 $\pm$ 0.12	12.65 (.000)*	3.31 $\pm$ 0.69	18.71 (.000)*
	Satisfaction	4.12 $\pm$ 0.33		3.56 $\pm$ 0.47	
	Moderate	3.90 $\pm$ 0.42		3.49 $\pm$ 0.44	
	Dissatisfaction	4.20 $\pm$ 0.47		3.90 $\pm$ 0.48	
	Very Dissatisfaction	4.15 $\pm$ 0.48		4.13 $\pm$ 0.48	

Conted...

Clinical Performance Satisfaction	Very Satisfaction	4.16 ± 0.24	2.38 (0.52)	3.53 ± 0.60	11.71 (.000)*
	Satisfaction	3.93 ± 0.49		3.34 ± 0.57	
	Moderate	4.11 ± 0.44		3.71 ± 0.48	
	Dissatisfaction	4.20 ± 0.46		3.91 ± 0.47	
	Very Dissatisfaction	4.25 ± 0.63		4.07 ± 0.52	
Academic Record	Over 4.0	4.27 ± 0.53	5.60 (.001)*	4.02 ± 0.42	10.11 (.000)*
	3.5-4.0	4.23 ± 0.47		3.93 ± 0.51	
	3.0-3.5	4.14 ± 0.43		3.67 ± 0.55	
	Less than 3.0	3.93 ± 0.48		3.59 ± 0.39	
Experience of Safety Education	Yes	4.20 ± 0.49	2.58 (.010)*	3.86 ± 0.54	2.66 (.008)*
	No	4.05 ± 0.42		3.68 ± 0.45	
Experience of Safety Campaign	Yes	4.16 ± 0.49	.48 (.630)	3.85 ± 0.54	2.00 (.047)*
	No	4.14 ± 0.45		3.72 ± 0.48	
Experience of Incident	Yes	4.06 ± 0.48	-3.16 (.002)*	3.79 ± 0.52	-.47 (.638)
	No	4.23 ± 0.46		3.81 ± 0.52	
Experience of Reporting Incident (academic adviser)	Yes	4.11 ± 0.48	-.86 (.392)	3.90 ± 0.49	1.62 (.108)
	No	4.17 ± 0.47		3.78 ± 0.52	
Experience of Reporting Incident (medical team)	Yes	4.15 ± 0.53	-.08 (.940)	3.73 ± 0.58	-.84 (.400)
	No	4.16 ± 0.47		3.81 ± 0.51	

Correlations between Safety Perception, Safety Control, Self Confidence in Patient Safety and Clinical Performance Ability: The correlations between variables are displayed in Table 3. There was a statistically significant positive correlation among self confidence in patient safety, safety perception($r=.61$,

$p<.001$), and safety control($r=.63$, $p<.001$). Also, there was a statistically significant positive correlation among clinical performance ability, safety perception($r=.56$, $p<.001$), safety control ($r=.69$, $p<.001$), and self confidence in patient safety ($r=.56$, $p<.001$) [Table 3].

Table 3: Correlations between variables

Variables	Safety Perception	Safety Control	Self Confidence in Patient Safety	Clinical Performance Ability
	r(p)	r(p)	r(p)	r(p)
Safety Perception	1			
Safety Control	.63(.000)	1		
Self Confidence in Patient Safety	.61(.000)	.65(.000)	1	
Clinical Performance Ability	.56(.000)	.69(.000)	.56(.000)	1

Influencing factors on Self Confidence in Patient Safety: The regression analysis for self confidence in patient safety model is displayed in Table 4. To determine the influence of safety perception, safety control and clinical performance ability on self confidence in patient safety, a multiple-regression model was used. The presence of auto-correlation and multicollinearity for the regression model were analyzed using Durbin–Watson’s statistic (1.95),

and the variance inflation factor (1.012-1.724), which indicated that the base requirements of regression analysis were satisfied. The explanatory power was a statistically significant 54.0% (Adj $R^2=.530$; $F=15.90$, $p<.045$). Among these factors, safety perception($p<.001$), safety control($p<.001$), and experience of incident($p<.001$) were proved to exert a significant influence on self confidence in patient safety ($\beta=.32$). And academic record(Less 3.0)

($p = .008$), clinical performance ability($p=.008$), and major satisfaction(Satisfaction) ($p = .045$) were presented

as the influential factors. It proved to have the greatest influence on self confidence in patient safety[Table 4].

Table 4: Regression Analysis for Self Confidence in Patient Safety

Variables	B	SE	β	t	p
(Constant)	1.28	0.17	-	7.57	.000
Safety Control	0.30	0.05	.32	5.43	.000
Safety Perception	0.32	0.05	.32	6.20	.000
Experience of Incident (reference=yes)	0.14	0.04	.15	3.67	.000
Academic Record_ Less 3.0 (reference=over 4.0)	-.14	0.05	-.11	-2.67	.008
Clinical Performance Ability	0.14	0.05	.15	2.67	.008
Major Satisfaction_ Satisfaction (reference= Very Satisfaction)	0.17	0.09	.08	2.02	.045
$R^2=.54$, Adj $R^2=.53$ $F=15.90$, $p<.045$					

Influencing factors on Clinical Performance Ability:

The regression analysis for clinical performance ability model is displayed in Table 5. To determine the influence of safety perception, safety control and clinical performance ability on self confidence in patient safety, a multiple-regression model was used. The presence of auto-correlation and multicollinearity for the regression model were analyzed using Durbin–Watson’s statistic (1.83), and the variance inflation factor (1.030-2.048), which indicated that the base requirements of regression

analysis were satisfied. The explanatory power was a statistically significant 53.0% (Adj $R^2=.520$; $F=5.57$, $p<.019$). Among these factors, safety control($p<.001$), and major satisfaction(Moderate)($p<.001$) were proved to exert a significant influence on clinical performance ability. And, safety perception ($p=.012$), self confidence in patient safety ($p=.012$), and academic record(3.0-3.5) ($p = .019$) were presented as the influential factors.; it was shown to have the greatest influence on clinical performance ability[Table 5].

Table 5: Regression Analysis for Clinical Performance Ability

Variables	B	SE	β	t	p
(Constant)	1.02	0.21	-	4.78	.000
Safety Control	0.47	0.06	.47	8.29	.000
Major Satisfaction_ Moderate (reference= Very Satisfaction)	-0.16	0.05	-.14	-3.24	.001
Safety Perception	0.13	0.06	.12	2.20	.028
Self Confidence in Patient Safety	0.15	0.06	.14	2.52	.012
Academic Record_ 3.0-3.5 (reference=over 4.0)	-0.10	0.04	-.09	-2.36	.019
$R^2=.53$ Adj $R^2=.52$ $F=5.57$, $p<.019$					

Discussion

This study presents the outcome of questionnaires surveyed to identify safety perception, safety control and self confidence in patient safety and to determine the effects of these factors on clinical performance ability among nursing students. The difference in clinical performance ability according to general characteristics showed that the higher the clinical performance ability, major satisfaction, clinical performance satisfaction and academic record the more confident students experienced in performing the patient safety education. This should

be done in a way to improve students’ major and practical satisfaction, and education on patient safety should be linked with school classes and working environment^[10].

This study indicates that there was a positive correlation among clinical performance ability, safety perception, safety control, and self confidence in patient safety, which matches the results of Park’s study^[11]. Park’s study was a significant positive correlation between knowledge and confidence on patient safety. The current study shows that confidence on patient safety is directly linked with safety perception and that nursing

students have greater knowledge if they have high-level tendencies to form self confidence in patient safety^[11].

The more safety perception and safety control increased, the greater its influence was on self confidence in patient safety. The more experience of incident decreased, the greater its influence was on self confidence in patient safety. Students should be aware of the potential to witness medical errors during clinical practice. It also needs education based on accurate guidance on how to identify and deal with the situation^[12]. The more safety control increased, the greater its influence was on clinical performance ability. These outcomes support the postulation that nursing students who possess high safety perception and safety control demandsocial connection by developing self confidence in patient safety and that they want to improve clinical performance ability^[13].

This study has some limitations. First, we considered only Juniors and Seniors in nursing college in 3 areas. Therefore, a longitudinal research design is recommended for tracking the progress of students' patient safety competence over time. Second, since the data analysis was performed on a small number of participants, it will be infeasible to infer the findings of this research to other analysis. In order to expand the outcomes of this study to other areas, follow-up studies must be conducted. Third, the self-reporting of structural questionnaires introduces the risk of recall bias, as well as potential situation of actual safety perception, safety control, self confidence in patient safety and clinical performance ability. Additional studies in a number of cultures and contexts should be conducted to recognize various aspects of patient safety and improve knowledge of factors influencing patient safety in nursing curriculum.

Conclusion

There was a statistically significant positive correlation among safety perception, safety control, self confidence in patient safety and clinical performance ability and there were positive correlations between these factors. The regression model explained approximately 54.0% of self confidence in patient safety. Meanwhile, safety perception($p<.001$), safety control($p<.001$), experience of incident($p<.001$), academic record(Less 3.0)($p=.008$), clinical performance ability($p=.008$), and major satisfaction(Satisfaction)($p=.045$) were responsible for influencing factors on self confidence

in patient safety. The regression analysis model showed approximately 53.0% of clinical performance ability. Meanwhile, safety control($p<.001$), major satisfaction(Moderate)($p<.001$), safety perception($p=.012$), self confidence in patient safety ($p=.012$), and academic record(3.0-3.5)($p=.019$) were responsible for influencing factors on clinical performance ability. This study found that clinical performance ability could be managed by safety perception, safety control and self confidence in patient safety. Specifically, clinical performance ability can be controlled by safety perception, safety control and self confidence in patient safety. This requires an understanding that self confidence in patient safety is not result associated with individual skills, but result associated with safety perception and safety control.

Based on this study results, additional studies are suggested to seek strategy and devise measurements for the improvement of safety perception, safety control, self confidence in patient safety and clinical performance ability. Also a curriculum should be established that will increase nursing students' self confidence in patient safety and clinical performance ability. By participating such a program, nursing students should be mindful of the self confidence in patient safety, and design and suggest a clinical performance ability to reduce its occurrence. Moreover, methodological studies are suggested to verify factors that have effects on the self confidence in patient safety and clinical performance ability of nursing students and to develop a valuation scale for measuring nursing students' patient safety that is appositely divided to reflect current trends.

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The Effects of Grit and Academic Self-Efficacy on Major Satisfaction among Students in Health-Related College Majors

Hyun-jeong Kim¹, Su-min Hong²

¹Professor, Department of Nursing, ²Professor, Department of Dental Hygiene, Baekseok University, Cheonan, 31065 Korea

ABSTRACT

Background/Objectives: The present study was conducted to investigate the effects of grit and academic self-efficacy on major satisfaction for students in health-related majors.

Method/Statistical Analysis: Self-report questionnaire were consisted grit, self-efficacy, major satisfaction scale and completed by 290 university students in health-related majors. The collected data were analyzed with the SPSS 22 software program using ANOVA, Scheffe post-hoc test, the Pearson correlation coefficient, and multiple regression.

Findings: The grit score was higher in the male students ($M=3.03$) than in the female students ($M=2.89$). Academic self-efficacy was higher among the male students ($M=3.24$) than among the female students ($M=2.97$) and higher in the seniors ($M=3.11$) than in the juniors ($M=2.95$). Grit and academic self-efficacy were not significantly dependent on the major. The results of a multiple regression analysis were found that academic self-efficacy had a positive (+) effect on major satisfaction ($\beta=.349, p<.001$). Among the sub-factors, perseverance of effort and self-control efficacy was found to have a significant positive (+) effect on major satisfaction.

Improvements/Applications: Educational and counseling programs may need to be developed to help the students establish long-term goals and develop their capabilities in regard to making continuous efforts to accomplish the goals.

Keywords: Grit, Academic self-efficacy, Major satisfaction, College students, Health-related majors

Introduction

A university student's satisfaction with his or her chosen major frequently shows in the student's academic achievement. Major satisfaction influences not only a student's academic achievement but also college life, as well as career choice^[1]. Therefore, research on the various factors affecting major satisfaction is necessary.

Grit is a concept that has recently been identified as a significant factor in goal achievement. Grit can be defined as the effort and determination to achieve one's goals. Grit is the ability to perform, despite the

time and obstacles one faces in achieving a goal. In a study of college students, the factor of grit was found to affect students' academic achievement, grades, college life satisfaction, sense of belonging, faculty-student interaction, and persistence^[2]. In a study of international students in Korea, grit was a factor found to be closely connected to a student's decision to remain in school rather than dropping out, as well as in adaptation to college life^[3].

Academic self-efficacy is the most important variable affecting a college student's major satisfaction. Academic self-efficacy is an individual's belief and expectation that he or she is capable of solving academic problems without assistance. Students with high self-efficacy showed high rates of satisfaction with their major as well as ability to adjust to college life. If students improve their self-efficacy, they can expect to be able to excel in academic achievement. In a study

Corresponding Author:

Su-min Hong
Professor, Department of Dental Hygiene
Baekseok University, Korea
Email: sarangtou@bu.ac.kr

of 1141 college students, self-efficacy was found to be positively correlated with college life adjustment and negatively correlated with stress and depression, thus indicating self-efficacy's positive role in college students in relation to academic achievement^[4].

Students in health-related majors are required to work hard, considering an academic workload that includes professional theoretical education, on-site clinical practice, and national exams. Therefore, research on grit and academic self-efficacy as factors that can improve satisfaction with the major of health department students is necessary yet insufficient. The present study was therefore conducted to investigate the effects of grit and academic self-efficacy on major satisfaction for students in health-related majors.

Materials and Method

Research Tools: Self-report questionnaire surveys were completed by 290 university students in health-related majors. The surveys used the grit scale translated by Lee and Son^[5] the academic self-efficacy scale developed by Kim and Park^[6], and the major satisfaction scale revised by Song^[7].

The grit scale, developed by Duckworth et al. to measure grit, consists of six questions to measure each of the two factors constituting grit, which are consistency of interest and perseverance of effort^[8]. A higher total score, reflecting the reverse scoring, is considered to indicate greater perseverance and enthusiasm for accomplishing long-term goals.

The self-efficacy scale consists of 12 questions using a five-point Likert scale to investigate three sub-factors of self-efficacy, which are task difficulty, self-control efficacy, and confidence.

The major satisfaction scale consists of 22 questions using a five-point Likert scale to investigate four sub-factors of major satisfaction, which are general satisfaction, subject satisfaction, relationship satisfaction, and recognition satisfaction.

Statistical Analysis

In the present study, the reliability (Cronbach's α) of the research tools was high, specifically 0.673 for the grit scale, 0.894 for the academic self-efficacy scale, and

0.964 for the major satisfaction scale. The collected data were analyzed with the SPSS 22 software program using a frequency analysis to investigate the demographic characteristics of the subjects, and an independent sample t-test, a one-way analysis of variance (ANOVA), and a Scheffe post-hoc test to investigate the differences in the key variables depending on the characteristics of the subjects. In addition, a Pearson's correlation analysis was performed between the key variables. A multiple regression analysis was performed to test the effects of the grit and academic self-efficacy of the university students in health-related majors on the major satisfaction. The statistical significance was tested with reference to the significance level of 0.05.

Results and Discussion

Among the 290 subjects in the present study, there were 72 men (24.8%), and 218 women (75.2%). A total of 160 subjects (55.2%) were seniors, and 130 (44.8%) were juniors. The major of 91 subjects (31.4%) was nursing, while 79 (27.2%) subjects studied dental hygiene, 57 (19.7%) physical therapy, and 63 (21.7%) emergency service. An independent sample t-test, a one-way ANOVA, and a Scheffe post-hoc test were performed to investigate differences in grit, academic self-efficacy, and major satisfaction depending on the demographic characteristics of the subjects. The results are shown in Table 1.

The grit score was higher in the male students ($M=3.03$) than in the female students ($M=2.89$). With regard to grade ($t=2.497$, $p<.05$), the grit score was higher in the senior students ($M=2.98$) than in the junior students ($M=2.86$). Academic self-efficacy was significantly dependent on sex and grade. With regard to sex ($t=4.276$, $p<.001$), academic self-efficacy was higher among the male students ($M=3.24$) than among the female students ($M=2.97$). Regarding grade ($t=2.768$, $p<.01$), academic self-efficacy was higher in the seniors ($M=3.11$) than in the juniors ($M=2.95$). Grit and academic self-efficacy were not significantly dependent on the major ($p>.05$).

Satisfaction with the major was significantly dependent on the major ($F=7.784$, $p<.001$). Major satisfaction was higher in students of nursing and dental hygiene than in students of emergency service. Major satisfaction was not significantly dependent on the sex or grade of the subjects ($p>.05$).

Table 1: Demographic characteristics and grit, academic self-efficacy, and major satisfaction of subjects

Item	Grit		Academic self-efficacy		Major satisfaction	
	M ± SD	t/F	M ± SD	t/F	M ± SD	t/F
Male	3.03 ± 0.42	2.678**	3.24 ± 0.51	4.276***	3.64 ± 0.80	-0.453
Female	2.89 ± 0.40		2.97 ± 0.47		3.69 ± 0.68	
4th	2.98 ± 0.40	2.497*	3.11 ± 0.46	2.768**	3.64 ± 0.75	-1.11
3rd	2.86 ± 0.42		2.95 ± 0.52		3.73 ± 0.65	
Nursing	2.94 ± 0.40	0.230	3.08 ± 0.51	0.808	3.81 ± 0.61	0 7.784***
Dental hygiene	2.89 ± 0.40		3.07 ± 0.53		3.86 ± 0.55	
Physical therapy	2.91 ± 0.43		2.99 ± 0.53		3.58 ± 0.65	
Emergency service	2.94 ± 0.42		2.97 ± 0.38		3.36 ± 0.93	

** p<.01 *** p<.001

As shown in Table2, the average grit score was 2.92 points out of 5 points, and the average scores for perseverance of effort and consistency of interest, the sub-factors of grit, were 3.08 and 2.76 points, respectively. The average academic self-efficacy score was 3.03 points out of 5 points, and the average scores for task difficulty, self-control efficacy, and confidence, the sub-factors of academic self-efficacy, were 2.82, 3.26, and 3.02 points, respectively. The average major satisfaction score was 3.68 points out of 5 points, and the average scores for general satisfaction, subjects satisfaction, relationship satisfaction, and recognition satisfaction, the sub-factors of major satisfaction, were 3.66, 3.62, 3.53, and 3.90 points, respectively.

Table 2: Sub-factors of grit, academic self-efficacy, and major satisfaction

Item	Sub-factors	M ± SD
Grit	Perseverance of effort	3.08 ± 0.54
	Consistency of interest	2.76 ± 0.53
	Total	2.92 ± 0.41
Academic self-efficacy	Task difficulty	2.82 ± 0.69
	Self-control efficacy	3.26 ± 0.60
	Confidence	3.02 ± 0.77
	Total	3.03 ± 0.49

Conted...

Major satisfaction	General satisfaction	3.66 ± 0.79
	Subject satisfaction	3.62 ± 0.71
	Relationship satisfaction	3.53 ± 0.76
	Recognition satisfaction	3.90 ± 0.82
	Total	3.68 ± 0.71

To measure the effects of the grit and academic self-efficacy of the university students with a health-related major on their major satisfaction, a multiple regression analysis was performed, and the results are shown in Table 3. The regression model was found to be appropriate ($F=22.056(p<.001)$), and the explanatory power of the model was about 13.3%. Testing the significance of the coefficient of regression showed that academic self-efficacy had a significant and positive (+) effect on major satisfaction ($\beta=.349, p<.001$). In other words, university students with a health-related major who had higher academic self-efficacy scores showed higher major satisfaction scores. In contrast, grit did not show a significant effect on major satisfaction ($p>.05$).

Table 3: Association between grit, academic self-efficacy, and major satisfaction assessed by multiple regression

Variable	B	S.E	β	t	p	VIF
	2.00	0.31		6.511	<.001	
Grit	0.06	0.11	.033	0.534	.594	1.262
Academic self-efficacy	0.50	0.09	.349	5.649***	<.001	1.262

$F=22.056(p<.001)$, $R^2=.133$, adjusted $R^2=.127$, Durbin-Watson=1.198

*** p<.001

Table 4 shows the results of the multiple regression analysis performed to test the effects of the sub-factors of grit on major satisfaction. The regression model was found to be appropriate ($F=16.081(p<.001)$), and the explanatory power of the model was about 10.1%. Among the sub-factors, perseverance of effort was found to have a significant positive (+) effect on major satisfaction ($\beta=.322, p<.001$). In other words, university students with a health-related major who had higher perseverance of effort scores showed higher major satisfaction scores. In contrast, consistency of interest did not show a significant effect on major satisfaction ($p>.05$).

A multiple regression analysis was performed to examine the effect of the sub-factors of academic self-efficacy on major satisfaction. The regression model was found to be appropriate ($F=47.336(p<.001)$), and the explanatory power of the model was about 33.2%. Among the sub-factors, self-control efficacy was found to have a significant positive (+) effect on major satisfaction ($\beta=.589, p<.001$). In other words, university students with a health-related major who had self-control efficacy scores showed higher major satisfaction scores. In contrast, task difficulty showed a weak positive effect, and confidence did not show a significant effect on major satisfaction ($p>.05$).

Table 4: Association between sub-factors of grit, academic self-efficacy and major satisfaction assessed by multiple regression

Variable	B	S.E	β	t	p	VIF
	2.659	0.285		9.345	<.001	
Perseverance of effort	0.420	0.074	.322	5.662***	<.001	1.033
Consistency of interest	-0.101	0.076	-.075	-1.325	.186	1.033
F=16.081($p<.001$), $R^2=.101$, adjusted $R^2=.095$, Durbin-Watson=1.340						
	1.561	0.221		7.079	<.001	
Task difficulty	-0.111	0.054	-.108	-2.041*	.042	1.199
Self-control efficacy	0.699	0.061	.589	11.393***	<.001	1.142
Confidence	0.048	0.048	.052	1.011	.313	1.146
F=47.336($p<.001$), $R^2=.332$, adjusted $R^2=.325$, Durbin-Watson=1.521						

* $p<.05$ *** $p<.001$

The goal of education in health-related majors is to foster competent healthcare and medical experts. Attaining the goal requires various studies and efforts to elevate the academic achievements of the students obtaining education in these majors. Therefore, the present study was conducted to investigate grit and academic self-efficacy as the factors involved in high major satisfaction, which affects academic achievements. The results of the present study showed that perseverance of effort, one of the sub-factors of grit, has a positive effect on major satisfaction. This result is consistent with the existing study, in which the authors concluded that not only intelligence quotient and talent but also grit are important in achievements by students, as grit helps to maintain talent over time and to concentrate effort^[8]. A study which conducted with 253 university students reported that perseverance of effort has a positive effect on not only academic achievements but also occupational attitude^[9].

Grit refers to the sincerity to set long-term goals and make efforts to accomplish them. Therefore, helping

individual students to establish definite long-term goals is important. The major satisfaction and academic achievements of university students with a health-related major may be elevated by offering programs to help individual students to establish their own realizable goals and experience the sense of accomplishment through efforts to attain the goals, and by actively providing personalized education in relation to the programs.

In addition, the results of the present study showed that academic self-efficacy has a positive effect on major satisfaction. This finding is consistent with the report by an existing study, in which the authors stated that self-efficacy is highly associated with adaptation to college life and has a negative correlation with stress and depression^[4]. Learners having a high level of self-efficacy may continue with their studies in spite of adversities. Creating own solutions in the face of various challenges that are hard to bear is important to university students, rather than simply focusing on high academic performance^[10].

University students with a health-related major are required to manage heavy class loads and work placements while preparing for the national examinations. Therefore, these students need instruction that will help them to continue in their major through their own motivation and willpower. Educational and counseling programs may needed to be developed to help the students establish long-term goals and develop their capabilities in regard to making continuous efforts to accomplish the goals, as well as creating their own solutions to problems they confront.

Conclusion

The grit score was higher in the male students than in the female students. Academic self-efficacy was higher among the male students than among the female students and higher in the seniors than in the juniors. Grit and academic self-efficacy were not significantly dependent on the major. Academic self-efficacy had a positive effect on major satisfaction. Among the sub-factors, perseverance of effort and self-control efficacy was found to have a significant positive effect on major satisfaction. A strategy to develop perseverance of effort and self-control efficacy is essential for health related department college student because they are under much academic stress. Therefore, educational and counseling programs for developing and establishing long-term goals may be needed to help them to make continuous effort.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Difference In Multicultural Awareness and Multicultural Efficacy between Regular People of Multi-Cultural Backgrounds and North Korean Refugees, as Perceived by Nursing Students of South Korea

Jin-Kyoung Park¹, Do-Young Lee²

¹Dept. of Nursing, Daejeon University, 62, Daehak-ro, Dong-gu, Daejeon, 34520, Republic of Korea,

²Dept. of Nursing, Changshin University, 262, Palyongro, Masanhoewon-gu, Changwon-si, Gyeongsangnam-do, 51352, Korea

ABSTRACT

Background/Objectives: This study was conducted to identify the difference in multicultural awareness and multicultural efficacy between regular people of multi-cultural backgrounds and North Korean refugees, as perceived by nursing students.

Method/Statistical Analysis: Data were collected using a total of 717 copies of a questionnaire. A frequency analysis, paired t-test, and Pearson's correlation coefficients were used for the analysis.

Finding: The analysis showed that the multicultural awareness of university students majoring in nursing, towards North Korean refugees was lower than the multicultural awareness they had towards regular people of multicultural backgrounds excluding North Korean refugees. In addition, both multicultural awareness and multicultural efficacy towards regular people and North Korean refugees had a positive correlation. This researcher suggests developing a program to promote multicultural capabilities in university students of nursing towards North Korean refugees.

Improvements/Applications: This program would have to address the culture-specific awareness towards North Korean refugees in addition to general multicultural awareness.

Keywords: Multicultural family members, Multicultural awareness, Multicultural efficacy, Nursing student, North Korean refugees

Introduction

Since the 1990s, there has been an increase in North Korean refugees who fled the famine in North Korea. As of February, 2018, the number of North Korean refugees reached three-fold that of the figure in 2001^[1]. The South Korean government includes North Korean refugees among those with a different cultural background. Due to a long history of the two Koreas being divided, North Korean refugees have a different vocabulary, value

system, life style and ideology. Such difference makes it difficult to understand them simply based on the fact that the same ethnicity is shared with South Koreans ^[2]. In fact, North Korean refugees are in the absolute and relative minority in South Korea in terms of political, economic and social status, as well as the power they have. As such, they are classified as the same category as regular immigrants ^[3]. Therefore, it is important to conduct education on building cultural capabilities in university students of nursing to prepare them for cases when they come across North Korean refugees in a clinical setting.

Cultural capabilities refer to the ability to provide effective medical services by taking into account the cultural beliefs, behavior and needs of the person in

Corresponding Author:

Do-Young Lee
Professor, Department of Nursing,
Changshin University, Korea
Email: shine@cs.ac.kr

question. Cultural awareness is important in fostering such capabilities ^[4]. Cultural awareness is the first stage of fostering cultural capability, and refers to the values and beliefs of an individual towards other cultures, awareness of stereotypes and ethnocentric views, as well as awareness of other cultures ^[4]. According to a study conducted in Korea, university students of nursing show a low level in supportive attitude towards North Korean refugees among the categories of intimacy, accepting attitude and supportive attitude ^[5], they also showed a negative attitude towards providing preferential treatment to North Korean refugees ^[2]. This can be said as the result of their views towards North Korean refugees as heterogeneous the same way they would view other refugees, rather than viewing them as of the same ethnicity. Such a perception is driven by the difference in life style, life experience and sentiment due to having lived in a different political system and ideology ^[5]. Therefore, training must be provided to university students of nursing who will provide therapeutic care-giving to North Korean refugees in a clinical setting, so that they can avoid aloofness and reluctance towards North Korean refugees but have a positive perception towards them.

One of the key cognitive factors in developing cultural capabilities in nurses is transcultural efficacy ^[6]. Transcultural efficacy is the confidence that one can carry out transcultural nursing techniques ^[6]. That is, nurses with a high degree of transcultural efficacy have a high level of confidence that she can overcome obstacles or weaknesses in her own transcultural nursing techniques, leading her to execute a high degree of cultural capabilities ^[6]. Therefore, transcultural efficacy is a useful concept in indirectly measuring the cultural capabilities of nursing students whose cultural capabilities cannot be measured directly as they have not been staffed in clinical settings yet.

As such, this study seeks to review the awareness and cultural efficacy of nursing students towards North Korean refugees. To that end, their multicultural awareness and multicultural efficacy towards North Korean refugees and towards regular people of different cultural backgrounds will be surveyed to see if there is any difference. This analysis will provide basic data that can contribute to the development of a systematic nursing program that can help improve the cultural capabilities of nursing students towards North Korean refugees.

The purpose of this study is to investigate the multicultural awareness and multicultural efficacy of regular people of North Korean refugees and those with multicultural backgrounds who are not North Korean refugees to review whether there is a difference. Specific objectives were set as follows.

1. The difference in multicultural awareness and multicultural efficacy towards regular people with multicultural backgrounds and towards North Korean refugees, as perceived by nursing students is reviewed.
2. The correlation between multicultural awareness and multicultural efficacy towards regular people with multicultural backgrounds and towards North Korean refugees, as perceived by nursing students is reviewed.

Materials and Method

Design of the Study: This study is a descriptive survey using a self-reported questionnaire to improve the cultural nursing capabilities towards North Korean refugees, by reviewing the difference in the multicultural awareness and multicultural efficacy towards North Korean refugees and towards regular people with multicultural backgrounds, as perceived by nursing students.

Study Subjects: The study subjects were university students majoring in nursing studies in their first to fourth year at three universities located in regions K, I and C. Data were collected from March to June, 2017 using a structuralized questionnaire that study subjects were asked to fill out themselves. Out of the total of 730 copies of the questionnaire that were collected, 717 copies with sufficient responses were used for the final analysis.

Research Tools

Multicultural Awareness: Service Having multicultural awareness means having the cognitive, conscious and behavioral factors of multi-culturalism. To measure multicultural awareness, the multicultural awareness questionnaire reconfigured by ^[7] based on the questionnaire that ^[8] developed by incorporating the characteristics of the Korean society into the tools used in the preceding studies of ^[9,10]. The scale for multicultural awareness consisted of 5 questions on the cognitive factors, 5 questions on the conscious factors and 5 questions on the behavioral factors, measured on

a 5 point Likert scale. A higher scale represents a higher degree of multicultural awareness in the nursing student. In the study by [7], Cronbach's α or the reliability of the tool was .799, while it was .847 for this study. For the multicultural awareness on North Korean refugees, the same tool was used as above, but by replacing the subject with North Korean refugees. Before applying the revised tool, it was reviewed and verified for its validity of content by an expert on North Korean issues and a professor of nursing studies. In this study, Cronbach's α or the reliability of the tool for measuring the awareness towards North Korean refugees was .891.

Multicultural Efficacy: Job Multicultural efficacy refers to the confidence one has in learning and executing cultural nursing techniques towards diverse parties [6]. To measure multicultural efficacy, the TCSE-scale developed by [11] for Korean nurses by reflecting the health and medical services system associated with multiculturalism in Korea and the sociocultural characteristics of Korea was revised to be better fit for university students of nursing and applied. The scale for multicultural efficacy consists of 4 questions on the cognition, 12 questions on practice and 9 questions on emotions. Multicultural efficacy was measured on a 4 point Likert scale, with a higher score representing a higher degree of multicultural efficacy in the nursing student. A higher score represents a higher multicultural efficacy in nursing students. At the time of the tools' development, Cronbach's α for reliability was .880, while for this study, it was .949.

To measure multicultural efficacy towards North Korean refugees, the same above tool was used, but with the subject replaced to refer to North Korean refugees. Before applying the revised tool, it was reviewed and verified for its validity of content by an expert on North Korean issues and a professor of nursing studies. In this study, Cronbach's α or the reliability of the tool for measuring the awareness towards North Korean refugees was .972.

Data Collection and Procedures

For this study, data were collected using a structuralized questionnaire from March to June, 2017 on students majoring in nursing studies and enrolled in their 1st to 4th years at universities located in regions K, I and C. To abide by ethical standards, the study purpose, methodology, privacy protection of study subjects and the time it would take to fill out the questionnaire were

sufficiently described to the professors and potential candidates of each university and asked for their voluntary participation, as well as a written consent. It was explained that study participants would be kept anonymous, and the data collected would not be used for any other purpose than this study. Subjects were also told that they can withdraw from this study at any point in time, in which case they would not undergo any disadvantage. It took approximately 10 minutes for a subject to fill out the questionnaire. Participants were offered a small gift in return.

Data Analysis

Data collected were analyzed as follows, using SPSS 20 (PASW Statistics 20).

1. The degree of multicultural awareness and multicultural efficacy towards regular people of multicultural backgrounds and towards North Korean refugees, as well as the general characteristics of university students majoring in nursing were analyzed in terms of frequency, percentage, mean and standard deviation, minimal value and maximum value.
2. A paired t-test was used to analyze the difference in the mean value of the multicultural awareness and multicultural efficacy of nursing students towards regular people and towards North Korean refugees.
3. Pearson's correlation coefficients were used to analyze the correlation between the multicultural awareness and multicultural efficacy of nursing students towards regular people and towards North Korean refugees.

Results and Discussion

General Characteristics of Study Subjects: The general characteristics of the 23 study subjects were as seen in Table 1

Table 1: General Characteristics (N = 717)

Characteristics	Categories	n	%
Gender	Male	628	88.7
	Female	80	11.3
Age(years)	First grade	229	32.3
	Second grade	252	35.5
	Third grade	205	28.9
	Fourth grade	23	3.2

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Religion	Catholicism	85	12.0
	Christian	241	34.1
	Buddhism	32	4.5
	None	336	47.5
	Other	13	1.8

Multicultural awareness and multicultural efficacy towards regular people with multicultural backgrounds and North Korean refugees: The multicultural awareness and multicultural efficacy that

nursing students have towards regular people with multicultural backgrounds and towards North Korean refugees were as seen in Table 2.

Multicultural awareness was scored 3.77 ± 1.58 points on a 5 point scale. Multicultural awareness towards North Korean refugees scored 3.40 ± 0.54 points.

Multicultural-efficacy scored 3.16 ± 2.75 points on a 4 point scale. Multicultural efficacy towards North Korean refugees was 3.12 ± 0.46 points which was lower than multicultural efficacy.

Table 2: Degree of the Variable of the Subject (N = 717)

Variables		Total Item				Item	
		Mean	SD	Min	Max	Mean	SD
Multicultural awareness	Cognition	20.01	2.50	5	25	4.00	0.50
	Consciousness	18.65	2.81	5	25	3.73	0.56
	Behavior	18.30	2.97	5	25	3.66	0.59
	Total	56.58	7.92	0	75	3.77	1.58
Multicultural awareness towards North Korean refugees	Cognition	17.46	2.71	5	25	3.49	0.54
	Consciousness	17.31	3.26	5	25	3.46	0.65
	Behavior	16.42	3.20	5	25	3.28	0.64
	Total	51.05	8.16	0	75	3.40	0.54
Multicultural -efficacy	Cognition	12.37	1.81	4	16	3.09	0.45
	Practice	37.93	5.26	12	54	3.16	1.31
	Emotion	29.23	4.25	9	45	3.24	1.06
	Total	79.21	11.00	0	115	3.16	2.75
Multicultural efficacy towards North Korean refugees	Cognition	12.15	1.92	4	16	3.03	0.48
	Practice	37.79	5.07	12	54	3.14	0.42
	Emotion	28.59	3.92	9	45	3.17	0.43
	Total	78.08	11.60	0	115	3.12	0.46

The difference in multicultural awareness and multicultural awareness towards regular people with multicultural backgrounds and towards North Korean refugees

The difference in multicultural awareness and multicultural efficacy of nursing students towards regular people with diverse backgrounds and towards North Korean refugees is as seen in Table 3.

In nursing students, multicultural awareness towards regular people with multicultural backgrounds was higher than their multicultural awareness towards North Korean refugees. This difference was statistically

significant ($t=19.37$, $p<.001$). In all three sub-categories of cognition ($t=23.83$, $p<.001$), consciousness ($t=22.31$, $p<.001$), and behavior ($t=16.57$, $p<.001$), multicultural awareness towards regular people was significantly higher than towards North Korean refugees. For multicultural efficacy in nursing students, too, it was higher towards regular people with multicultural backgrounds than towards North Korean refugees. This difference was statistically significant ($t=3.41$, $p=.001$). In terms of sub-categories, cognition ($t=3.30$, $p=.001$) and emotion ($t=5.08$, $p<.001$) was significantly higher towards regular people, but in the sub-category of practice, it cannot be said to be higher ($t=0.63$, $p=.524$).

Table 3: The difference in multicultural awareness and multicultural awareness towards regular people with multicultural backgrounds and towards North Korean refugees (N = 717)

Characteristics	Categories	Mean	SD	t	p
Multicultural awareness towards North Korean refugees	Cognition	2.53	2.82	23.83	<.001
	Consciousness	1.30	3.07	11.31	<.001
	Behavior	1.86	3.00	16.57	<.001
	Total	5.52	7.63	19.37	<.001
Multicultural efficacy towards North Korean refugees	Cognition	0.21	1.70	3.30	.001
	Practice	0.10	4.25	0.63	.524
	Emotion	0.64	3.37	5.08	<.001
	Total	1.12	8.85	3.41	.001

The correlation between multicultural awareness and multicultural efficacy towards regular people with multicultural backgrounds and towards North Korean refugees

The correlation between major variables is as seen in Table 4. Multicultural awareness towards regular people and towards North Korean refugees had a positive correlation of a medium level ($r=.54$, $p<.001$), while the multicultural efficacy towards both groups had a strong positive correlation ($r=.69$, $p<.001$). Multicultural awareness and multicultural

efficacy towards regular people had a medium-level positive correlation ($r=.55$, $p<.001$), while multicultural awareness and multicultural efficacy towards North Korean refugees had a strong positive correlation ($r=.63$, $p<.001$). Moreover, multicultural awareness towards regular people with multicultural backgrounds and multicultural efficacy towards North Korean refugees had a medium-level positive correlation ($r=.47$, $p<.001$). Multicultural awareness towards North Korean refugees and multicultural efficacy towards regular people with multicultural backgrounds, too, had a medium-level positive correlation ($r=.43$, $p<.001$).

Table 3: Relationships among the Study Variable**(N = 717)**

Variables	MA	MANK	ME	MENK
	r(p)	r(p)	r(p)	r(p)
MA	1	.549 (<.001)	.552 (<.001)	.473 (<.001)
MANK		1	.435 (<.001)	.636 (<.001)
ME			1	.694 (<.001)
MENK				1

MA=Multicultural awareness; MANK=Multicultural awareness towards North Korean refugees

ME=Multicultural–efficacy; MENK=Multicultural efficacy towards North Korean refugees

Discussion

This study was conducted to seek measures to improve the cultural nursing capabilities towards North Korean refugees, by identifying the difference in multicultural awareness and multicultural efficacy of nursing students towards regular people with multicultural backgrounds and towards North Korean refugees.

The multicultural awareness of nursing students towards North Korean refugees was found to be lower

than that towards regular people with multicultural backgrounds who are not North Korean refugees. The multicultural awareness of nursing students towards North Korean refugees scored significantly lower in all three sub-categories of cognition, consciousness and behavior. In other studies conducted in Korea, too, nursing students scored the lowest in supportive attitude, among the three categories of intimacy, accepting attitude and supportive attitude ^[5], and university students showed a negative attitude towards

providing preferential treatment towards North Korean refugees [2]. This can be attributed to the fact that to university students who have lived under a different political system and ideology despite being of the same ethnicity, the difference in life style, life experience and emotions make them view North Korean refugees as foreign refugees rather than as those of the same race [5]. Therefore, effective multicultural education related to North Korean refugees must be provided to university students of nursing who will serve as therapeutic caregivers of North Korean refugees in clinical settings in the future, to ensure that these students do not have a reluctant attitude but a positive perception towards North Korean refugees. Moreover, in terms of multicultural efficacy, too, university students majoring in nursing studies had significantly lower multicultural efficacy towards North Korean refugees than towards regular people, indicating an urgency for training to boost the students' multicultural capabilities related to North Korean refugees. There was a positive correlation between the nursing students' multicultural awareness towards regular people and towards North Korean refugees, between their multicultural efficacy towards the two groups, between their multicultural awareness and multicultural efficacy towards regular people with multicultural backgrounds, between multicultural awareness and multicultural efficacy towards North Korean refugees, between multicultural awareness towards regular people with multicultural backgrounds and multicultural efficacy towards North Korean refugees, and between multicultural awareness towards North Korean refugees and multicultural efficacy towards regular people of multicultural backgrounds.

These findings suggest that it would be effective to apply multicultural education related to North Korean refugees within the framework of general multiculturalism education when conducting education programs on university students of nursing to reinforce their multicultural capabilities. The model by Papadopoulos, Tilki and Taylor (the PTT model) which is a leading model for multicultural capabilities education, classifies learning into culturally generic competencies and culturally specific competencies [12]. That is, culturally generic competencies focus on the deep understanding and perception of fundamental social or organizational structures that promote or undermine cultural capabilities nursing, or how cultural identity affects health. During the practice stage, the focus is on

the acquisition of specific cultural capabilities within a specific cultural group [4].

Therefore, to improve the cultural capabilities of nursing students towards North Korean refugees who are of the same ethnicity as the students themselves but are perceived as people with a different cultural background, a program to promote multicultural capabilities towards North Korean refugees must be developed based on the model for culturally specific competencies should be applied to university students of nursing.

Conclusion & Suggestions

This study was conducted to identify measures that can improve the cultural nursing capabilities towards North Korean refugees, by understanding the difference in multicultural awareness and multicultural efficacy of university students of nursing, towards regular people with multicultural backgrounds and towards North Korean refugees.

The study results show that nursing students' multicultural awareness towards North Korean refugees was lower than their multicultural awareness towards regular people with multicultural backgrounds excluding North Korean refugees. The same was found for their multicultural efficacy. Moreover, there was a positive correlation between their multicultural awareness towards regular people and towards North Korean refugees, and between their multicultural efficacy towards regular people and towards North Korean refugees.

Therefore, this researcher suggests that to improve the cultural capabilities of nursing students towards North Korean refugees who are of the same ethnicity as the students themselves but are perceived as people with a different cultural background, a program to promote multicultural capabilities towards North Korean refugees must be developed based on the model for culturally specific competencies should be applied to university students of nursing.

This study is the first of its kind to compare the multicultural awareness and multicultural efficacy of South Korean nursing students at universities towards regular people with multicultural backgrounds and towards North Korean refugees, and thus is meaningful in that it provides basic data that can contribute to the development of a curriculum for the fostering of

multicultural nursing capabilities in university students of nursing. However, as this study was conducted on students of only three colleges of nursing, its findings cannot be generalized. As such, this researcher suggests an expanded study or an iteration of this study to acquire more general findings.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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The Effects of Flipped Learning Classes in Nursing Students

Do-Young Lee¹, Joo-Young Lee²

¹Dept. of Nursing, Changshin University, 262, Palyongro, Masanhoewon-gu, Changwon-si, Gyeongsangnam-do, 51352, Korea; ²Dept. of Nursing, Seoul Women's College of Nursing, 38, Ganhodaero, Seodaemun-gu, Seoul, 03617, Korea

ABSTRACT

Background/Objectives: This study was conducted to verify the effects that flipped learning classes have on the satisfaction with classes after applying flipped learning classes to university students of nursing

Method/Statistical Analysis: This study is a descriptive and investigative study that verifies the effects of flipped learning on satisfaction with classes, after applying flipped learning to the course of nursing management for university students of nursing.

Findings: Through this study, it was found that factors affecting the satisfaction with flipped learning classes were learning attitude and satisfaction with the subject.

Improvements/Applications: In order to improve the satisfaction of learners during flipped learning classes, measures to improve learning attitude and the satisfaction with the subject would be needed.

Keywords: *Flipped Learning, learning attitude, learning motivation moderation strategy, academic self-efficacy, satisfaction with the subject, satisfaction with the class*

Introduction

Nursing education covers a wide range of content and leads to a national accreditation test in written form based on the theory learned. As such, lectures that focus on the delivery of knowledge are still the mainstream method of teaching. To overcome the constraints of rote learning, efforts have gradually been made to improve nursing capabilities of students by incorporating aspects of clinical practice. Korean Accreditation Board of Nursing Education, too, recommends various instruction methods to ensure students of nursing achieve certain levels of core capabilities ^[1].

In recent years, a learner-oriented instruction method has been highly valued, and technological progress led to a wider application of flipped learning that puts the focus on the learner ^[2]. Flipped learning is conducted focusing on the learner and the interaction between the instructor

and the student. Students carry out individual learning outside the classroom using online media, and engage in learning in the classroom through various methods. The online media used outside the classroom offers flexibility in adjusting the amount to be covered and the pace at which it progresses. Learning is promoted through individual studies, then complemented by the interaction between the student and the instructor ^[3]. In addition, learners take a proactive role in being responsible for their own learning, while instructors can run a class based on individual learning and acquired knowledge according to the individual student's abilities ^[4]. Flipped learning is meaningful in that it is a self-guided learning method where the students study before the class, then takes part in the classroom.

Preceding studies note that through flipped learning, the learning effects were improved ^[5], that learning motivation was promoted and academic achievements were improved ^[6]. Moreover, by having the learner study in advance of the classroom session, the student's responsibility and confidence are improved, which in turn led to higher self-efficacy ^[7]. Through improved critical thinking, their communication skills were also improved ^[8]. Flipped learning is applied in various

Corresponding Author:

Joo-Young Lee
Professor, Department of Nursing,
Seoul Women's College of Nursing, Korea
Email: daisy58@hanmail.net

classes, and studies have been conducted on flipped learning, but most of them focus on verifying the academic achievements. There has been a lack of studies on the satisfaction students feel with the flipped learning method. While learning ability and an improvement in such ability are important, studies would be needed on the variables that improve the learners' satisfaction with the classes.

As such, this study applied flipped learning to the courses of nursing management studies and reviewed after the class the learning attitude, learning motivation moderation strategy, academic self-efficacy, satisfaction with the subject and satisfaction with the class to identify factors affecting satisfaction with the class to provide basic data for nursing education.

Study Methodology

Design of the Study: This study is a descriptive and investigative study that verifies the effects of flipped learning on satisfaction with classes, after applying flipped learning to the course of nursing management for university students of nursing.

Objectives of the Study: This study seeks to apply flipped learning to the subject of nursing management for university students of nursing, review the general characteristics of nursing students, their learning attitude, learning motivation moderation strategy, academic self-efficacy, satisfaction with the course and satisfaction with the class, as well as identify factors affecting satisfaction with classes using flipped learning methods. Specific study goals are as follows.

- The general characteristics of the study participants, their learning attitude, learning motivation moderation strategy, academic self-efficacy, satisfaction with the subject and satisfaction with the class will be reviewed.
- The difference in burnout in accordance with general characteristics of the study participants, their learning attitude, learning motivation moderation strategy, academic self-efficacy, satisfaction with the subject and satisfaction with the class will be reviewed and correlation among these variables will be identified.
- Factors affecting study participants' satisfaction with flipped learning classes will be identified.

Study Participants and Data Collection

Criteria for Selecting Study Participants: This study was conducted on students majoring in nursing studies at a university in city S. The number of study participants was analyzed using the G* power program. For multiple regression analysis, a significance level of 5%, effect size of 0.1, a power of 95% and an attrition rate of 10% were assumed. The resulting number was 260 participants. The questionnaire was distributed to a total of 283 participants, but among those questionnaire copies, 277 copies were used for the final analysis.

Study Tools

Learning Attitude: Learning attitude refers to the physical, mental attitude and stance in learning ^[9]. In this study, the scale for learning attitude as revised by Hwang ^[10] was used. This tool consists of 16 questions. Each question was measured on a 5 point Likert scale, with a higher score indicating a higher learning attitude. In this study, Cronbach's $\alpha=.93$.

Learning Motivation Moderation Strategy: For learning motivation moderation strategy, the scale developed by Schwinger et al. ^[11], later revised by Wolters ^[12] and complemented by Lee ^[13] was used. In this study, this score refers to the total score consisting of 7 categories of improved interest and meaning, self-order for execution and approach, environmental control, self result measures, mastering self orders, execution avoidance self order and near goal setting. Cronbach's α for learning motivation moderation strategy was found to be within the range of .76 and .90 according to the sub-factors ^[13]. In this study, Cronbach's $\alpha= .89$.

Academic Self-efficacy: Academic self-efficacy refers to the judgment of one's own ability to organize and execute acts necessary for the learner to carry out academic tasks ^[14]. In this study, it refers to the score measured using the academic self-efficacy scale of Kim et al.^[14], consisting of the three categories of preference for the difficulty level of the task, self-control efficacy and confidence. In the study by Kim et al. ^[14], Cronbach's $\alpha=.87$ and in this study, Cronbach's $\alpha= .93$.

Satisfaction with the Subject: Satisfaction with the subject refers to the score measured by the scale originally developed by Shin ^[15] and later revised by Ju et al. ^[16]. A higher score indicates a higher level of satisfaction with the subject. In this study, Cronbach's $\alpha= .94$.

Satisfaction with the Class: Satisfaction with the class refers to the degree that the students' needs for learning are met as perceived by the students themselves, or in other words, the maximum degree to which the learning content as deemed necessary for the learner is being provided [17]. In this study, it refers to the score measured using the scale revised by Kim^[18]. In this study, Cronbach's $\alpha = .92$.

Collection of Data and Ethical Considerations

Data Collection Method and Process: The researcher met with the students in person to explain the objectives of the study and seek consent to data collection. The goal and methodology of the study were also explained. After acquiring consent to participation from those who wished to take part in the study, a signed consent form was also acquired. It took approximately 10-15 minutes per participant to conduct the questionnaire. Participants read the questionnaire and filled it out themselves.

Data Collection Method and Process: To abide by ethical standards in regards to the study participants, a consent form for study participation was attached. The consent form describes the objective and content of the study, states the autonomy of the study subjects to take part in the study, as well as the anonymity of the subjects that will be guaranteed. It also noted that subjects are free to withdraw their participation at any point in time at no risk of disadvantage, and that the collected data

would be used for no other purpose than this study. Considering the ethical aspects concerning the study subjects, the researchers gave the explanation to them in person.

Study Procedures

Design of the Flipped Learning Class: Flipped learning is a self-guided learning method where the student checks her level of knowledge before the classroom session and collaboration between the coaching instructor and students during the classroom session is used for problem-solving [Table 1].

The flipped learning class applied in this study consisted of 2 hour sessions running for a total of 4 weeks to meet the study goals of nursing management studies. The class design framework for flipped learning with the three stages of pre-class, in-class and after-class elements were used as the basis. Before the class, a notification was sent out to inform students of the pre-class reading materials in the relevant chapter. Students were also asked to watch the lecture video posted on the website which included a quiz. During the class, the quiz, a question and answers session and small group collaborative activities were carried out for problem-solving, presentation and feedback. After the last class, what was learned was summarized, a reflective journal and a concept map for the relevant chapter were used to compile the lessons, evaluate the class and share opinions.

Table 1: Design of the Flipped Learning Class

Theme	Stage	Instruction Method	Duration	Deliverable
Management of the Quality of Nursing	Pre-Class	Advance study via online videos	minutes*4 sessions	- Online video - Quiz
	In-Class	- Confirmation and evaluation of online learning - Interaction between the instructor and student - Drafting and presentation of the concept map learned - Lecture		- Review of the online video quiz and resolution - Q&A and feedback through online learning - Summary and compilation of concept map
	After-Class	- Reflective journal - Feedback and exchange of opinions		Reflective journal

Data Analysis

The data used in this study were analyzed with SPSS 20(PASW Statistics 20) program as follows.

1. The general characteristics of university students of nursing studies were analyzed using frequency, percentage, mean and standard deviation.
2. All variables concerning university students of nursing studies were analyzed for their mean and standard deviation.
3. The correlation among learning attitude after the flipped learning class, learning motivation moderation strategy, academic self-efficacy,

satisfaction with the subject and satisfaction with the class was analyzed using Pearson's correlation.

4. Factors affecting the satisfaction level with classes in flipped learning classes for university students of nursing studies were analyzed through a multiple regression analysis.

Results and Discussion

General Characteristics of Study Subjects: An analysis of the general characteristics of the study

subjects showed that for the total of 277 subjects, average age was 22.91($\pm$ 2.65) years. In terms of the type of high school they graduated, 258 subjects (92.8%) had graduated from a liberal arts high school, while 13 subjects (4.7%) had marked their high school type as 'other'. In terms of marital status, 273 subjects (98.2%) were single. For religion, 137 subjects (49.3%) responded as 'other', followed by 84 subjects (30.2%) who identified themselves as Christians [Table2].

Table 2: General Characteristics (N = 277)

Characteristics	Categories	n (%) or M ± SD	t or F(p)
Age(years)	20~30	268(96.8)	1.33(.158)
	31~40	9(3.2)	
	22.91 ± 2.65		
Graduated High School Type	Academic High School	258(92.8)	.76(.768)
	Vocational High School Education	3(1.1)	
	Specialized High Schools	2(0.7)	
	Characterization High School	2(0.7)	
	Other	13(4.7)	
Marital Status	Single	273(98.2)	1.14(.305)
	Married	5(1.8)	
Religion	Christian	84(30.2)	.69(.846)
	Buddhism	13(4.7)	
	Catholicism	44(15.8)	
	Other	137(49.3)	

The subject's learning attitude, learning motivation moderation strategy, academic self-efficacy, satisfaction with the subject and satisfaction with the class: Learning attitude scored 3.32($\pm$ 0.39) points, learning motivation moderation strategy scored 3.45($\pm$ 0.39) points, academic self-efficacy scored 3.76($\pm$ 0.42) points, satisfaction with the subject scored 3.94($\pm$ 0.62) points and satisfaction with the class scored 4.26($\pm$ 0.47) points[Table 3].

Table 3: The subject's Learning attitude, Learning motivation moderation strategy, Academic self-efficacy, Satisfaction with the subject and Satisfaction with the class (N = 277)

Variables	M $\pm$ SD
Learning attitude	3.32 $\pm$ 0.39
Learning motivation moderation strategy	3.45 $\pm$ 0.39
Academic self-efficacy	3.76 $\pm$ 0.42

Conted...

Satisfaction with the subject	3.94 $\pm$ 0.62
Satisfaction with the class	4.26 $\pm$ 0.47

Correlation Among the Variables: Correlation with learning attitude was found to be significant with learning motivation moderation strategy (F=.38, p<.001), with academic self-efficacy (F=.50, p<.001), with satisfaction with this subject (F=.40, p<.001), and with satisfaction with the class (F=.36, p<.001). Correlation with learning motivation moderation strategy was found to significant with academic self-efficacy (F=.30, p<.001), with satisfaction with the subject (F=.23, p<.001), and with satisfaction with the class (F=.24, p<.001). Academic self-efficacy was found to have a significant correlation with satisfaction with the subject (F=.40, p<.001) and with satisfaction with the class (F=.35, p<.001). Satisfaction with the subject was found to have a significant correlation with satisfaction with the class (F=.37, p<.001)[Table 4].

Table 4: Relationships among the Study Variable (N = 117)

Variables	Learning attitude	Learning motivation moderation strategy	Academic self-efficacy	Satisfaction with the subject	Satisfaction with the class
	r(p)	r(p)	r(p)	r(p)	r(p)
Learning attitude	1	.38(<.001)	.50(<.001)	.40(<.001)	.63(<.001)
Learning motivation moderation strategy		1	.30(<.001)	.23(<.001)	.24(<.001)
Academic self-efficacy			1	.40(<.001)	.35(<.001)
Satisfaction with the subject				1	.37(<.001)
Satisfaction with the class					1

Factors Affect Satisfaction with the Class in Flipped Learning: [Table 5] shows a multiple regression analysis analyzing all the variables that have a significant effect on the degree of satisfaction felt by university students of nursing with the class using a flipped learning method.

Variables affecting satisfaction levels in flipped learning were learning attitude ($\beta=.15$ $p=.025$) and satisfaction with the subject ($\beta=.22$, $p<.001$). The F value in the regression model was 13.99 at $p<.001$, with the regression equation having an explanatory power of 22.5%.

Since the Durbin-Watson value is 1.85 which is close to the reference value of 2 and not close to 0 or 4, correlation between the residuals was deemed unlikely, and thus the regression model is seen as fit. In addition, the model has all the tolerance limits being of 0.1 or higher, indicating that there are no issues of multi-linearity [19].

Table 5: Factors affect satisfaction with the class in flipped learning

Variables	B	S.E	β	t	p	TI	VIF
(Constant)	1.96	.29		6.75	<.001		
Learning attitude	.18	.08	.15	2.27	.024	.64	1.57
Learning motivation moderation strategy	.11	.07	.09	1.58	.115	.83	1.21
Academic self-efficacy	.08	.09	.07	.90	.369	.51	1.96
Satisfaction with the subject	.17	.05	.22	3.66	<.001	.78	1.28
Satisfaction with the class	.09	.05	.12	1.84	.068	.72	1.39

Discussion

This study was conducted to verify the effects that flipped learning classes have on learning attitude, learning motivation moderation strategy, academic self-efficacy, satisfaction with the subject and satisfaction with the class, as well as to identify factors affecting satisfaction with the class, thereby providing basic data for education of nursing studies.

Seung&Lee [20] presented the characteristics of flipped learning as follows. First, pre-class learning is carried out using high-tech media. Second, when compared with traditional lecture-style classes, students engage in self-guided learning which leads to more active

class participation. Third, in the classroom session, various activities can be carried out to promote higher dimension learning and creative problem-solving skills [20]. Fourth, the instructor, rather than simply forwarding knowledge to the students, plays the role of promoter and collaborator. Fifth, pre-class learning using high-tech media and classroom sessions allows for more integration and in-depth blended learning.

Conclusion

In this study, the factors affecting satisfaction with flipped learning classes were found to be learning attitude and satisfaction with the subject. To improve the student's satisfaction with the flipped learning class,

measures would be needed to improve the student's learning attitude and their satisfaction with the subject. The following is suggested based on the findings of this study. First, as this study was conducted on nursing students of one university, a follow-up iteration is recommended to generalize the findings. Second, a qualitative study is recommended to compile the various opinions felt by the study participants focusing on the reflective journal. Lastly, through the application of various instruction methods to university students of nursing, education methods that can realize high quality nursing based on improved problem-solving skills and critical thinking in clinical settings must be developed, and studies that verify the effects of such methods must be carried out.

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The Effect of Bilateral Upper Limb Training on Recovery of Upper Limb Function in Patients with Acute Stroke

Sang-Hwa Lee¹, Bo-Kyoung Song², Ha-Na Kim³

¹Department of Occupational Therapy, National Institute of Dementia, 670 Daewangpangyo-ro Bundang-gu, Seongnam-si, Gyeonggi-do, 13494, Republic of Korea; ²Department of Occupational Therapy, Kangwon National University, 346 Hwangjo-gil, Dogye-eup Samcheok-si Gangwon-do 245-710, Republic of Korea; ³Department of Occupational Therapy, Chung Dam Clinic, 46, Samseong-ro 147-gil, Gangnam-gu, Seoul, 06063, Republic of Korea

ABSTRACT

Background/Objectives: The purpose of this study was to survey the influence on action observation of meaningful tasks on upper limb function in patients with stroke. Thirty stroke patients were prospectively randomized to bilateral upper limb training task (BULTT) group or general upper limb rehabilitation (GULR) group.

Method/Statistical Analysis: We studied 30 acute stroke patients. The experimental group (N = 15) applied bilateral upper limb training task (BULTT) and the control group (N = 15) performed general upper limb rehabilitation (GULR) for the affected side. Both groups executed 5 times per week and 30 minutes per session for 4 weeks. To assess the effects of intervention, the paired t-test was used to contrast before and after intervention results of each group. The independent t-test test was used to contrast changes in outcome measures between the groups.

Findings: The Fugl-Meyer Assessment (FMA) before-test score BULTT group was 17.00 ± 3.74 and after-test score was 21.27 ± 4.62 . Significant changes in the FMA were observed in both groups. However, the results from the observation of BULTT were most significant. The mean change in FMA score was 4.27 ± 2.09 in the BULTT group and 1.80 ± 1.78 in the GULR group, showing a statistically significant difference. The BULTT group showed a significant increase in upper limb function after training intervention.

Improvements/Applications: This study demonstrated that action observation of meaningful bilateral upper limb training in patients with stroke. We present evidence that action observation of meaningful tasks has a beneficial effect in occupational therapy for movement disorders after stroke.

Keywords: stroke, bilateral upper limb training, upper limb motor function, meaningful tasks, Fugl-Meyer Assessment

Introduction

Stroke is caused by vascular occlusion such as hypoxia, ischaemia, or infarction, or by intracranial hemorrhage. Cerebral infarction is the most frequently occurring type. This is related to the central nervous system being very sensitive to oxygen deficiency or ischemia in various

organs of the body¹. Stroke patients generally develop muscle weakness, coordination problems, abnormal muscle tension, and motor paralysis². Stroke patients with these neurological symptoms have social, mental and physical impairments, of which 40% have some dysfunction and 15-30% have sensory disturbances^{3,4}. A significant reduction in the function of the affected side is generally associated with reduced use of the injured upper limb in real life. Therefore, it can induce learned nonuse, which can result in weakened function of the affected side and increase the restriction of daily life^{2,5}.

Corresponding Author:

Ha-Na Kim

Occupational Therapist, Chung Dam Clinic,
Republic of Korea

Email: mydream57@naver.com

Bilateral activity is based on the assumption that the right and left muscle groups are simultaneously activated

and similar neural activation occurs in both cerebral hemispheres⁶. Simultaneous execution of both upper limbs can also increase activation of the affected cortical area, which can be attributed to the bilateral distribution of the channels that transmit commands and the common initiation of motion commands through simultaneous execution of both upper limbs^{7,8}. It is known that the enhancement of the efferent connection of the ipsilateral upper limb by activation of the uninjured brain region improves motor control of the affected upper limb⁹.

Activation of the primary motor and somatosensory cortex of the affected side is further enhanced by the simultaneous performance of the both upper limbs which is compared to the single side of the affected, which is related to the activation of both the cerebral hemispheres^{7,10}. Also, when performing tasks with both hands, in order to move of both hands complex interactions between both cerebral hemispheres can occur and this interaction can promote the effect of the affected upper limb¹¹.

Many actions in real life are performed by coordination of both hands. Repeated, similar tasks used in daily life may improve function even in patients with severe upper limb paralysis¹². This treatment approach using both hands is closely related to daily life and the affected side upper limb is improved functionally to the help rehabilitation and daily activities of stroke patients¹³.

Several studies have demonstrated the effect of bilateral exercise to induce the recovery of motor function using both the affected and less affected upper limbs¹⁴⁻¹⁶. These studies have reported that bilateral activity in the early level of stroke rehabilitation improves symmetric body and reduces abnormal muscle tone¹⁵. In addition, it has been reported that complex interactions are activated in the cerebrum for the exercise planning of both upper limbs¹⁶.

Therefore, based on the above facts, this study investigated the effect of bilateral upper limb training task on upper limb function in patients with acute stroke.

Materials and Method

Subjects: In this study, we randomly divided the 30 study subjects into two groups (Table 1) : the BULTT group and the GULR group. These participants met the selection criteria and gave voluntary knowledgeable consent to take part in the study. The incorporation criteria were as follows:

First, hemiplegic patients with stroke duration less than 6 months

Second, a score of ≥ 24 in the MMSE-K (Korean version of the Mini-Mental Status Examination)

Thirdly, a level of $\leq$ Brunnstrom recovery of upper limb stage 3

Fourth, in the line bicection test, patients without unilateral neglect

Fifth, patients without musculoskeletal disorders such as joint building or limited range of motion

Table 1: Individual Information of Patients

Characteristics		BULTT group (n = 15)	GULR group (n = 15)
Gender	Male	6	7
	Female	9	8
Age (y)		61.53 $\pm$ 8.81	62.00 $\pm$ 8.13
MMSE-K		27.60 $\pm$ 1.06	27.80 $\pm$ 1.37
Height(cm)		165.67 $\pm$ 7.19	166.00 $\pm$ 7.42
Weight(kg)		67.40 $\pm$ 12.35	66.87 $\pm$ 11.32
Onset of stroke months		3.60 $\pm$ 1.30	3.20 $\pm$ 1.37
Side of hemiplegia	right	11	9
	Left	4	6

M $\pm$ SD: mean $\pm$ standard deviation.

BULTT: bilateral upper limb training task, **GULR:** general upper limb rehabilitation

Materials - Fugl-Meyer Motor Function Assessment(FMA): Upper limb Subtest: FMA is used to classify hemiplegic patients with stroke as a Brunnstrom recovery stage and to assess the recovery of function¹⁷. Fugl-Meyer et al. developed an assessment tool by defining 50 detailed movements according to the six stages of recovery of Brunnstrom's hemiplegic patients. 0 ~ 2 points are given depending on the performance of the evaluation item. 0 point is not performed, 1 point is performed partially, and 2 points are divided into complete execution. The overall score ranges from 0 to 100, including upper and lower limbs. There are 33 items in the upper part of the test, which is 66 points. The details of upper limb examination are 18 items for shoulder/elbow/forearm, 5 items for wrist, 7 items for hand (finger), and 3 items for upper limb coordination ability¹⁸. Sanford et al. reported an inter-rater reliability of 0.96 for upper limb examination¹⁹. In this study, only upper limb test items were used for upper limb function evaluation.

Methods-Bilateral Upper Limb Training Task:

Subjects were divided into BULTT group (15 patients) and GULR group (15 patients). The experiment was conducted for 5 weeks each week for 30 minutes for 4 weeks. The BULTT group performed the bilateral upper limb training task and the GULR group performed general upper limb rehabilitation.

The posture for bilateral upper limb activity is to sit on the backrest chair and place both upper limbs on the table, and the hip, knee, and ankle joints are flexed 90 degrees. And the patient is allowed to maintain the correct posture by inducing the patient to use the backrest or the footrest according to the physical condition so that the same weight is applied to both legs from the center of the chair.

Table 2 summarizes the results of the bilateral upper limb training task with reference to the programs of Desrosiers et al. and Lewis & Byblow^{20,21}.

Table 2: Bilateral Upper Limb Training Task

Program	Method
Wipping table with towel	The patient wipes the table by placing both hands with the fingers together locked or both hands without the fingers together locked in parallel on a towel, pushing and pulling the table forward, left and right. Elbow joints move with flexion and extension, and shoulder joints move with horizontal adduction and horizontal abduction. As the elbow joint moves, the scapular of the affected upper limb is not retracted.
Mimiceing the drinking	The patient mimics the action of drinking a cylindrical plastic cup with finger togerht locked to the mouth. Shoulder and elbow joints move with flexion.
Moving blocks to boxes	The patient should hold the block (4cm × 4cm × 4cm) placed in front of the table with finger together locked and move it into a box located at eye level of 30 cm. Keep your finger locked and move the elbows in the flexion direction. The block is picked up mainly with the less affected fingers. When placed in the box, the shoulder joint moves in the flexion direction and the elbow joint moves in the extension direction.

Analysis Methods

The results of the collected data were analyzed using SPSS (ver. 12.0) statistical program. The general characteristics of the subjects were descriptive statistics and chi-squared test was used for the homogeneity test between the BULTT group and the GULR group. Shapiro Wilk test was used to confirm normality, and the paired t-test was used to compare FMA before and after intervention. The independent t-test was also conducted to compare groups after intervention. The statistical significance level was 0.05.

Results and Discussion

Comparison of Results (Fma Score) Before and After The Intervention: Upper limb motor function in both groups before and after treatment is shown in Table 3.

The changes of FMA before and after the application of bilateral upper limb training task were significantly improved from 17.00 to 21.27 ($p < 0.001$). In addition, the change of FMA from general upper limb rehabilitation was improved from 17.27 to 19.07 ($p < 0.01$).

Table 3: Comparison of Results (FMA Score) Before and After the Intervention

	BULTT group (n = 15)		GULR group (n = 15)	
	Pre-test	Post-test	Pre-test	Post-test
FMA	17.00 (3.74)	21.27 (4.62)	17.27 (4.59)	19.07 (5.31)
P	.000***		.002**	

The values are mean (standard deviation), * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ by paired t-test

FMA: Fugl-Meyer Assessment

BULTT: bilateral upper limb training task, GULR: general upper limb rehabilitation

Comparison of Results Between the BULTT Group and GULR Groups: The mean changes in upper limb motor function scores in the 2 groups are compared in Table 4.

The mean change in FMA was 4.27 ± 2.09 in the BULTT group and 1.08 ± 1.78 in the GULT group, showing a statistically significant difference. Mean change in the FMA was significantly greater in the BULTT group.

Table 4: Comparison of Results Between the BULTT Group and GULR Groups

	Mean Change	
	BULTT group (n = 15)	GULR group (n = 15)
FMA	4.27(2.09)	1.80(1.78)
P	.002**	

The values are mean (standard deviation), * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ by independent t-test

FMA: Fugl-Meyer Assessment

BULTT: bilateral upper limb training task, GULR: general upper limb rehabilitation

Discussion

In this study, we investigated the effect of bilateral upper limb training on upper limb function in acute stroke patients. In the selection of the subjects, the MMSE-K revealed that the cognitive impairment was considered as a result of 24 out of 30 total score, or visual perception ability including neglect and homonymous hemianopsia in the line by section were excluded from this study. We also excluded patients with musculoskeletal disorders such as contracture of joints or limitation of range of motion, and patients with complete voluntary movement of the affected upper limb without assistance. The subjects selected for the study were less than 6 months in the stroke diagnosis. In addition, the subject is a patient with Brunnstrom recovery of upper limb stage 3 or less who needs active assistance because of the voluntary movement of the affected upper limb and the difficulty of one hand moving of the affected limb without assistance. There were no cognitive impairment, visual perception disabilities, or musculoskeletal disorders.

Bilateral upper limb training was consisted of supplementing and modifying the less affected upper limb so as to lead to various movements of the affected upper limb, referring to the previous studies^{20,21}. During the application of the program, the subjects crossed the fingers of both hands and performed activities with their hands clipped. The fingers together locked may prevent the associated reaction by reducing the spasticity of the flexion pattern of the affected upper limb by abduction of the affected fingers and also increasing the sensation and perception of the affected side since the fingers together locked are held in the midline of the body²².

In this study, BULTT improved the upper limb function more than GULT, and there was a significant difference between the two groups before and after the intervention. When any activity begins on both sides, the motor cortex of both hemispheres simultaneously activates and inhibits the functions of the other side. Previous studies on stroke patients have emphasized the importance of simultaneous exercises on the bilateral upper limb and reported that normal movement of the upper limb through coordination of both hands plays an important role in the quality of performance in daily life⁷. Fey et al. reported improved upper limb function when repeated bilateral upper limb training was applied to stroke patients¹². Lewis & Byblow also suggested using the affected and less affected upper limb simultaneously to improve the function of the upper limb.

Recovery of upper limb function has a direct impact on performing independent activities and activities of daily living. The results of this study show that BULTT performance in acute stroke patients is effective in improving the function of the affected upper limb in stroke patients.

In this study, generalized interpretation of all stroke patients is limited because only limited patients who meet the selection criteria were studied. Further evaluation of factors that may have an additional effect on upper limb function was not considered and further evaluation should be performed to further clarify the relationship between bilateral tasks and upper limb function. Therefore, additional studies should be conducted to investigate the effect of bilateral upper limb activity on patients' rehabilitation process in various aspects.

Conclusion

The purpose of this study was to investigate the effect of bilateral upper limb activity on upper extremity function into acute stroke patients. Thirty patients were selected based on the selection criteria, and 15 subjects were divided into two groups, one was an experimental group applying bilateral upper limb training task and the other was a general upper limb rehabilitation group. FMA was used to compare upper limb functions before and after intervention for 4 weeks. The results were as follows.

First, there was a significant change in upper limb function before and after intervention in BULTT and GULR, but it was more effective in BULTT ($p < 0.001$)

Second, there was significant improvement in bilateral upper limb activities after intervention ($p<0.05$).

Second, the comparison between the two groups showed significant improvement in the BULTT group ($p<0.05$).

These results suggest that the upper limb function area of acute stroke patients with BULTT is improved. Therefore, it seems that BULTT can be used as a therapeutic method for the recovery of upper limb function in stroke patients, and further study on the effect of the patient on rehabilitation should be handled together.

Ethical Clearance: Not required

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The Effect of Awareness Toward Dementia on Dementia Education Program of Adolescents

Bo-Kyoung Song¹, Ha-Na Kim², Sang-Hwa Lee³

¹Department of Occupational Therapy, Kangwon National University, 346 Hwangjo-gil, Dogye-eup, Samcheok-si Gangwon-do, 25949, Republic of Korea; ²Chung Dam Clinic, 46, Samseong-ro 147-gil, Gangnam-gu, Seoul, 06063, Republic of Korea; ³National Institute of Dementia, 670 Daewangpangyo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, 13494, Republic of Korea

ABSTRACT

Background/Objectives: As the elderly population increases, dementia patients are rapidly increasing as well and dementia causes various social problems such as burden and cost of care. These social problems will be affected by the present adolescents who will become responsible for dementia patients and aged generation. The purpose of this study was to survey the effect of awareness toward dementia on Dementia Education Program(DEP) of adolescents. Throughout the program, 32 subjects were educated and received tasks related to dementia.

Method/Statistical Analysis: Subjects were recruited online and DEP was processed for 2 days with 9 educational topics. By providing volunteer work hours accepted in high school when the tasks were completed, we increased the participation. To evaluation the awareness toward dementia, we used the dementia awareness questionnaire used on nationwide study on the prevalence of dementia in Korean elders by the Ministry of Health and Welfare. To analyze the subject's general characteristics, descriptive analysis was used. Conducted paired T-test to analyze the change of awareness toward dementia before and after DEP in the group.

Findings: Dementia awareness questionnaire's perfect score is 15. Higher the score is, greater the awareness toward dementia. Before DEP, the score was. After DEP, the score was. Comparing the before and after scores, the score increased. The result showed statistical significant difference.

Improvements/Applications: The study showed that the effect of awareness toward dementia on DEP of adolescents was positive. This result can be used as a background data announcing the need for early education through school health education, starting from the present adolescence that will directly support the elderly generation in future.

Keywords: *Dementia, Awareness toward dementia, Adolescents, Dementia education program, School health education, Early education*

Introduction

Our elderly population, over 65 years old, is rapidly expanding every year. It is estimated to be 7.06million people in 2017, 12.31million people in year 2024 and

22.90million in year 2041. As the elderly population rapidly expands every year, it caused number of social problems. Among them, dementia is the representative problem of the aged. As with the increasing aging population, dementia patients are rapidly increasing as well. It is estimated to be 0.7million people in year 2017, 1million in year 2024 and over 2million in year 2041^{1,2}.

Corresponding Author:

Sang-Hwa Lee
Occupational Therapist,
National Institute of Dementia, Republic of Korea
Email: lsh@nid.or.kr

As dementia symptom progresses the ability to live by oneself decrease. Eventually the patient's quality of life decreases and caregiver's burden and stress increases³. But because ordinary people see symptoms

of dementia as a part of aging, it makes them not able to get a proper service^{4,5,6}.

In modern days, social advancement of women, nuclear family made traditional support system get weak. Increased primary caregiver's caring time made caregiver's social participation decrease and giving up their personal needs. Also increase in economic cost made conflict issues among caregivers and their family^{7,8}. The results supporting that the dementia patient makes quality of the life of their family low have been verified in many previous studies. These burdens of care make people two to three times more likely to be depressed than the normal people. About one-third of the patient's family show major symptoms of depression and more than half of them suffer from chronic depression^{9,10,11,12}.

These social problems will be affected by the present adolescents who will become working age population and become responsible for dementia patients and aged generation. Adolescence is a sensitive period in which growth is vigorous and the awareness of oneself grows and that means what they learn at this time is very important. Initiating early education on dementia since adolescence can decrease negative awareness toward dementia. Also spreading these positive side to homes and communities will be very effective on creating dementia friendly society^{7,8,13}.

Therefore, this study seeks to find out what kind of influence does DEP, which provides correct information on dementia, has on adolescents. Furthermore, it intends to be provided as a background data to inform the necessity of early education on dementia since adolescence.

Materials and Method

Subjects: The subjects that were recruited through online were total 32 people. These subjects met the selection criteria and gave voluntary knowledgeable

consent to take part in the study. The specific selection criteria were as follow: (1) person who understood the study's aim, method, period and agreed to participate (2) person who is currently attending high school (3) person who never had dementia education before (4) person who don't have any mental and physical deficits.

Materials: To evaluate the awareness toward dementia, we used the dementia awareness questionnaire used on nationwide study on the prevalence of dementia in Korean elders by the Ministry of Health and Welfare. Dementia awareness questionnaire has total 15 questions, consisted of 5 questions on the causes of dementia, 3 questions on epidemiology and institution of dementia, 4 questions on symptoms and diagnosis of dementia and 3 questions on treatment and prevention of dementia. Each question is evaluated as 'yes' if the explanation is correct and 'no' if it is incorrect. 1 point if the answer is right, 0 point if it's not. The total score can be 0 to 15 points. Higher the score is, greater the awareness toward dementia¹⁴. The data were analyzed by SPSS version 18.0 program. To analyze the subject's general characteristics, descriptive analysis was used. Conducted paired t-test to analyze the change of awareness toward dementia before and after DEP in the group. All statistical significance levels in the data were.

Methods: Before DEP, subjects went through pre-evaluation on awareness of dementia using dementia awareness questionnaire. After DEP, post-evaluation was conducted using the same questionnaire. Subjects got DEP, consist of 9 kinds of education subjects for 4 hours a day, 2 days in total. After the first day, assignments related to dementia were given to be completed. We increased participation by giving certificate and approval of volunteer work hours. In this study the dementia information of the National Institute of Dementia, which was established to carry out dementia management duties from the Ministry of Health and welfare, was used to provide the right information about dementia. Education topic and contents are as shown in table 1

Table 1: Contents of Dementia Education Program

Education Topic	Contents
1. Orientation	Introducing program, schedule and assignments
2. Understanding of dementia	Definition of dementia
3. Dementia prevention exercise	Rules and exercise method for dementia prevention Assignment: submit the video after following the dementia prevention exercise
4. Service information using 'Dementia Check' application	Dementia risk test and function for prevention of disappearance etc Assignment: using the 'Dementia Check' application

Conted...

5. Dementia support service	Introducing national dementia support service contents
6. Education on improving dementia awareness	Cause, symptom and treatment of dementia
7. Cognitive training on dementia	Cognitive training method to improve attention, memory etc
8. Introducing National Dementia Helpline	Roles and function of National Dementia Helpline
9. Finishing activity	Impressions about the program, checking assignment's result, awarding certificate

Results and Discussion

General Characteristics of Subjects: Numbers of subjects were total 32 and analysis results for general characteristics are as shown in table 2. Subjects gender were male 21 people (65.6%) and female 11 people (34.4%). Age were 'age 17' 14 people (43.8%), 'age 18' 12 people (37.5%) and 'age 19' 6 people (18.8%). High school grade were first grader 11 people (34.4%), second grader 15 people (46.9%) and third grader 6 people (18.8%). Subjects who have religion were 10 people (31.3%), who don't were 22 people (68.8%). Subjects who had experience in volunteer work were 7 people (21.9%), who didn't were 25 people (78.1%). Subjects who have experience in living together with the dementia patient were 8 people (25%), who don't were 24 people (75%).

Table 2: General Characteristics of Subjects (N = 32)

Variables	Categories	n(%)
Gender	Male	21(65.6%)
	Female	11(34.4%)
Age	17	14(43.8%)
	18	12(37.5%)
	19	6(18.8%)
High School Grade	First Grader	11(34.4%)
	Second Grader	15(46.9%)
	Third Grader	6(18.8%)
Religion	Yes	10(31.3%)
	None	22(68.8%)
Experience in volunteer	Yes	7(21.9%)
	None	25(78.1%)
Experience in living together	Yes	8(25%)
	None	24(75%)

Comparison of Result Before and After DEP in the Group: Dementia awareness questionnaire's perfect score is 15. The analysis result of the change in awareness

toward dementia is as shown in Table 3. Before DEP, the score was 10.15 ± 1.52 . After DEP, the score was 12.37 ± 1.75 . Comparing before and after scores, the score increased. The result showed statistical significance ($p < 0.01$).

Table 3: Comparison of Results Before and After DEP in Group (N=32)

Variables	Pre-evaluation	Post-evaluation	p
Awareness toward dementia	10.15 ± 1.52	12.37 ± 1.75	0.00*

Mean $\pm$ standard deviation, * $p < 0.01$ by paired t-test.

Discussion

This study showed that due to DEP, awareness toward dementia of adolescents has significantly increased. When converting the average score of each question to 100 points, before DEP, 'Early treatment can slow the progress of dementia' and 'Regular exercise helps prevent dementia' questions marked the highest by scoring 90 points. 3 questions that got the most wrong answers were 'Drinking too much alcohol is prone to dementia', scored 6 points, 'Women are more likely to have dementia than men', scored 25 points, and 'One in 100 elderly people can have dementia', scored 37 points. The questions that had the most improvements on the scores for awareness toward dementia were 'Drinking too much alcohol is prone to dementia' and 'One in 100 elderly people can have dementia' and the score of the cause and epidemiology toward dementia improved the most. The result is similar to the study on 226 Incheon people's, who were over 19 years old, awareness toward dementia. The study on old-old elderly's awareness toward dementia also had low awareness in cause and epidemiology toward dementia. These results are

considered like this, due to low in awareness toward dementia and lack of education. Misunderstanding toward dementia causes delays early diagnosis and making judgement that treatment is impossible. This will have a huge influence on preventing and managing dementia. Having positive attitude toward dementia by providing correct awareness will help preventing dementia and early diagnosis^{15,16}.

For the adolescents who will become adult and support the elderly generation, consciousness of supporting and attitude toward elderly will be very important. Correct awareness toward dementia help ease the anxiety of dementia by having influence on attitude toward dementia. If the attitude is more positive, caregiver's burden of care will decrease. Also the quality of life and consciousness of supporting the elderly will increase^{17,18,19}.

In this study adolescents were given DEP and it showed positive increase in awareness toward dementia. This result will have a positive effect on adolescents' important attitude and consciousness of supporting the elderly. Therefore it can be said that adolescents' education on dementia is important. Also early education on dementia through school health education starting from adolescence should be carried out²⁰.

The limitations of this study is that it did not set the control group and because the study only went through few high school students, there is a limit in generalizing to all adolescents. But as with other previous studies' results, DEP showed that it has a positive effect on awareness toward dementia of adolescents^[21]. Furthermore, the study could be used as a background data to inform the necessity of early education on dementia starting from adolescence.

Conclusion

The purpose of this study was to survey the effect of awareness toward dementia on DEP of adolescents. Comparing before and after DEP, the score increased. The result showed that due to DEP, awareness toward dementia of adolescents has significantly increased. Throughout the results, we could know that providing DEP to adolescents has a positive effect on having correct awareness toward dementia.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Oral Health-Related Factors and Stress from Cultural Adaptation among Vietnamese Students in Korea

Na-Rae Oh¹, Su-YeonSeo¹, Oe-Nam Kim²

¹Department of Dental Hygiene, ²Department of Nursing, Youngnam Foreign Language College

Abstract

Although the recent rise in the number of foreign students in Korea may have positive cultural and economic effects, the negative effects of stress from cultural adaptation cannot be overlooked. This study investigates the relationship between oral health and stress from cultural adaptation in university life.

In this study, 100 copies of the survey were distributed to Korean and Vietnamese university students each, with response failure rates considered. The survey took place in October 2017 and lasted for 9 days. Excluding the incomplete responses, 80 and 99 survey responses were selected from Vietnamese and Korean students respectively. The results indicated similar levels of satisfaction for oral health care, which were $3.06 \pm .959$ for Vietnamese students and $3.09 \pm .771$ for Korean students. The satisfaction rates for their own oral health were $2.85 \pm .956$ for Vietnamese students and $3.07 \pm .961$ for Korean students. There was no statistically significant difference, but Korean students had about 1.425 times higher satisfaction rate for their own oral health than Vietnamese students. The statistics for oral health knowledge were 8.28 ± 1.091 for Vietnamese students and $9.18 \pm .774$ for Korean students. There was a statistically significant difference ($p < .00$), with the figure for Korean students being 3.488 times higher than Vietnamese students. The most stressful factor among Vietnamese students in the process of cultural adaptation was 'Feel the need to learn Korean' with 3.46 ± 1.31 and the least was 'Do not feel accepted by Koreans' with 1.95 ± 0.82 . Cultural adaptation stress scores were significantly lower in the group who brushed 3 times daily than in the group who did not. This was statistically significant ($p < .05$).

The results of this study suggest that it is important to give training on oral health to help Vietnamese students experience oral care services and be informed about it. The administrative support from students' respective universities will be needed as well.

Keywords: Vietnamese students, cultural adaptation stress, oral health factors, oral health-related characteristics, Oral health behavior

Introduction

Korea has paid closed attention to attracting foreign students, through adopting measures based on the 'Comprehensive plan for growth in the number of foreign students' in 2001, to open up its education market and increase the international reputation of its home universities ^[1]. According to Statistics Korea, the

rates of increase in the number of Vietnamese students and Chinese students are 91% and 12% respectively.

If the trend was to continue, our society could benefit from this inflow of foreign students not only economically but also through domestic students being able to learn the language, history, culture, arts, society and economics of foreign countries, which will pave a path for domestic students to become global citizens. Korea can build for itself a support through these foreign students developing an in-depth understanding of Korea as a nation ^[2].

However, this increasing number of foreign students faces problems such as language barriers, tuition fees as well as other financial difficulties, homesickness,

Corresponding Author:

Su-YeonSeo

Department of Dental Hygiene

Youngnam Foreign Language College, Korea

Email: e-bbii@hanmail.net

personal problems and difficulties in carrying out daily activities^[3].

A cultural adaptation stress refers to such distress, confusion and negative behaviors that arise when one goes through the process of adapting to another culture^[4].

Its definition includes a source of tension or stress that one experiences when encountered with the values of the mainstream society accompanied with the resulting stress which is a series of physical, psychological and societal issues like mental health conditions - anxiety, depression, a sense of alienation and physical symptoms^[5].

Thus, it calls for a solution to the cultural adaptation stress of foreign students, of which the first is expanding the scope of social relations. Oberg identifies four stages of overcoming the cultural adaptation stress that a foreign student goes through^[6].

Social relations involve any activities that an individual does to fulfill his physical, emotional and instrumental needs through the relationships he maintains. They are defined as an instrumental, emotional, informational and appraisal support – assistance, advice, guidance, compliments, availability of comfort, help, and information^[7].

The concept of social relations attracted a lot of attention for its ability to strengthen problem-solving skills and has been used in a wide variety of contexts. It is obtained through meaningful interactions with other people, assisting the psychological adaptation of an individual^[8].

Cohen and Hoberman stated that the level of social relations can be the main cause of illness as well as an element that buffers stress and boosts health. In addition, it was found that people with higher level of education and occupational status participate in more social activities, which in turn has positive effects on the health^[9].

There would be another societal issue if foreign students were to hold back the sufferings they experience in Korea, a country that uses different language and has a different culture to its own^[10]. Their mental and physical health conditions should be prioritized so that they can concentrate on their studies. Implementing measures to solve this issue will necessitate investigating such conditions. Since a precedent study consisted of analysis of the entire body, this study investigates the oral health-related factors.

Oral health knowledge is necessary for oral hygiene and healthy oral conditions. It includes understanding the prevention, cure, and maintenance of oral health. It is generally gained through oral health education and is expected to have a correlation with the cultural adaptation stress, as it affects the oral health.

Cultural adaptation stress of foreign students is a type of stress caused by encountering a culture that is different from their own. The cultural adaptation stress can be defined as an accumulation of various types of problems in a day-to-day life. For this reason, we examine the relationship between cultural adaptation stress and oral health-related factors.

Materials and Methodology

Subjects of Experiments: The study was conducted after the participants had been informed of the objectives, anonymity, and confidentiality of the experiment and that the results would be used for the sole purpose of research. After receiving a written consent from the participants on this matter, the Vietnamese translated self-administered questionnaire was distributed. The recommended sample size was 67 which was obtained using the G * power 3.14 program, with an effect size of 0.05 and power of 0.05 and 0.8. 100 copies of the survey were distributed to Korean and Vietnamese university students each, with response failure rates considered. The survey took place in October 2017 and lasted for 9 days. Excluding the incomplete responses, 80 and 99 survey responses were selected from Vietnamese and Korean students respectively.

Methodology: The survey consisted of 4 general, 12 oral health-related and 11 cultural adaptation stress questions. The survey given to Korean students excluded the cultural adaptation stress questions.

Statistical Analysis

The samples were analyzed using SPSS 23.0 (SPSS Inc, Chicago, IL, USA) with the statistical significance level of $p < 0.05$. Frequency and comparative analysis were used for country-specific characteristics and difference between the respondents. A t-test was used for country-specific oral hygiene-related characteristics. The cultural adaptation stress of Vietnamese students was examined by looking at the average and standard deviation. Oral health behavior frequency analysis and the relevant cultural adaptation stress was tested with t-test and ANOVA test.

Results and Discussion

Differences in the Country-specific General Background of Respondents: There were 42 male Vietnamese students (52.5%) and 70 female Korean students (70.7%) as shown in table 1. The number of respondents who did have a religion was 61 (76.3%) for

Vietnamese group and 63 (63.4%) for Korean group. Vietnamese students had monthly spending average higher than 250,000 won while 79 (79.8%) Korean students belonged to this category. 33 Vietnamese students received an oral treatment in the home country while 92 Korean students received the same ($p < 0.00$).

Table 1: Differences in the Country-Specific General Background of Respondents

Characterization	Division	Vietnam		Korea		χ^2	p
		N	%	N	%		
Gender	Male	42	52.5	29	29.3	9.957	0.002*
	Female	38	47.5	70	70.7		
Religious	No	61	76.3	63	63.4	3.307	0.067
	Yes	19	23.8	36	63.4		
Monthly spending	<25	28	35.0	20	20.2	4.937	0.020*
	25≤	52	65.0	79	79.8		
Whether or not received an oral treatment in the home country	Yes	33	41.3	92	92.9	56.093	0.000**
	No	47	58.8	7	7.1		

Differences in Country-Specific Oral Health-Related Characteristics: The results of the difference between oral health-related characteristics are as follows in table 2. The satisfaction score for oral treatment of home country was $3.06 \pm .959$ for Vietnamese students and $3.09 \pm .771$ for Korean students, with no statistically significant difference. The satisfaction scores for their own oral health was $2.85 \pm .956$ and $3.07 \pm .961$ for Vietnamese

and Korean students each. Although the results showed no statistically significant difference between the two groups, Korean students had 1.424 times higher score than Vietnamese students. The oral health knowledge score was 8.28 ± 1.091 for Vietnamese students and $9.18 \pm .774$ for Korean students. There was a statistically significant difference ($p < 0.00$) with the score for Korean students being 3.488 times higher than Vietnamese students.

Table 2: Differences in Country-Specific Oral Health-Related Characteristics

Characterization	Vietnam		Korea		OR	95%	t	p
	Mean	SD	Mean	SD				
Home country oral treatment satisfaction rate	.06	± 0.959	3.09	± 0.771	0.718	0.425-1.203	-0.220	0.826
Own oral health satisfaction rate	.85	± 0.956	3.07	± 0.961	1.425	0.922-2.200	-1.531	0.127
oral health knowledge score	.28	± 1.091	9.18	± 0.774	3.488	1.977-6.152	-6.495	0.000**

Cultural Adaptation Stress of Vietnamese Students: The responses of Vietnamese students to cultural adaptation stress questionnaire are as follows in table 3. The problems with the language barrier appeared to have the strongest influence on the cultural adaptation stress.

The most stressful factor was 'I feel like I need to learn Korean' with a score of 3.46 ± 1.31 , followed by 'I do not speak Korean fluently' with 3.36 ± 0.983 . The least stressful factor, marked 1.95 ± 0.82 , was 'I do not feel accepted by Koreans'.

Table 3: Score on the Cultural Adaptation Stress Factors of Vietnamese Students

Questionnaire			
1. I am not fluent in Korean	3.36	± 0.983	2
2. I feel uncomfortable around people who can speak only Korean	2.93	± 1.05	5

Conted...

3. I feel like I need to learn Korean	3.46	± 1.31	1
4. I find it difficult to understand if it is in Korean	3.26	± 1.25	3
5. People treat me unfairly or disrespectfully because I do not speak fluent Korean	2.58	± 1.27	8
6. I feel irritated when people think that I will naturally speak fluent Korean	2.46	± 1.01	10
7. I have been discriminated because I do not speak Korean fluently	2.86	± 1.30	6
8. I find it difficult to understand when people speak in Korean	3.20	± 1.15	4
9. I feel irritated when people ask me to follow the Korean way	2.58	± 1.18	8
10. It's difficult to socialize with Koreans because of cultural background	2.85	± 1.15	7
11. I do not feel accepted by Koreans	1.95	± 0.82	11
Total	2.86	± 0.67	

Cultural Adaptation Stress According to Oral Health Behavior Characteristics of Vietnamese Students:

According to the result in table 4, 63 Vietnamese students (78.8%) brushed 1-2 times and 11 of them (13.8%) did not brush at all. In terms of the amount of toothpaste usage per brushing, 50 students answered that they use an amount equal to the 2/3 of the toothbrush head and 24 students said they use length equal to the full toothbrush head. Furthermore, 38 Vietnamese students responded that they change toothbrush every 3 months

and 31 responded that they change every month. 25 students (31.3%) answered that they do carry portable oral products and 55 students (68.8%) answered they do not. In the question about the opinion on the necessity of carrying oral hygiene products, 41 respondents (51.3%) answered that it is necessary while 39 (48.8%) answered it is unnecessary. Among Vietnamese students, the cultural adaptation stress score was significantly lower in the group who brushed 3 times daily than in the group who did not. This was statistically significant ($p < .05$).

Table 4: Cultural Adaptation Stress According to the Oral Health Behavior Characteristics of Vietnamese Students

Characterization	Division	N	%	Mean	SD	F/t	p
Number of brushings per day	0	11	13.8	3.16	± 0.58	3.138 a>c	0.049*
	1-2	63	78.8	2.86	± 0.60		
	3-4	6	7.5	2.33	± 1.17		
Toothpaste usage (per each brushing)	toothbrush head 1/3	6	7.5	3.34	± 0.78	1.730	0.184
	2/3	50	62.5	2.81	± 0.53		
	full head	24	30.0	2.85	± 0.86		
Frequency of toothbrush replacement	1 month	31	38.8	2.73	± 0.69	0.901	0.411
	3 months	38	47.5	2.94	± 0.70		
	6 months	11	13.8	2.95	± 0.46		
Carries portable oral products	Yes	25	31.3	2.72	± 0.76	-1.28	0.204
	No	55	68.8	2.93	± 0.62		
Portable oral products necessity	Necessary	39	48.8	2.79	± 0.73	-0.891	0.376
	Not necessary	41	51.3	2.93	± 0.60		

Conclusion

This study was conducted to investigate the cultural adaptation stress that foreign students go through and the factors affecting oral health of both Korean and foreign students.

According to the results, the satisfaction score for oral treatment of home country was $3.06 \pm .959$ for Vietnamese students and $3.09 \pm .771$ for Korean students, with no statistically significant difference. It is considered that the higher satisfaction score for Korean students comes Korean students having a better

understanding of oral health. The satisfaction score for one's own oral health was $2.85 \pm .956$ and $3.07 \pm .961$ for Vietnamese and Korean students each. Although the results showed no statistically significant difference between two groups, Korean students had 1.424 times higher score than Vietnamese students. The oral health knowledge score was 8.28 ± 1.091 for Vietnamese students and $9.18 \pm .774$ for Korean students. There was a statistically significant difference ($p < 0.00$), with the score for Korean students being 3.488 times higher than Vietnamese students.

The statement describing the most stressful factor among Vietnamese students in the process of cultural adaptation was 'I feel the need to learn Korean' with 3.46 ± 1.31 and the least was 'I do not feel accepted by Koreans' with 1.95 ± 0.82 . Cultural adaptation stress scores were significantly lower in the group who brushed 3 times daily than in the group who did not. This was statistically significant ($p < .05$). The cultural adaptation stress of Vietnamese students indicated a low correlation with oral health-related factors. The results of this study suggest that it is important to educate Vietnamese students to raise oral health awareness. There is also a need for multi-perspective efforts to solve the oral health problem of foreign students and to smoothen the cultural adaptation process relating to oral health. The administrative support from students' universities will be required as well.

This study emphasizes the importance of researching the oral health behavior characteristics of foreign students in Korea before taking the measures to improve the oral health problems of such students. In addition, the oral health behavior of domestic students should be analyzed along with that of foreign students to compare and observe the difference between these behaviors and factors causing such differences. This also demands administrative support from oral health care services for foreign students.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Implementation of Glove-Type Wearable Healthcare System for Heartrate Measurement During Daily Life

Ji-Yun Seo¹, Yun-Hong Noh², Do-Un Jeong³

¹Ubiquitous IT Engineering Graduate School, Dongseo University, 47 Jurye-ro, Sasang-gu, Busan, 47011, Korea; ²Department of Computer Engineering, Busan Digital University, 57 Jurye-ro, Sasang-gu, Busan, 47011, Korea; ³Division of Computer Engineering, Dongseo University, 47 Jurye-ro, Sasang-gu, Busan, 47011, Korea

ABSTRACT

Background/Objectives: In recently, U-Healthcare has evolved into Smart-Healthcare due to growth of IoT technology and entry into an aging society; it is able to provide variety of medical service technologies. Wearable technology for health monitoring in everyday life is provided with a variety of medical service models through linkage with existing ICT infrastructures.

Method/Statistical Analysis: In the proposed system is first to filter and amp the data measured thought the PPG sensor in the measurement section, and then to perform the ADC conversion in the control section. Then, heart rate was detected from the filtered data by the IBI method after remove the motion noise using the adaptive filter. Finally, heart rate display is possible on the LCD in the control section and transmitted to the monitoring section through Bluetooth communication.

Findings: To evaluate overall performance of implemented system, experiment was conducted to comparative evaluation with commercial system, adaptive filter evaluation and performance evaluation in daily life. For a reliable system evaluation, we conducted a comparative experiment with the commercial system (PSL-iPPG2) of Physio lab company and confirmed the similarity of 98.44%. Evaluated the adaptive filtering implemented by adding artificial noise to the original signal, and it was confirmed that the motion noise remove performance is excellent. In addition, heart rate detection precise of the detection system using the general detection method and the adaptive filter was evaluated. As a result, heart rate detection of 89.19% was found to be low in the case of the general detection method and 98.02% in the case of the heart rate detection method using the adaptive filter.

Improvements/Applications: The implemented system designed an adaptive filter for motion noise remove for precise heart rate measurement in daily life. In addition, confirmed that the system implemented in this paper can be applied to everyday life through experiments. In future research, it is aimed to implement a heart rate monitoring system optimized for motion noise for measuring heart rate with various activity states and psychological changes.

Keywords: PPG, Wearable, Healthcare, Inter beat Interval, Beer-Lambert law, Adaptive filter.

Introduction

In recently, U-Healthcare has evolved into Smart-Healthcare due to growth of IoT technology and entry into an aging society, it is able to provide variety of medical service technologies^[1]. Wearable technology for health monitoring in everyday life is provided with a variety of medical service models through linkage with existing ICT infrastructures^[2]. The wearable device is currently used most in Activity device field and Healthcare

Corresponding Author:

Do-Un Jeong
Professor, Division of Computer Engineering,
Dongseo University, Korea
Email: dujeong@dongseo.ac.kr

device field. Activity devices^[3,4] can monitor motion and physical activity information, and healthcare devices^[5,6] can monitor bio-signals such as blood pressure, ECG, EMG, EEG and etc. and transmit to users or external agencies. In particular, ECG and PPG are bio-signals that reflect the activity state of heart, and serve as the important criteria signal when diagnosing heart disease and vascular diseases. The heart rate that represents the activity cycle of heart is the overall rhythm determined by count of contraction and relaxation activities of the SA-node^[7]. Blood released from the left ventricle during systole moves to the peripheral blood vessels and increases arterial dimensions. Thereafter, pulse generated at a portion where blood is drawn into the heart from peripheral blood vessels during diastole. At this time, analyzing the penetrance and the reflectance using the light to the pulse generated can measure the PPG signal moving according to the heartrate. Although it is common to use contact-type measurement methods that attach to the body to measure heart activity state, there are many problems such as cost and wearing limitations to use in daily life. To solve this problem, PPG and heart rate measurement systems using non-contact type measurement have been studied ^[8-10]. This paper proposes a glove-type wearable healthcare system that heart rate monitoring according to heart activity state and minimizes noise due to external light or user movement. The system implemented reflection type PPG probe using infrared led (IR) and red led(R) as the light source, enabling non-invasive measurement for a long term with simple operation method without specialization. In addition, adaptive filter is designed for remove to noise caused by ambient bio-signal and user motion when measuring the PPG. The implemented system can monitor the heart rate information according to the activity state as well as the physical information, and it can transmit the current location information and health information to the surrounding people in case of emergency.

Materials and Method

In the proposed system is first to filter and amp the data measured thought the PPG sensor in the measurement section, and then to perform the ADC conversion in the control section. Then, heart rate was detected from the filtered data by the IBI method after remove the motion noise using the adaptive filter. Finally, heart rate display is possible on the LCD in the control section and transmitted to the monitoring section

through Bluetooth communication. Monitoring section can precise heart rate monitoring as well as transmit the current location information and health information to the surrounding people in case of emergency. Figure 1 shows the flow chart of glove-type wearable health management system.

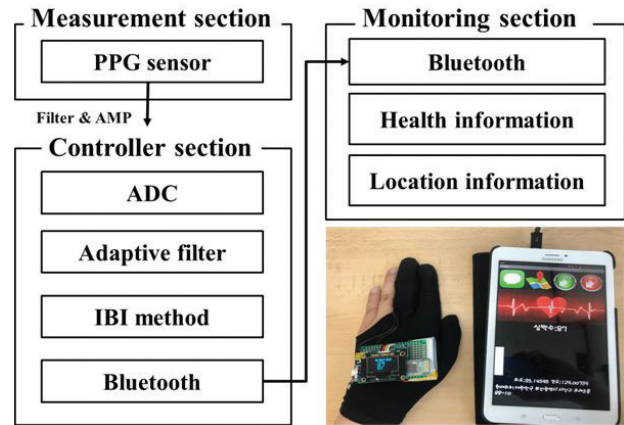


Figure 1: Flow chart of the glove-type wearable healthcare system

Beer-Lambert Law for PPG Measurement: The Beer-Lambert law built in the measurement sensor was used for PPG measurement. Beer-Lambert law detects the heart rate from changes in blood flow using optical feature. Figure 2 shows the flowchart of Beer-Lambert law.

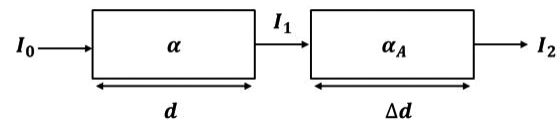


Figure 2: Flowchart of the Beer-Lambert Law

Light generating from light source (I_0) is partially absorbed in the process of penetrating skin tissue. This can be seen as a DC component since the penetration length of light (d) and absorption of light (α) are not changed. In addition, penetration light (I_1) after passing through the DC component can be represented by the light of the AC component (I_2) if it is influenced by relative absorption (α_A) of arterial blood and penetration length (Δd) due to changes arterial blood dimensions. The AC component shows the effect of changes in light penetration length and relative absorption of arterial blood. Equation 1 shows the calculated equations of (I_1) and (I_2).

$$I_0 \exp - (\alpha d + \alpha_A \Delta d) \quad \dots(1)$$

Adaptive Filter Design for Motion Noise Remove: Since the PPG signal is measured using an optical method, it is highly affected by noise. There are not only

light sources analyzed when light penetrance skin tissue, but also ambient light noise, noise caused by physical combining errors in measuring sensors and measuring parts, electromagnetic noise of the measuring equipment itself, etc. Using PPG signals that are affected by these noises will cause distortion of waveforms and changes in amplitude it is making accurate measurements impossible. Therefore, while the PPG signal measures the heartrate cycle, is also necessary to remove motion noise because the signal related to breathing is also measured. In this paper, we implemented an adaptive filter using LMS(least mean square) algorithm based on the steepest descent method to remove the motion noise generated when PPG measurement. The adaptive filter iteratively adjusts the filter coefficients with the least mean square algorithm based on a given filter coefficient to estimate remove noise or features of the desired signal. Figure 3 shows a diagram of the implemented adaptive filter. Equation 2-4 shows the equations of the implemented adaptive filter.

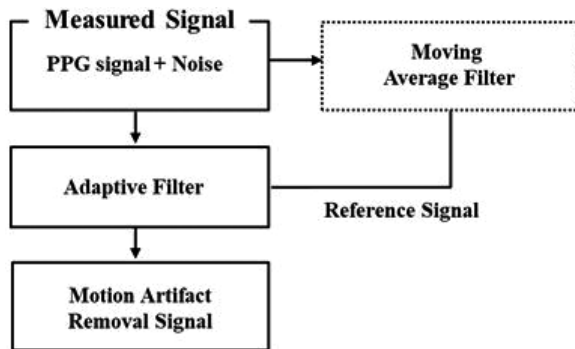


Figure 3: Diagram of the implemented adaptive filter

$$E(n) = P(n) + N(n) - eN(n) \quad \dots(2)$$

$$eN(n) = \sum_{k=0}^L h_k N_R(n-k) \quad \dots(3)$$

$$h_k(n+1) = h_k(n) + 2\mu E(n)N_R(n-k) \quad \dots(4)$$

P_n is the original signal, L is the degree, $N_{(n)}$ is the noise component signal, $N_R(n)$ is the reference noise signal extracted from the low frequency band by applying the moving average filter, $eN(n)$ is the estimated noise signal, $h_k(n)$ is the filter coefficient, and μ is the convergence constant.

IBI Method for Heart Rate Analysis: To reliably measure the IBI(Inter beat Interval) between PPG bits, an 8-bit hardware timer timer2 was set in the ATmega128-based control section to generate an interrupt every millisecond. This allows a sampling rate

of 500 Hz and a bit timing of 2ms. After calculating the maximum and minimum points from the measured data every 2ms, measure the first beat and second beat if the 10 IBIs become one function. By calculating the average IBI using the two measured functions and dividing by 60000, the BPM can be obtained. Finally, if the range of data transmitted to the monitoring system is 0 or more than, the range of BPM is given and it is judged whether there is an abnormal or normal. If there is no input data, check for connection again. When an abnormal bpm is detected, BPM, latitude, longitude, and location address are sending to surrounding people. Android studio program based application has been implemented to monitoring precise heartrate graphs. Figure 4 shows the flow chart of the IBI method and Application

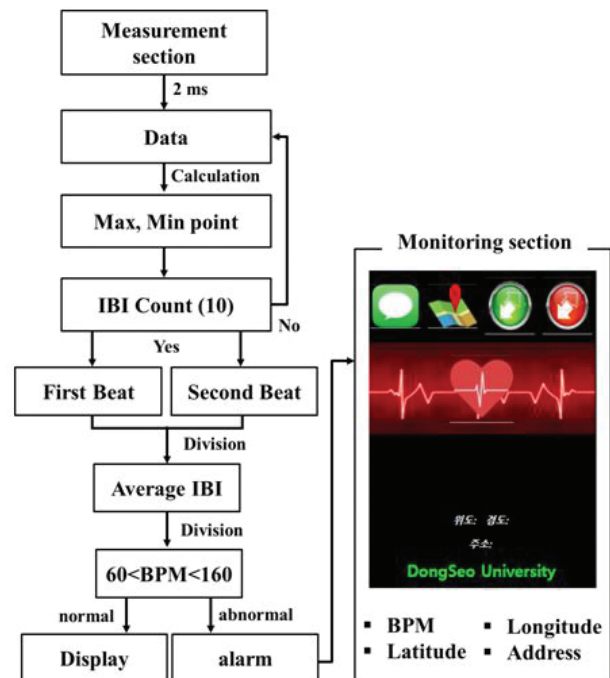


Figure 4: Flowchart of the IBI Method and Application

Results and Discussion

Comparison Evaluation with Commercial Systems:

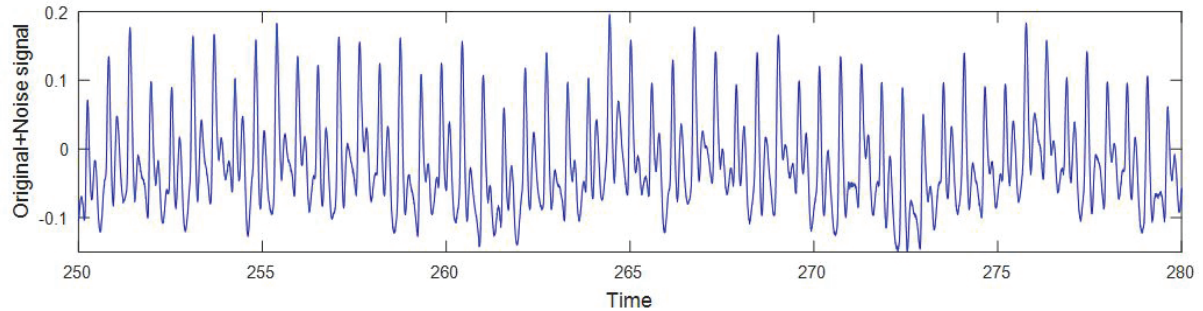
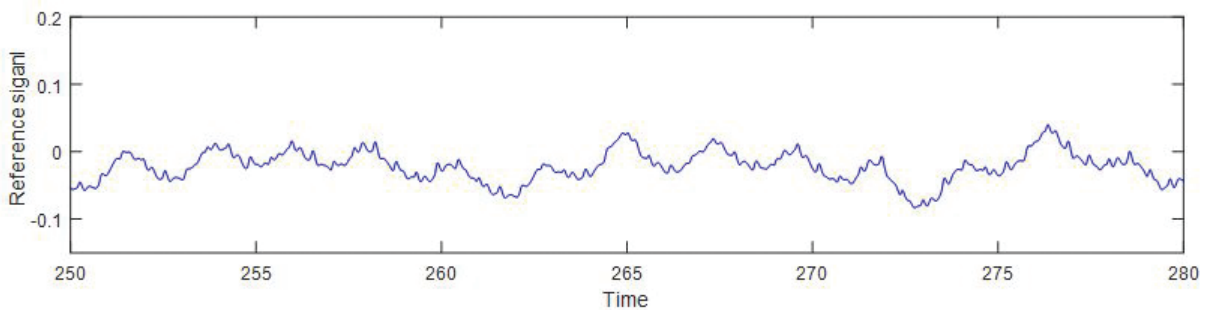
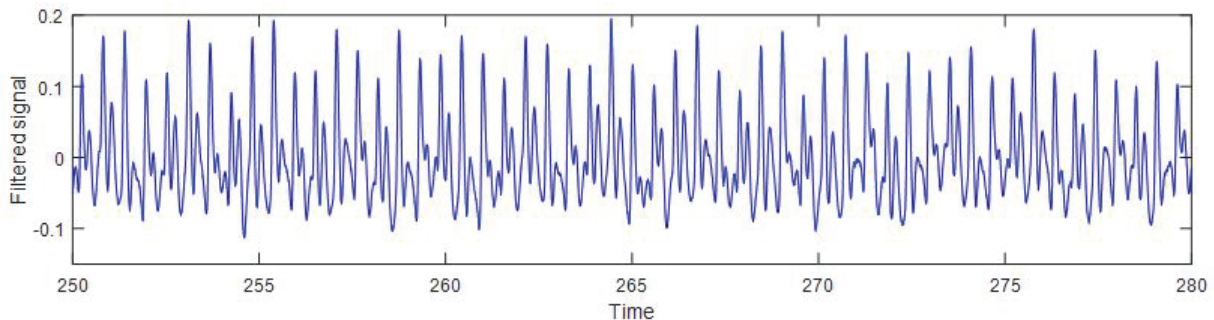
An experiment was conducted with Physio lab company PPG measurement system (PSL-iPPG2) for comparative evaluation with commercial systems. The experiment was progress for 5 minutes with 5 subjects. Experimental results showed that the similarity of heart rate detection between the implemented system and commercial system was 98.44%, which is an excellent detection performance. Table 1 shows the heart rate comparison results between the implemented system and the commercial system.

Table 1: Comparison Results Between the Implemented System and the Commercial System

	Detection Heart Rate		
	Implement system	Commercial system	Similarity [%]
Subject 1	348	354	98.30
Subject 2	379	382	99.21
Subject 3	366	372	98.38
Subject 4	388	396	97.97
Subject 5	359	365	98.35
Avg.			98.44

Adaptive Filter Performance Evaluation: In order to evaluate the performance of the adaptive filter, artificial noise signal and motion noise signal were added to the

original signal to remove the noise using the proposed adaptive filter. First, in order to evaluate the features of motion noise components, we analyzed PPG signal measured after a 10 - minute rest and PPG signals measured at walking and running. As a result, it was possible to identify a specific frequency component which appears only in the activity state such as walking and running, unlike the frequency component in the sitting static state. Therefore, the frequency of 3Hz, 2.7Hz, and 4.1Hz was determined as a specific frequency, and an artificial motion noise signal was generated by mixing the noise signal of the specific frequency band with the white noise. Experimental results show that the proposed adaptive filter has superior motion noise removal performance. Figure 5 shows the results of the adaptive filter performance evaluation.

**(a) Original + Noise signal****(b) Reference signal****(c) Processing with adaptive filter****Figure 5: Results of the adaptive filter performance evaluation**

Performance Evaluation in Everyday Life: To evaluate overall performance of measuring heart rate in everyday life, an experiment was conducted to measure heart rate during the activity state for 10 minutes with 5 subjects wearing implemented system. The experimental environment established different sections of moving path as shown in figure 6 (a: downhill, b: flatland, c: uphill) on the campus and took a 30-second break before moving by section. In addition, heart rate detection precise of the detection system using the general detection method and the adaptive filter was evaluated. In order to determine the heart rate detection of the two methods, MATLAB was used to visually count the heart rate recorded in the heart rate recording papers and set them as reference heart rate. As a result, heart rate detection of 89.19% was found to be low in the case of the general detection method and 98.02% in the case of the heart rate detection method using the adaptive filter.

Table 2 shows the heart rate detection results of the two methods. Figure 7 shows result of remove motion noise in daily life.

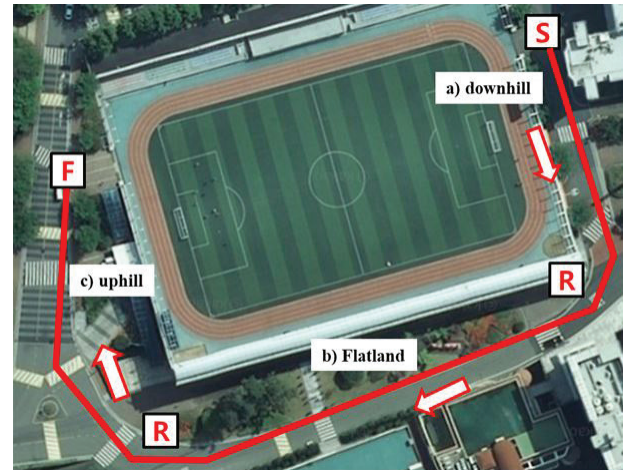


Figure 6: Moving path

Table 2: Heart Rate Detection Results of the Two Methods

	a section			b section			c section		
	RS	WF	NF	RS	WF	NF	RS	WF	NF
Subject 1	234	228	206	213	207	203	249	243	207
Subject 2	246	243	217	222	216	213	261	255	218
Subject 3	261	255	214	237	233	227	279	273	242
Subject 4	296	291	267	228	225	221	301	293	246
Subject 5	267	261	233	224	220	218	283	279	243
Detection [%]		98.30	87.13		97.95	96.25		97.81	84.19
[RS]Reference signal, [WF]with adaptive filter, [NF]not adaptive filter WF=98.02% NF=89.19%									

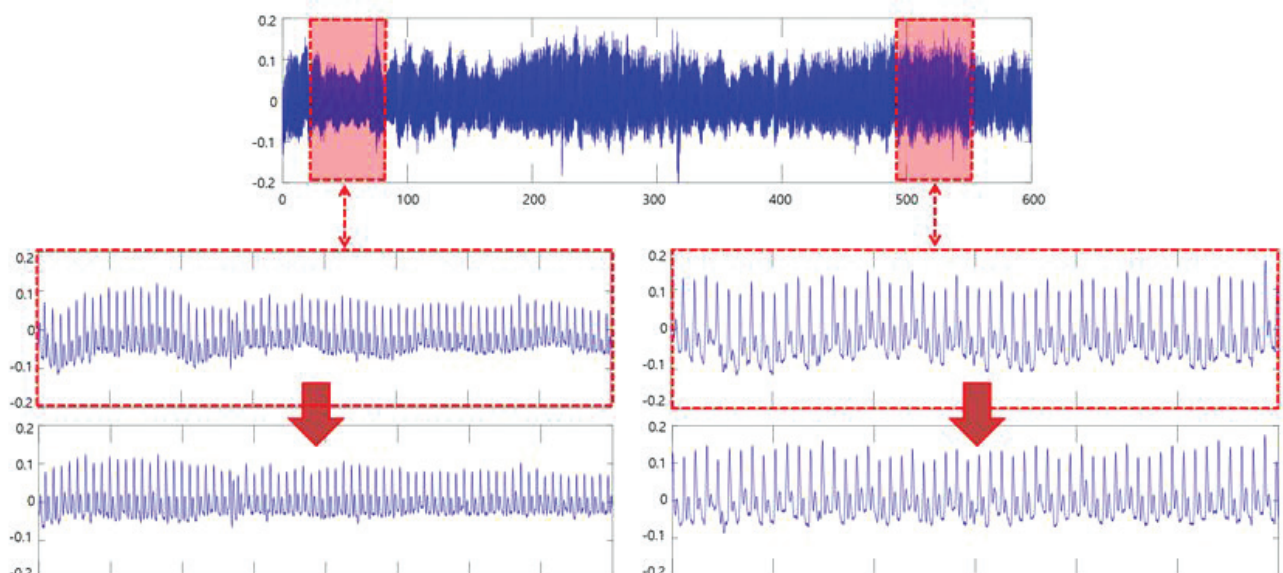


Figure 7: Result of remove motion noise in daily life

Conclusion

This paper has implemented a glove-type wearable healthcare system for measuring heart rate in daily life. The implemented system measured PPG using Beer-Lambert law for PPG sensor. Also, in this paper implemented an Android-based monitoring section for real-time monitoring. Monitoring section can precise heart rate monitoring as well as transmit the current location information and health information to the surrounding people in case of emergency. To evaluate overall performance of implemented system, experiment was conducted to comparative evaluation with commercial system, adaptive filter evaluation and performance evaluation in daily life. For a reliable system evaluation, we conducted a comparative experiment with the commercial system(PSL-iPPG2) of Physiolab company and confirmed the similarity of 98.44%.Evaluated the adaptive filtering implemented by adding artificial noise to the original signal, and it was confirmed that the motion noise remove performance is excellent. In addition, heart rate detection precise of the detection system using the general detection method and the adaptive filter was evaluated. As a result, heart rate detection of 89.19% was found to be low in the case of the general detection method and 98.02% in the case of the heart rate detection method using the adaptive filter. Therefore, it is confirmed that the system implemented in this paper is applicable to everyday life. In future research, it is aimed to implement a heart rate monitoring system optimized for motion noise for measuring heart rate with various activity states and psychological changes.

Acknowledgment

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Women's Quality of Life and Their Health Awareness by Age at the First Childbirth and Age at the Last Childbirth

Myoung-Hee Kim

Professor, Department of Nursing, Semyung University, Republic of KOREA

ABSTRACT

Background/Objectives: The aim of this study was to prove how factors associated with childbirth related variables affect women's quality of life (QoL) and their health awareness.

Method/Statistical Analysis: This study is a secondary analysis that uses the raw data collected through the KNHANES between 2013 and 2015. A total of 5,698 subjects were selected for this study among 22,948 participants who completed the KNHANES between 2013 and 2015. This study used the SPSS win 19 program to analyze data and a complex sample- general linear model was used to analyze quality of life by examining childbirth related variables.

Findings: While childbirth affected women's QoL and their health awareness when their first childbirth occurred prior to 20 years of age, it did not affect women's QoL and their perceived health conditions when the first childbirth occurred after age 20.

Improvements/Applications: Study results can be used to alter women's perceptions of childbirth if they avoiding giving birth due to an assumption that it will have a negative influence on their QoL and health.

Keywords: *Quality of life (QoL), Subjective health status, Childbirth age, Birth interval, KNHANES.*

Introduction

Continuing low birth rates and delays in the parturition of the first child due to women's avoidance of childbirth have resulted in numerous demographically issues^[1-3].

Korea's total fertility rate has been decreasing since 1983 and it dropped below 1.5 in 2000^[4]. The total fertility rate in 2013 was 1.19, which was too low to even maintain the current demographic structure and accordingly, population policy interventions are required to prevent destabilization of the demographic structure.

Society's stress for higher education is one of factors that has affected women's desire to start a family. Women have obtained more roles in labor market by participating

as an economic population. Additionally, birth culture has been changed due to changes in values such as gender equality and marriage. In modern society generally, women are expected to be juggle work with family life, and the tension between these roles plays a primary factor in women's avoidance of child birth. This is because modern women consider their individual QoL, pursuing their personal satisfaction and meeting their desires as more important than participating in childbirth^[5-9].

An individual's QoL is a multi-dimensional concept that is related to physical, mental, social, emotional, and individual functioning^[10]. Women in modern society view taking a break in their career to give birth and rear their children as decreasing their quality of life. This causes an increase of married couples who give up having a child and Korea's demographic structure has been jeopardized due to the decrease in fertility rate. Thus women's efforts to keep up their QoL and increase their social roles have brought about the avoidance of childbirth.

Therefore, it is necessary to positively change perceptions of childbirth by implementing policies that can make it easier for women to carry out their work and

Corresponding Author:

Myoung-Hee Kim

Professor, Department of Nursing,
Semyung University, Korea

Email: mh1352@semyung.ac.kr

rear their children instead of encouraging them avoid childbirth. The study seeks to investigate how factors associated with childbirth such as the age at first birthing, number of children, age at last birth, and birth interval affect women's QoL and their health awareness state.

Method

Study Design: This paper is a secondary analysis examining raw data from the Korean National Health and Nutrition Examination Survey VI (KNHANES VI) prosecuted between 2013 and 2015.

Study Population: A total of 5698 women were finally selected as this study subjects from a total of 22,948 participants who completed the Korean National Health and Nutritional Examination Survey between 2013 and 2015. The subjects were married, lived with their partners, had no ongoing illness, and answered in the survey about their age at first and last birth.

Study Variables: This paper used health survey data including demographic characteristics, socio-economic characteristics, disease incidence and prevalence, age of the first birth, age of the last birth, recognition of stress, and perceived health condition in the KNHANES raw data.

The participants' age at the first birth was divided into the following groups: below 20s, between 20 and 29, between 30 and 39, and over 40s. Subjects who had the same age of the first and last birth were indicated as "1" and subjects who reported that they had a different age between the first and last birth were indicated as "2." The birth interval was specified as follows; 1 child when subjects had the same age of the first and last birth and gaps in the mother's age ranging from 1 year ~5 years, 6 years ~10 years, 11 years ~15 years, and over 16 years.

Awareness of level of stress was interpreted as follows; 1 point- hardly/never, 2 points- a little, 3 points- high, and 4 points- extremely high, with higher point values being indicative of higher levels of stress. A subjective health condition was specified as follows; 1 point (very bad), 2 points (bad), 3 points (mediocre), 4 points (good), and 5 points (very good), with higher point values showing better health.

EQ-5D materials were employed to study QoL. EQ-5D is a standard instrument that assesses the QoL related to health conditions which is composed of five areas including mobility, self-care, usual activities, pain/

discomfort, and anxiety/depression. It uses a three-point scale wherein 1 point-no problem, 2 points- some problems, 3 points- serious problems. Subject's quality of life was determined by converting each question into weight values ranging between 1 (excellent) and -1 (worst; worse than dying).

Statistical Analysis

SPSS win 19 was used for analysis, and statistical errors were below 0.05. Statistical analysis was conducted by using complex standard design through applying weight values. Subjects' general characteristics were calculated through frequency and percentage. Differences in the age at the first birthing, number of children, age at the last birth, QoL based on birth interval, recognition of stress, and subjective level of health were analyzed by using a complex sample general linear model (CSGLM).

Ethical Considerations: The Korea National Health and Nutrition Examination Survey was conducted with the approval of the institutional review board of the KCDC and the raw data can be downloaded from the website of the KNHANES for academic research use.

Results and Discussion

The Socioeconomic Related Characteristics of Subjects

Table 1 presents the socioeconomic related characteristics of subjects.

Subjects' age was investigated as follows; 20~29 (3.8%), 30~39 (22.5%), 40~49 (27.7%), 50~59 (25.8%), 60~69 (13.2%), and over 70 (6.9%).

18.8% of subjects had one child and 81.2% had two or more children. 95% of subjects' age at first birth was between 25.74~26.01 and 0.4% of subjects first gave birth when they were over 40. 95% of subjects' age at last birth was between 29.47~29.73 and this indicated that subjects stopped giving birth at a relatively young age. 95% of subjects' birth interval was 3.61~3.83 years and 58.80% of subjects had the birth interval of 1 to 5 years. Regarding subjects' recognition of stress level, 95% CI was 2.14~2.18 points, indicating that majority of subjects experience a low level of stress. In regard to subjects' perceived health, 95% CI was 3.07~3.12 points which indicates subjects feel they have mediocre health.

Table 1: Socioeconomic related characteristics of study participants (N = 5698)

Characteristics	Categories	N ^a	Estimated value (%) ^b	SE (%) ^b
Age (years)	20~29	138	3.80	0.40
	30~39	1115	22.50	0.80
	40~49	1369	27.70	0.80
	50~59	1459	25.80	0.70
	60~69	1046	13.20	0.50
	≥70	571	6.90	0.30
Residential area	Capital (Seoul)	1075	19.60	0.60
	Urban, Metropolitan area	1498	26.30	1.10
	Province	3125	54.20	1.20
Personal income level	Lower class (1st quartile)	1196	21.70	0.70
	Lower-middle class (2nd quartile)	1415	25.40	0.80
	Upper-middle class (3rd quartile)	1567	26.90	0.80
	Upper class (4th quartile)	1499	26.00	1.00
Household income level	Lower class (1st quartile)	829	11.70	0.60
	Lower-middle class (2nd quartile)	1441	25.50	0.80
	Upper-middle class (3rd quartile)	1666	31.00	0.90
	Upper class (4th quartile)	1741	31.80	1.10
Education	≤Elementary school	1378	19.10	0.70
	Middle school	675	11.30	0.50
	High school	1974	37.80	0.80
	≥College	1666	31.80	0.90
Occupation	Professional occupations	578	10.80	0.50
	Other occupations	2179	38.10	0.80
	Unemployed (housewives and students)	2937	51.20	0.80
Basic living allowance (n=5695)	Yes, received	256	4.30	0.30
	No, never received	5439	95.70	0.30
Home ownership (n=5697)	No home ownership	1560	30.00	1.00
	1 household	3312	56.80	0.90
	2 or more household	825	13.20	0.60
Number of children	One person	954	18.80	0.60
	More than two	4744	81.20	0.60
Age of first birth	95% CI: 25.74~26.01 Min.~ Max.: 15~50	5698	25.88	0.069
	Below 19	244	3.80	0.30
	20~29	4618	80.20	0.70
	30~39	814	15.60	0.60
	Over 40	22	0.40	0.10
Age of last birth	95% CI: 29.47~29.73 Min.~ Max.: 16~50	5698	29.60	0.065
	Below 19	13	0.30	0.10
	20~29	2947	51.60	0.80
	30~39	2639	46.60	0.80
	Over 40	99	1.60	0.20

Conted...

Interval between births	95% CI: 3.61~3.83 Min.~ Max.: 0~30	5698	3.72	0.056
	One child	954	18.80	0.60
	1~5 years	3307	58.80	0.80
	6~10 years	1040	16.60	0.50
	11~15 years	282	4.20	0.30
	Over 16 years	115	1.60	0.20
Recognition of stress (n=5656)	95% CI: 2.14~2.18	5656	2.16	0.010
	Barely/never	820	13.50	0.50
	A little	3462	60.80	0.80
	High	1127	21.10	0.70
	Extremely high	247	4.60	0.30
Perceived health status (n=5696)	95% CI: 3.07~3.12 Min.~ Max.: 1~5	5696	3.09	0.013
	Very bad	224	3.20	0.30
	Bad	905	15.60	0.50
	Mediocre	3002	53.20	0.80
	Good	1359	24.50	0.70
	Excellent	206	3.60	0.30

a: Unweighted value, b: Weighted value

Women's QoL and their health awareness state by age of the first birth.

Korean women's QoL and their health awareness state by age of the first birth was indicated in table 2.

There were significant differences in subjects' QoL by age of the first birth (Wald F=15.49, $p<0.001$) and in the sub-categories of quality of life including mobility (Wald F=17.00, $p<0.001$), self-care (Wald F=11.17, $p<0.001$), usual activities (Wald F=9.70, $p<0.001$), and pain/discomfort (Wald F=3.46, $p=0.016$). Additionally, there was significant difference in participants' health awareness state by age of the first birth (Wald F=8.58, $p<0.001$).

Subjects' QoL (5EQ point) showed that women who first gave birth in their 20~29 and 30~39 age range

were higher than participants who first became a mother in their teenage years (Wald F=22.72, $p<0.001$; Wald F=38.42, $p<0.001$, respectively). The sub-categories of QoL including 5EQ (mobility) and 5EQ (usual activities) showed significant differences (Wald F=20.54, $p<0.001$; Wald F=20.19, $p<0.001$, respectively), as women who were 20~29 and 30~39 displayed higher point values of 5EQ compared to participants who were below 20 years of age (Wald F=37.55, $p<0.001$; Wald F=27.00, $p<0.001$, respectively).

In the area of health awareness state, participants who had their first birth in their 20~29 and 30~39 age range felt healthier compared to women who had the first child birth before age 20 (Wald F=14.10, $p<0.001$; Wald F=23.79, $p<0.001$, respectively).

Table 2: EQ-5D and their health awareness state according to age at the first childbirth in Korean women (N = 5698)

Categories	Age at the first childbirth (years)	% ^a	Mean	SE	Estimated value	SE	Wald F	<i>p</i>
5 EQ-Total							15.49	<0.001
	<20	3.80	0.90	0.01	Ref			
	20~29	80.20	0.94	0.01	0.04	0.01	22.72	<0.001
	30~39	15.60	0.96	0.01	0.05	0.01	38.42	<0.001
	>40	0.40	0.93	0.02	0.02	0.02	0.76	0.382

Conted...

5 EQ: mobility							17.00	<0.001
	<20	3.80	1.28	0.03	Ref			
	20~29	80.20	1.13	0.01	-0.15	0.03	20.54	<0.001
	30~39	15.60	1.06	0.01	-0.21	0.03	37.55	<0.001
	>40	0.40	1.19	8.79	-0.09	0.09	1.00	0.316
5 EQ: self-care							11.17	<0.001
	<20	3.80	1.05	0.01	Ref			
	20~29	80.20	1.02	0.01	-0.02	0.01	2.89	0.089
	30~39	15.60	1.00	0.31	-0.04	0.01	10.38	0.001
	>40	0.40	1.09	6.76	0.04	0.06	0.43	0.508
5 EQ: usual activities							9.70	<0.001
	<20	3.80	1.21	0.02	Ref			
	20~29	80.20	1.08	0.01	-0.13	0.03	20.19	<0.001
	30~39	15.60	1.04	0.01	-0.16	0.03	27.00	<0.001
	>40	0.40	1.09	0.06	-0.11	0.07	2.42	0.120
5 EQ: pain/ discomfort							3.46	0.016
	<20	3.80	1.34	0.03	Ref			
	20~29	80.20	1.28	0.01	-0.06	0.03	2.91	0.088
	30~39	15.60	1.22	0.01	-0.11	0.04	7.74	0.006
	≥ 40	0.40	1.26	0.11	-0.07	0.11	0.42	0.513
5 EQ: anxiety/ depression							1.98	0.116
	<20	3.80	1.17	0.03	Ref			
	20~29	80.20	1.12	0.01	-0.04	0.03	1.74	0.187
	30~39	15.60	1.11	0.01	-0.06	0.03	3.35	0.068
	≥40	0.40	1.27	0.10	0.09	0.11	0.76	0.381
Recognition of stress (n=5656)							2.48	0.060
	<20	3.80	2.20	0.05	Ref			
	20~29	80.20	2.15	0.01	-0.04	0.05	0.62	0.429
	30~39	15.70	2.20	0.02	0.01	0.06	0.01	0.890
	≥40	0.30	2.51	0.18	0.31	0.19	2.63	0.105
Perceived health status (n=5696)							8.58	<0.001
	<20	3.80	2.82	0.06				
	20~29	80.20	3.08	0.01	0.26	0.06	14.10	<0.001
	30~39	15.60	3.20	0.03	0.37	0.07	23.79	<0.001
	≥40	0.40	3.00	0.16	0.17	0.18	0.89	0.345

a: Weighted value

Women's QoL and their health awareness state by number of children.

Korean women's quality of life and their health awareness state by number of children was indicated in table 3.

There was significant differences in women's QoL by number of children (Wald F=23.28, $p<0.001$) and in

the sub-categories of quality of life including mobility (Wald F=33.04, $p<0.001$), self-care (Wald F=14.41, $p<0.001$), and usual activities (Wald F=7.52, $p<0.001$).

5EQ point (quality of life) appeared higher among women who had two or more children compared to who had one child (Wald F=23.28, $p<0.001$). Women who had two or more children showed higher quality of life rather

than women who had one child in the sub-categories of QoL including 5EQ-mobility, 5EQ-self-care, and 5EQ-usual activities which displayed significant differences.

Subjects' number of children did not affect women's health awareness state as it did not show any significant difference. This finding is contradicting to findings

in Payne's research ^[11], that is, women perceived their health bad and men perceived their health good in case of having higher number of children. It is analyzed that the subjects of this study had one or two children and consequently the number of children did not affect participants' perceived health status.

Table 3: EQ-5D and their health awareness state according to number of children in Korean women (N = 5698)

Categories	Number of children	% ^a	Mean	SE	Estimated value	SE	Wald F	p
5 EQ-Total	One child	18.80	0.96	0.01	Ref			
	More than two children	81.20	0.94	0.01	-0.01	0.01	23.28	<0.001
5 EQ: mobility	One child	18.80	1.07	0.01	Ref			
	More than two children	81.20	1.14	0.01	0.06	0.01	33.04	<0.001
5 EQ: self-care	One child	18.80	1.01	0.01	Ref			
	More than two children	81.20	1.03	0.01	0.01	0.01	14.41	<0.001
5 EQ: usual activities	One child	18.80	1.05	0.01	Ref			
	More than two children	81.20	1.08	0.01	0.02	0.01	7.52	0.006
5 EQ: pain/discomfort	One child	18.80	1.25	0.01	Ref			
	More than two children	81.20	1.28	0.01	0.02	0.01	2.69	0.101
5 EQ: anxiety/depression	One child	18.80	1.12	0.01	Ref			
	More than two children	81.20	1.13	0.01	0.01	0.01	0.66	0.417
Recognition of stress (n=5656)	One child	18.80	2.19	0.02	Ref			
	More than two children	81.20	2.16	0.01	-0.03	0.02	1.41	0.235
Perceived health status (n=5696)	One child	18.80	3.12	0.02	Ref			
	More than two children	81.20	3.08	0.01	-0.04	0.03	1.59	0.208

a: Weighted value

Women's QoL and their health awareness state by age of the last birth.

Korean women's QoL and their health awareness state by age of the last birth is shown in table 4.

There were no significant differences in women's QoL and their health awareness state by age of the last birth. This indicated that age of the first birth affects

women's health while age of the last birth did not significantly impact on women's QoL and their health awareness state. This study indicated that 95% of subjects' last birth age was before 30 years old and the variables of the last birth age did not show any significant differences in their QoL and their health awareness state. Therefore, it is necessary to have a comparison study that examines more diverse age groups according to the age of the last birth such as in 20s, 30s, and 40s.

Table 4: EQ-5D and their health awareness state according to age at the last childbirth in Korean women (N = 5698)

Categories	Age at the last childbirth (years)	% ^a	Mean	SE	Estimated value	SE	Wald F	p
5 EQ-Total							2.13	0.095
	<20	0.30	0.94	0.03	Ref.			
	20~29	51.60	0.94	0.01	0.01	0.03	0.08	0.773
	30~39	46.60	0.95	0.01	0.01	0.03	0.11	0.735
	≥40	1.60	0.91	0.01	-0.02	0.03	0.39	0.529

Conted...

5 EQ: mobility							1.88	0.131
	<20	0.30	1.08	0.06	Ref.			
	20~29	51.60	1.13	0.01	0.04	0.06	0.50	0.478
	30~39	46.60	1.12	0.01	0.03	0.06	0.37	0.541
	≥40	1.60	1.22	0.04	0.13	0.07	3.37	0.067
5 EQ: self-care							0.75	0.522
	<20	0.30	1.08	0.06	Ref.			
	20~29	51.60	1.02	0.01	-0.06	0.06	0.92	0.337
	30~39	46.60	1.02	0.01	-0.06	0.06	0.94	0.331
	≥40	1.60	1.05	0.02	-0.03	0.06	0.23	0.632
5 EQ: usual activities							1.23	0.296
	<20	0.30	1.28	0.18	Ref.			
	20~29	51.60	1.08	0.01	-0.19	0.18	1.13	0.287
	30~39	46.60	1.07	0.01	-0.20	0.18	1.21	0.271
	>40	1.60	1.12	0.03	-0.15	0.19	0.68	0.409
5 EQ: pain/ discomfort							2.07	0.103
	<20	0.30	1.19	0.091	Ref.			
	20~29	51.60	1.27	0.01	0.08	0.09	0.77	0.379
	30~39	46.60	1.26	0.01	0.07	0.09	0.55	0.459
	≥40	1.60	1.41	0.061	0.22	0.11	3.60	0.058
5 EQ: anxiety/ depression							1.82	0.141
	<20	0.30	1.05	0.05	Ref.			
	20~29	51.60	1.12	0.01	0.07	0.05	1.62	0.203
	30~39	46.60	1.12	0.01	0.07	0.05	1.50	0.220
	≥40	1.60	1.22	0.04	0.16	0.07	5.06	0.025
Recognition of stress (n=5656)							1.91	0.126
	<20	0.30	1.96	0.22	Ref.			
	20~29	51.50	2.15	0.01	0.18	0.22	0.71	0.400
	30~39	46.70	2.17	0.01	0.21	0.22	0.89	0.344
	≥40	1.50	2.32	0.07	0.35	0.23	2.30	0.130
Perceived health status (n=5696)							2.46	0.062
	<20	0.30	3.16	0.30	Ref.			
	20~29	51.60	3.07	0.01	-0.09	0.30	0.09	0.757
	30~39	46.60	3.12	0.01	-0.03	0.30	0.01	0.900
	≥40	1.60	2.97	0.08	-0.19	0.31	0.36	0.544

a: Weighted value

Women's QoL and their health awareness state by the interval between births.

Korean women's QoL and their health awareness state by birth interval is shown in table 5.

This study found that there were significant differences in women's QoL (Wald F=19.71, $p<0.001$)

and sub-categories of QoL including mobility (Wald F=27.31, $p<0.001$), self-care (Wald F=6.27, $p<0.001$), usual activities (Wald F=10.79, $p<0.001$), and pain/discomfort (Wald F=7.73, $p<0.001$). And there were significant difference in their health awareness state by the interval between births (Wald F=8.50, $p<0.001$).

Women who had one child and women who had their second child within 5 years after the first one did not show any significant differences in 5EQ point (quality of life). However, women's QoL decreased among those who had birth intervals of 6~10, 11~15, and over 16 years compared to women who had only one child (Wald F=41.31, $p<0.001$; Wald F=39.85, $p<0.001$; Wald F=21.05, $p<0.001$, respectively).

Women who had one child and women who had their second child within 5 years after the first one did not show any significant differences in their health awareness state. However, women's health awareness state diminished among those who had a birth interval of 6~10, 11~15, and over 16 years compared to women who had one child (Wald F=9.20, $p=0.003$; Wald F=10.34, $p=0.001$; Wald F=12.57, $p<0.001$, respectively).

Table 5: EQ-5D and their health awareness state according to birth interval in Korean women (N = 5698)

Categories	Birth interval (years)	% ^a	Mean	SE	Estimated value	SE	Wald F	<i>p</i>
5 EQ-Total							19.71	<0.001
	One child	18.80	0.96	0.01	Ref.			
	1~5	58.80	0.95	0.01	-0.01	0.01	2.98	0.085
	6~10	16.60	0.93	0.01	-0.03	0.01	41.31	<0.001
	11~15	4.20	0.90	0.01	-0.06	0.01	39.85	<0.001
	≥16	1.60	0.87	0.01	-0.08	0.01	21.05	<0.001
5 EQ: mobility							27.31	<0.001
	One child	18.80	1.07	0.01	Ref.			
	1~5	58.80	1.10	0.01	0.02	0.01	6.59	0.010
	6~10	16.60	1.20	0.01	0.12	0.01	51.97	<0.001
	11~15	4.20	1.31	0.03	0.24	0.03	51.12	<0.001
	≥16	1.60	1.38	0.05	0.31	0.05	34.80	<0.001
5 EQ: self-care							6.27	<0.001
	One child	18.80	1.01	0.01	Ref.			
	1~5	58.80	1.02	0.01	0.01	0.01	3.78	0.052
	6~10	16.60	1.04	0.01	0.03	0.01	16.79	<0.001
	11~15	4.20	1.07	0.01	0.05	0.01	11.59	0.001
	≥16	1.60	1.09	0.02	0.08	0.03	7.33	0.007
5 EQ: usual activities							10.79	<0.001
	One child	18.80	1.05	0.01	Ref.			
	1~5	58.80	1.06	0.01	0.01	0.01	0.50	0.478
	6~10	16.60	1.12	0.01	0.06	0.01	18.47	<0.001
	11~15	4.20	1.17	0.02	0.11	0.02	18.40	<0.001
	≥16	1.60	1.21	0.04	0.15	0.04	11.65	0.001
5 EQ: pain/discomfort							7.73	<0.001
	One child	18.80	1.25	0.01	Ref.			
	1~5	58.80	1.25	0.01	0.01	0.01	0.01	0.965
	6~10	16.60	1.32	0.01	0.07	0.02	9.89	0.002
	11~15	4.20	1.40	0.03	0.15	0.04	12.99	<0.001
	≥16	1.60	1.45	0.07	0.19	0.07	7.56	0.006
5 EQ: anxiety/depression							2.04	0.087
	One child	18.80	1.12	0.01	Ref.			
	1~5	58.80	1.12	0.01	0.01	0.01	0.01	0.909
	6~10	16.60	1.15	0.01	0.03	0.01	2.68	0.102
	11~15	4.20	1.15	0.02	0.03	0.02	1.05	0.305
	≥16	1.60	1.22	0.04	0.10	0.05	3.97	0.047

Conted...

Recognition of stress (n=5656)							1.44	0.217
	One child	18.80	2.19	0.02	Ref.			
	1~5	58.90	2.16	0.01	-0.03	0.03	1.10	0.295
	6~10	16.50	2.16	0.02	-0.03	0.03	0.65	0.418
	11~15	4.10	2.07	0.04	-0.12	0.05	4.73	0.030
	≥16	1.60	2.22	0.07	0.03	0.08	0.16	0.684
Perceived health status (n=5696)							8.50	<0.001
	One child	18.80	3.12	0.02	Ref.			
	1~5	58.80	3.13	0.01	0.01	0.03	0.03	0.858
	6~10	16.60	3.00	0.03	-0.12	0.04	9.20	0.003
	11~15	4.20	2.91	0.06	-0.21	0.06	10.34	0.001
	≥16	1.60	2.77	0.09	-0.35	0.10	12.57	<0.001

a: Weighted value

Conclusion

One of the factors for continuing low fertility rates is due to women's perception that the childbirth process would reduce their quality of life and negatively impact their health. This research sought to examine how childbirth affects women's quality of life and their perceived health conditions retrospectively and the findings indicate that if the first birth occurred before 20 years of age, childbirth affected women's quality of life and their perceived health. However, if the first birth occurred after age 20, childbirth did not impact women's quality of life and their perceived health conditions. Therefore, this study confirmed that childbirth does not necessarily have a negative impact on women's quality of life and their health and the results of this study should be used to change women's negative perception on childbirth.

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A Study on Reduction of Exposure Dose According to Use of Cone in Radiologic Examination of Paranasal Sinus

Cheong-Hwan Lim¹, Sung-Hun Jeoung², Hyung-Ok Song³

¹Research Scholar Dept. of Radiological Science, Hanseo University; ²Professor Dept. of Radiology, Seosan Jung-AngJeneral Hospital; ³Research Scholar Dept. of Radiology, Ik San Hospital

ABSTRACT

It aimed to seek the measures to decrease the exposure dose of radiation for the patients as well as the guardians during the paranasal radiography upon the survey on the usage of cone, which is the radiation shielding material in the paranasal radiography in the medical institutions, to measure the exposure dose to the patients depending on the usage of cone. The cone, diagnostic radiator, Ion Chamber, and Skull Phantom were used. The mean value was obtained measuring the points of 5° intervals of 0°, 45°, 90°, 135°, 180°, 225°, and 315° at 15cm from the center of the phantom five times each. In addition, the space dose was measured up to 200cm while increasing the distance with a radius of 50 cm from the center of the phantom. The spatial scattering dose distribution was measured five times at 50cm, 100cm, 150cm, and 200cm intervals in the directions of 0°, 45°, 135°, and 180° based on the phantom. 60% of medical institutions did not have the radiation shielding device of a cone and 74.4% did not use the cone in paranasal sinus examination. In the comparison of doses between the use and non-use of a cone, the dose decreased by 50.8% at 0°, 47.3% at 45°, 35.7% at 90°, 59.2% at 135°, 39.8% at 180°, 27.3% at 225°, and 46.4% at 315° when the cone was used. The spatial dosimetry according to the distance was highest at 11.56mR/h at 0°, 1.08mR/h at 45°, 1.59mR/h at 135°, and 0.94mR/h at 180°. In addition, spatial scattering rays were reduced to 92.7% when the cone was used as compared to when no cone was used. Therefore, a cone should be used in the radiologic examination of paranasal sinuses, and radiation workers and the family protector should also ensure that they are a safe distance away in order to prevent exposure by secondary radiation.

Keywords: Cone, Spatial Dosimetry, Paranasal sinus, Dosimetry according, Nasosinusitis

Introduction

Pediatric nasosinusitis is a disease that is associated with expensive socio-economic costs. It is known that upper airway infections are caused by the virus, that is, cold is the leading cause of nasosinusitis in children. An average of six to eight viral upper airway infections attacks each child every year, and 0.5 to 5.0% of such colds develop to acute bacterial nasosinusitis. In addition, allergic rhinitis, asthma, immunodeficiency, cystic fibrosis, primary ciliary dyskinesia, and gastroesophageal reflux are known to be leading causes

of or diseases related to pediatric nasosinusitis^{1,2}. Pediatric patients are known to be more susceptible to nasosinusitis than adults, but clinical progress varies from person to person. As the immune system develops, the possibility of natural healing increases. Therefore it is necessary that the choices of antibiotics, adjuvant agents, and surgical treatment are necessary are made in consideration of individual circumstances³. Children are highly susceptible to radiation and need to be examined using a radiation shielding device in order to optimize the exposure dose during general radiography^{4,5}. Radiologic examination of the paranasal sinus using a beam regulator (Cone), which is a radiation shielding device, can reduce the exposure dose and improve the penumbra removal and sharpness⁶. However, many medical institutions often use diagnostic radiation generators without a cone, which is a radiation shielding device, while using the Crop function to automatically

Corresponding Author:

Sung-Hun Jeoung
Professor, Dept. of Radiology,
Seosan Jung-AngJeneral Hospital
Email: jounghsun@naver.com

cut the image with a Digital Radiography (DR) system. If a cone is not used, the patient's exposure dose will increase and penumbra will occur. In addition, pediatric patients are often accompanied by a radiologist, so the exposure dose of the caregiver should be considered in addition to that of the patient^{7,8}. The purpose of this study is to investigate the use of a cone as a radiation shielding device in the radiologic examination of paranasal sinus and to evaluate the exposure dose of patients according to the presence or absence of a cone in radiologic examination of paranasal sinus, and to provide basic data for ensuring radiation safety management.

Dosimetric Instrument and Method

Dosimetric Instrument: A cone, a beam shielding device, was used to compare doses according to the presence or absence of the cone. The cone (beam-shielding device), diagnostic radiator (TE82F, R-150-650, Dong Kang Medical, Korea), Ion Chamber (Radical Corporation, Electrometer ion Chamber, U.S.A), and Skull Phantom were used to measure the spatial dose. G power program (Version 3.1.9.2, University of Kiel, Kiel, Germany) was used to select the number of subjects.

Survey Measurement: The structured questionnaire consisted of two questions about the presence or absence of the cone and whether or not to use the cone, as well as four more general questions. The four general questions involved hospital size, gender, age, and hospital experience. The questionnaire was certified by the Bioethics Committee of the Ministry of Health and Welfare of the Republic of Korea. The number of radiographer subjects in this questionnaire was analyzed by the G power program. In the F-test, the number of specimens required to maintain a median magnitude of 0.25 and maintain a power of 0.8 at a significance level of 0.05 was 102, but 120 radiographers were selected by convenience extraction in anticipation of a 10% dropout rate (IRB:P01-201812-22-001).

Dosimetry Method: The paranasal sinus radiation dose was measured in the case using the radiation shielding device cone and the case not using the cone. The conditions used for the measurement were the recommended conditions for head testing according to the Diagnostic Reference Level (DRL) of the Republic of Korea Ministry of Food and Drug Safety, which is FID 100cm. The test conditions were 76kVp and 25mAs. The mean value was obtained measuring the points of 5° intervals of 0°, 45°, 90°, 135°, 180°, 225°, and 315° at 15 cm from the center of the phantom five times each.

In addition, the space dose was measured up to 200 cm while increasing the distance with a radius of 50 cm from the center of the phantom. The spatial scattering dose distribution was measured five times at 50cm, 100cm, 150cm, and 200cm intervals in the directions of 0°, 45°, 135°, and 180° based on the phantom (Fig. 1), (Fig. 2).

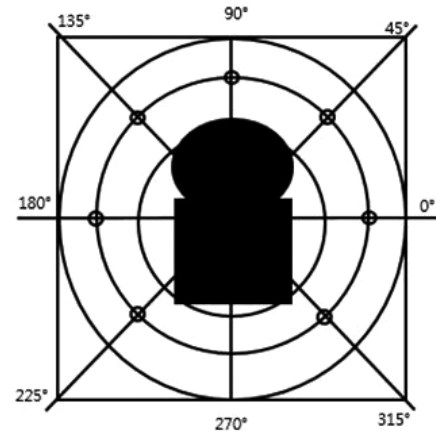


Figure 1: Dosimetry Methodpoint

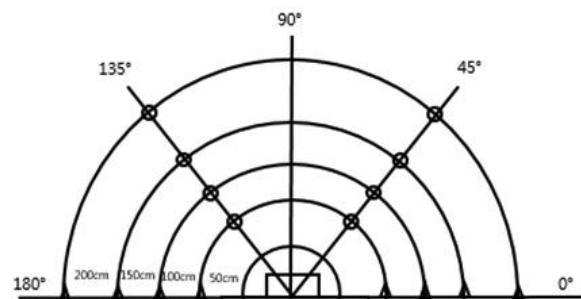


Figure 2: Spatial Dosimetry

Statistical Analysis

The dose according to the measured location was calculated by SPSS (statistical package for the social sciences) Ver. 24.0, the descriptive statistics were used to measure the Komogorov-smimov fitness test, mean and standard deviation. The paired t-test was used to compare the mean dose difference prior to and after cone use. The results were considered to be statistically significant if the p-value was less than 0.05.

Results

Analysis of Survey According to Use of Cone

General Characteristics of Subjects

The most common characteristics according to the use of the cone were male 86 persons, and female 39 persons, the most common age was 30s 52 persons,

age of 20s 33 persons, and age of 40s 25 persons. The most common size of the hospital where one works was a university hospital size 53 persons, a general hospital size 39 persons, and normal hospital and clinic size 17 persons. The most common length of hospital career was seven years or more with 76 persons (Table. 1).

Table 1: General Characteristics of Subjects (N = 120)

Division		N	%
Sex	Male	86	68.8
	Female	39	31.2
Age	20's	33	26.4
	30's	52	41.6
	40's	25	20.0
	50's	15	12.0
Size Of The Hospital	University Hospital	53	42.4
	General Hospital	39	31.2
	Specialized Hospital	16	12.8
	Private Hospital(clinic)	17	13.6
Hospital Career	1 year below	4	3.2
	1 and below 3 years group	18	14.4
	3 and below 5 years group	14	11.2
	5 and below 7 years group	13	10.4
	7 years group	76	60.8
N= Number of persons, %=Percent			

Display and Use of Cone: In the question about whether or not one has a cone, 75 persons, answered that they did not have a cone at their medical institution, and 49 persons, answered that they did have a cone. In the paranasal sinus test, 93 persons answered that they did not use the cone in either pediatric or adult tests, 23 persons answered that they always used it in both pediatric and adult tests, 4 persons answered that they used it only with adults, and 3 persons responded that

they used it only for children, so most of the medical institutions did not use a cone for paranasal sinus examination (Table. 2).

Table 2: Display and Use of Cone (N = 120)

Division		N	%
Whether to have or not	We have cone	49	39.2
	We don't have cone	75	60.0
	No answer	1	0.8
Whether to use or not	Both adult and child always use cone	23	18.4
	Only child uses cone	3	2.4
	Only adult uses cone	4	3.2
	Neither child nor adult uses cone	93	74.4
	No answer	2	1.6
N= Number of persons, %=Percent			

Dosimetry According to Use of Cone

Detector Dosimetry According to Use of Cone:

As a result of measuring the descriptive statistics and paired t-test in order to analyze the dosage difference according to the use of the cone, the researcher obtained the following results: The dose was 50.12 $\mu\text{R/h}$ when not using a cone at 0° , 24.64 $\mu\text{R/h}$ when using a cone, indicating a 50.8% decrease when using the cone. At 45° , the dose decreased by 47.3% when using the cone, and decreased by 35.7% when used at 90° . At 135° , the dose decreased by 59.2% when the cone was used and decreased by 39.8% when used at 180° . At 225° , the dose decreased by 27.3% when using the cone and decreased by 46.4% when using the cone at 315° . According to the paired t-test, the t-values were 14.59 at 0° , 27.64 at 45° , 7.81 at 90° , 69.64 at 135° , 22.78 at 180° , 12.54 at 225° , and 48.28 at 315° . The differences in dosages were statistically significant ($p < 0.000$), (Table 3).

Table 3: Detector dosimetry according to Use of Cone (N = 120)

Measuring Direction	Using Cone	Min	Max	Aver	S.D	T-Value
0°	No	50.10	50.20	50.12	0.05	14.59***
	YES	20.00	29.00	24.64	3.93	
45°	No	52.30	53.20	52.86	0.39	27.64***
	YES	27.00	31.00	28.40	1.67	
90°	No	53.20	53.90	53.52	0.31	7.81***
	YES	26.00	40.10	34.42	5.23	
135°	No	54.80	55.40	55.12	0.39	69.64***
	YES	22.00	24.00	22.50	1.67	

Conted...

180°	No	52.80	53.90	53.36	0.05	22.78***
	YES	30.10	35.10	32.14	3.93	
225°	No	41.30	41.90	41.54	0.11	12.54***
	YES	28.10	33.00	30.20	0.82	
315°	No	34.00	34.30	34.16	0.11	48.28***
	YES	17.10	19.10	18.32	0.82	
Min: Minimum, max: maximum, S.D: Standard Deviation, ***p<0.001						

Spatial Dosimetry According to Distance: Spatial dosimetry showed the following results. The dose was 11.56mR/h when not using the cone and 0.84mR/h when using the cone at 50cm in the direction of 0°, indicating that the dose decreased by 92.7% when using the cone. The dose decreased by 22.7% when using the cone at 100cm. At 150cm and 200cm, the mean was 0.1mR/h, which was the same before and after using the cone. The dose was 0.91mR/h when not using the cone and 0.30mR/h when using the cone at 50cm in the direction of 180°, and the

dose decreased by 68.1% when using the cone. At 100 cm, the dose decreased by 57.7% when using the cone. At 150cm, the dose decreased by 57.1% when using the cone. At 200cm, the mean value was 0.1mR/h, which was the same before and after using the cone. In the paired t-test, the t-value in the 0° direction was 64.76 at 50 cm and 1.82 at 100 cm, with a statistically significant difference only at 50 cm. The direction of 180° was 16.0 at 50cm, 5.47 at 100cm, and 6.53 at 150cm, which showed a statistically significant difference (Table 4).

Table 4: Spatial Dosimetry according to Distance (N = 120)

Measuring Direction		Using Cone	Min	Max	Aver	S.D	T-Value
0°	50cm	No	11.00	11.80	11.56	0.32	64.76***
		YES	0.80	0.90	0.84	5.23	
	100cm	No	0.30	0.50	0.44	0.09	1.82
		YES	0.20	0.40	0.34	0.09	
	150cm	No	0.10	0.10	0.10a	0.00	-
		YES	0.10	0.10	0.10a	0.00	
	200cm	No	0.10	0.10	0.10a	0.00	-
		YES	0.10	0.10	0.10a	0.00	
180°	50cm	No	0.90	1.00	0.94	0.11	16.0***
		YES	0.20	0.40	0.30	0.07	
	100cm	No	0.40	0.60	0.52	0.08	5.47***
		YES	0.20	0.30	0.22	0.04	
	150cm	No	0.20	0.30	0.28	0.04	6.53***
		YES	0.10	0.20	0.12	0.04	
	200cm	No	0.10	0.10	0.10a	0.00	-
		YES	0.10	0.10	0.10a	0.00	
min: Minimum, max: maximum, S.D: Standard Deviation, ***p<0.001, p>0.5							

Spatial Dose in 45° Angle from Center Line: The result of the space dose measurement at the 45° angle from the center line is as follows. The dose was 1.08mR/h when the cone was not used and 0.28mR/h when the cone was used at 50cm in the direction of 45°, indicating that the dose decreased by 74.1% when the cone was used. The

dose decreased by 53.3% when the cone was used at 100 cm and the dose decreased by 66.7% when the cone was used at 150 cm. At 200 cm, the dose decreased by 50.0% when the cone was used. The dose was 1.59mR/h when the cone was not used and 0.38mR/h when the cone was used. The dose decreased by 76.1% when the cone was

used. At 100cm, the dose decreased by 65.8% when the cone was used and the dose decreased by 56.2% when the cone was used at 150cm. In the case of 200 cm, the dose decreased by 44.4% when the cone was used. The paired t-test showed a t-value of 45.9° in 50cm with a mean of

8.94 and a mean of 3.16 in 200cm, with a statistically significant difference only in 50cm ($p < 0.000$). The 135° direction showed statistically significant differences from each of 33.07 at 50cm, 9.12 at 100cm, 5.09 at 150cm, and 4.00 at 200cm (Table 5).

Table 5: Spatial Dose in 45° Angle from Center Line (N = 120)

Measuring Direction		Using Cone	Min	Max	Aver	S.D	T-Value
45°	50cm	No	0.80	1.20	1.08	0.39	8.94***
		YES	0.20	0.30	0.28	1.67	
	100cm	No	0.60	0.60	0.60	0.00	-
		YES	0.20	0.30	0.28	0.05	
	150cm	No	0.30	0.30	0.30a	0.00	-
		YES	0.10	0.10	0.10a	0.00	
	200cm	No	0.10	0.30	0.20	0.07	3.16
		YES	0.10	0.10	0.10	0.00	
135°	50cm	No	1.50	1.63	1.59	0.045	33.07***
		YES	0.30	0.40	0.38	3.93	
	100cm	No	0.70	0.80	0.76	0.06	9.12***
		YES	0.20	0.50	0.26	0.13	
	150cm	No	0.30	0.50	0.46	0.09	5.09***
		YES	0.10	0.30	0.20	0.07	
	200cm	No	0.10	0.20	0.18	0.05	4.00***
		YES	0.10	0.10	0.10	0.00	
min: Minimum, max: maximum, S.D: Standard Deviation, ***p<0.001, p>0.5							

Considerations

The use of radiation in medical institutions has led to significant advances in the detection of patients' illnesses. However, there is a loss of radiation exposure caused by medical radiation, while the benefits and harms of radiation have always coexisted. Medical radiation is the most important cause of radiation exposure, and from the viewpoint of radiation protection, the management of medical radiation is crucial⁹. Although the three principles of time, distance, and shielding are specified as methods for reducing the radiation exposure, if the principles of time and distance cannot be fulfilled, radiation shielding should be provided to the patient and the radiation workers with appropriate shielding. These shields are intended to prevent scattering rays, while preventing exposure by a single lane¹⁰. According to Kim Bum Hee's previous research, doctors and specialists who work in operating rooms are not able to find lead glasses, shields, or thyroid shields, and these are not available at medical institutions either¹¹. In this

study, 60% of participants answered that the radiation shielding device of a cone was not used in their work settings, and only 39% of the users answered that they had a cone. In addition, 74.4% answered that they did not use the cone in paranasal sinus tests, and only 18.4% answered that they used it all the time. These shielding devices play an important role in radiation protection. In this study, the researcher measured the dose according to each angle when using the cone in the paranasal sinuses test. As a result, when the dose was measured using a cone at 0°, the dose decreased by 50.8%. In addition, the dose reduction was 47.3% at 45°, 35.7% at 90°, 59.2% at 135°, 39.8% at 180°, 27.3% at 225°, and 46.4% at 315°. The difference in the dose between the use and non-use of a cone was statistically significant ($p < 0.000$). These results show how important shielding devices are in reducing radiation exposure. Radiation involves electromagnetic waves that have no charge or mass, and when they collide with a subject, transmission, absorption, and scattering occur. In addition, the

«distance reciprocity law» is applied¹², in which the dose intensity at a distance from the source is halved. In a previous study by Jeon Min Cheol, a phantom was placed on the radiological examination table, and when the distance was doubled, the results were 23.09% and 10.43%, respectively, and 100% when the distance was 42.5cm. In a previous study by Park, Chang-hee, the dose of 5.51 μ Sv/h at a 50cm distance from the patient during abdominal examination in a mobile X-ray generator was less than the natural radiation dose and an average of 219cm away from the patient¹³. According to the report of Huh Yeji et al., scattering rays around the table in the shooting room were 3.3 ~ 7.76 μ Sv when measured horizontally and 8.02 ~ 19.18 μ Sv when measured vertically^{14, 15}. In this study, the spatial scattering rays along the distance were measured at 50, 100, 150, and 200 cm at 0°, 45°, 135°, and 180 ° with respect to the center of the phantom. The doses were the highest at 11.56mR/h at 0°, 1.08mR/h at 45°, 1.59mR/h at 135°, and 0.94mR/h at 180°. In addition, the scattering rays due to the use of the cone were reduced by up to 92.7% compared to when the cone was not used. When a patient undergoes a radiological examination at a medical institution, they are examined even if there will be radiation exposure, because it is more important to find and treat the disease than to avoid damage by radiation. However, scattering rays generated by the radiation when the test is performed cause spatial scattering rays, which cause indirect exposure without benefit to the patient's protector or radiation worker. Therefore, the amount of surveillance is increasing due to pollution in the environment. In the case of paranasal sinuses, which are frequently examined in pediatric patients, a cone, a radiation shielding device, should be used. If shielding devices are used, it will be helpful to reduce the amount of radiation experienced by radiation workers from two - dimensional space scattering rays.

Conclusion

In this study, the spatial dose according to the use of the cone was studied and the following conclusions were obtained.

1. 60% of medical institutions did not have the radiation shielding device of a cone and 74.4% did not use the cone in paranasal sinus examination.
2. In the comparison of doses between the use and non-use of a cone, the dose decreased by 50.8%

at 0°, 47.3% at 45°, 35.7% at 90°, 59.2% at 135°, 39.8% at 180°, 27.3% at 225°, and 46.4% at 315° when the cone was used.

3. The spatial dosimetry according to the distance was highest at 11.56mR/h at 0°, 1.08mR/h at 45°, 1.59mR/h at 135°, and 0.94mR/h at 180°. In addition, spatial scattering rays were reduced to 92.7% when the cone was used as compared to when no cone was used.

Therefore, a cone should be used in the radiologic examination of paranasal sinuses, and radiation workers and the family protector should also ensure that they are a safe distance away in order to prevent exposure by secondary radiation.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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The Relationship between Mental Health and Drug-use among Nepali Adolescents

Eunsil Kim¹, Sirjana Thapa¹

¹Assistant professor, Department of Child Welfare, Namseoul University

ABSTRACT

The purpose of this study is to identify the mental health status of Nepali adolescents and understand the factors that trigger the risk of drug-use. Survey has been conducted in the capital city of Kathmandu and Bhaktapur with 463 Nepali adolescents age group 13 to 19 using the scales of anxiety, depression, stress, cognitive-emotion regulation, self-esteem, potential drug-use. The results of this study are as follows. First, the level of anxiety, depression, and stress are within the scope of 'mild to moderate,' 'mild,' 'moderate' respectively. The level of self-esteem is within the range of 'normal,' and potential of drug-use is also within the scope of 'non-potential drug-use.' Second, the mental health-related variables selected in this study is accounted for about 23.4% of potential drug-use. Depression, self-esteem, and less adaptive cognitive emotional regulation has a significant impact on potential drug-use, while other variables do not. This study is worthwhile to provide basic data for the development of a mental health program and addiction prevention programs for Nepali adolescents.

Keywords: Nepali adolescents, mental health, potential drug-use, anxiety, depression, stress, self-esteem

Introduction

Drug abuse is one of the diseases that make human life unhappy and interfere with functioning as a healthy society, causing severe personal and social problems [1]. Also, it can lead to somatic symptoms (such as headache, insomnia, digestive, cardiovascular and immune system problems), cause mental health problems (such as anxiety, depression, and antisocial), and increase the risk of suicide. Besides, drug abuse is also associated with crime and may cause social harm.

Adolescence is a time of significant growth and development in the brain and may have various adverse effects by drug-use in a wide variety of areas such as learning, interpersonal, cognitive and language, and emotional development. And adolescent drug abuse is also known as a risk factor that increases the possibility of addiction in adulthood [2]. In particular, the use of

medication before the age of 14 increases the likelihood of experiencing depression, suicidal thoughts, attempts and psychopathology.

Nepal is a multi-ethnic, cultural, religious, bi-lingual society and has diverse customs, the caste system. Sometimes, substances use such as alcohol and marijuana is socially accepted according to those various customs and traditions. As a result, the production, sale and consumption of alcohol are increasing in Nepal [3], which caused high rate (17.4%) of alcohol use among adolescents [4]. The prevalence of drug-use and abuse among Nepali adolescents is 10%, and more than three quarters (81.2%) of illegal substance users responded that they had started before 20 years old. Despite the high risk of drug-use, there are fewer numbers of rehabilitation centers that also may lack specialized adolescent treatment programs in Nepal.

In order to develop prevention programs for drug abuse, it is necessary to identify drug-use status and influential factors. So far there have been many studies on the relationship between drug-use and psychosocial factors, such as ethnic and culture, family relationships, peer relationships, and a history of family drug-use. Moreover, many pieces of research have shown a

Corresponding Author:

Sirjana Thapa

Assistant Professor, Department of Child Welfare,
Namseoul University, Korea

Email: sriyonse@gmail.com

strong association in mental health with drug-use^[5-6]. In particular, depression has a direct effect on adolescents' drug abuse. Anxiety is also a factor that increases the risk of drug-use because adolescents try to consume drugs to reduce tension or attempt at self-medication. However, the self-medicating individual may be at high risk for mood disorders, substance use disorders, and suicidal behavior. Moreover, stress also increases the likelihood of drug-use. In particular, social stress and economic stress are found to be a trigger of adolescent drug-use. In the case of Nepal, many people have posttraumatic stress disorder due to an earthquake in 2015, which is expected to increase the likelihood of drug-use among adolescents in Nepal.

Recently, studies on protective factors among mental health factors such as self-esteem and cognitive-emotional regulation ability have been actively conducted. Self-esteem is the subjective assessment of one's worth as a person. Concerning drug-use, it has a significant relationship with self-esteem. Self-esteem itself is considered to be a critical factor in preventing adolescent drug-use. While some researchers reported a strong relationship between self-esteem and drug abuse, some others reported a weak relationship. Another important protective factor is Cognitive Emotion Regulation (CER). It is a cognitive way of managing the intake of emotionally arousing information. CER was found to play an essential role in the relationships between the negative experiences of life and the reporting of symptoms of depression and anxiety^[7]. In recent years; research is underway to clarify which CER strategies are protecting the drug-use.

Prevention in addiction is crucial before it reaches the level of addiction. For this reason, in many countries, drug abuse prevention education for young people is mandatory. However, Nepal is still behind and there is few professional preventive educational treatment programs that exist for an adolescent who suffers from drug-use. Especially, research on the relationship between adolescent drug abuse potential and mental health has not been conducted yet. In order to develop drug abuse preventive treatment programs for adolescents, it is necessary to identify adolescent drug abuse inducement factors and their protective factors, and to identify the relationship between those factors. Therefore, this study aims to investigate the mental health status and drug-use risk factors of adolescents in Nepal. Research problems are as follows. First, what are the potential drug-use and

mental health of adolescents in Nepal? Second, what are the relationship between mental health and drug-use among Nepali adolescents?

Materials and Method

Participants: Four hundred sixty-three adolescents in Nepal participated during the Survey. Amongst, 233 are men and 230 are women. The participants' age was 13 to 19 years. The criteria for youth age can be defined variously by each nation, and this study follows the criteria provided by WHO, ages 13 to 19. The age group is 14 years (22.9%) higher, respectively, 15 years (18.6%), 17 years old (16.8%), 13 years old (13.8%), 18 years old (13.6%) and 16 years old (12.5%).

Procedure: The survey conducted by two trained Nepali students who are currently studying master degree and each questionnaire was conducted by face to face method. If students did not understand the questionnaire items, an additional explanation was provided. A total of six questionnaires (133 items) were translated into Nepali. In the translation process, two international students from Nepal who are fluent in Nepali and English translated English to Nepali. Also, the translation results were compared and revised. Then, the translation into Nepali was translated into English and compared with the English text. Then a professor from Nepal edited and confirmed the results.

Tools

Anxiety (Beck Anxiety Inventory, BAI): BAI is a multiple-choice self-report inventory that is used for measuring the severity of anxiety^[8]. The standardized cutoffs are: 0–9(normal to minimal), 10–18(mild to moderate), 19–29(moderate to severe), 30–63(severe). In this study, BAI's Cronbach's α was .85.

Depression (Beck Depression Inventory, BDI): BDI is a multiple-choice self-report inventory for measuring the severity of depression^[9]. In this study, Cronbach's α of BDI was .83. The standard cut-off scores were as follows: 0–9(minimal), 10–18(mild), 19–29(moderate), 30–63(severe).

Stress (Perceived Stress Scale, PSS): The Perceived Stress Scale (PSS) is the most widely used psychological instrument for measuring the perception of stress^[10]. Cronbach's α was .70 or higher in several studies using this scale, but it was .54 in this study. The standard cut-off scores were as follows: 0-13 (low), 14-26 (moderate), 27-40 (high).

Cognitive Emotion Regulation (Cognitive Emotion Regulation Questionnaire, CERQ): CERQ is a multidimensional questionnaire constructed in order to identify the cognitive coping strategies someone uses after having experienced adverse events or situations [11]. The CERQ is a self-report questionnaire consisting of 18 items. The Cronbach's α of CERQ was .88 at the end of the study. In this study, Cronbach's α of CERQ was .88.

Self-esteem (Rosenberg Self-Esteem Scale, SES): SES consists of a total of 10 questions [12]. The cut-off point for problematic self-esteem is 15 points. The Cronbach's α of SES was .61.

Potential Drug-use (Screening Scale for Potential Drug-use Adolescents, SPDA): SPDA was designed to screen potential drug-users [13]. A total of 35 items consist of a 4-point scale. Potential drug-use cut-off point for adolescent screening is 73 points. The potential group is 73 points or more, and the non-potential group is 73 points or less. Cronbach's α of the SPDA was .90.

Statistical Analysis

Descriptive analysis was employed to determine the level of mental health in the study group. And a Pearson r correlation coefficient was calculated to test whether potential drug-use is associated with mental health variables. A multiple regression analysis was calculated for each outcome of interest. A significance level of $p < .05$ was applied. All data were analyzed using SPSS.

Ethical Considerations: Ethical approval was obtained from the Nepal government (NHRC No. 2485) and Namseoul University Research Ethics Committee in South Korea (No. NSUIRB-201807-001).

Results and Discussion

Mental Status: Table 1 shows that the mean of anxiety ($M = 15.94$) of Nepali adolescents was within the range of 'mild to moderate'. And there was a significant difference between male and female adolescents ($t = -2.86, p = .004$) and among school levels ($F = 3.51, p = .031$).

The mean of depression ($M = 14.89$) of Nepali adolescents was within the range of 'mild' level (19-29 points). There was a significant difference between male and female adolescents ($t = -3.78, p = .001$) and among school levels ($F = 4.27, p = .015$).

The mean of stress ($M = 18.54$) of Nepali adolescents was also within the range of 'moderate' (14-26 points). Results showed the stress level of female students was significantly higher than male students ($t = -3.12, p = .002$) and the higher secondary adolescents was significantly higher ($F = 4.26, p = .015$).

The mean of self-esteem ($M = 17.15$) of Nepali adolescents belonged to the normal level (over 15 points). However, problematic low self-esteem was 32.2%. There was no significant difference between male and female, and among school levels ($F = 2.34, p = .098$).

The mean of potential drug-use ($M = 65.46$) of Nepali adolescents indicates it is not within the range of potential drug-use group (greater than 73). However, 29.2% of the students were within the potential drug-use group. There was a significant difference between male and female adolescents ($t = 3.39, p = .001$) and among school levels ($F = 32.02, p = .001$).

Table 1: Descriptive Statistics of Mental Health Factors

Var.	Sex	Male				Female				Total			
	School Level	M	LS	HS	Sum	M	LS	HS	Sum	M	LS	HS	Sum
	n	69	66	98	233	68	63	99	230	137	129	197	463
Anxiety	M	14.52	13.56	16.00	14.87	15.43	16.92	18.20	17.03	14.97	15.20	17.11	15.94
	SE	9.18	6.82	7.98	8.09	8.82	7.39	8.10	8.18	8.98	7.27	8.10	8.20
Depression	M	12.71	11.65	15.08	13.41	14.82	16.54	17.37	16.39	13.76	14.04	16.23	14.89
	SE	6.60	7.67	8.54	7.87	9.40	8.91	8.88	9.07	8.15	8.62	8.77	8.61
Stress	M	17.41	17.74	18.23	17.85	17.82	19.41	20.11	19.24	17.61	18.56	19.18	18.54
	SE	4.12	4.85	4.51	4.49	4.94	5.40	4.86	5.11	4.53	5.18	4.77	4.85
Self-esteem	M	17.57	18.06	16.84	17.40	17.43	16.96	16.49	16.90	17.50	17.52	16.66	17.15
	SE	3.50	3.74	3.77	3.71	5.00	4.98	4.09	4.62	4.30	4.41	3.93	4.19
Potential Drug-use	M	60.49	64.48	74.73	67.61	62.87	57.08	67.49	63.27	61.67	60.87	71.10	65.46
	SE	12.61	12.28	14.71	14.78	12.57	10.10	12.61	12.66	12.60	11.82	14.14	13.92

Note. M=Middle School, LS=Lower Secondary School, HS=Higher Secondary School

The Relationships among Mental Status Variables:

Table 3 shows the correlation between mental health variables and potential drug-use. While potential drug-use is correlated positively but weakly with anxiety and stress, moderately with depression. On the other hand, self-esteem is weakly but negatively correlated.

Among CERQ adaptive strategies, potential drug-use is correlated with 'Positive Reappraisal' negatively, and 'Putting into Perspective' positively. Among CERQ less adaptive strategies, potential drug-use is correlated with 'Acceptance,' 'Rumination,' 'Catastrophizing,' 'Other-blame,' and 'Self-blame' positively

Table 2: Correlation Matrix Among Mental Health Variables

Variables	Dep	Str	SE	PDU	CERQ adaptive regulation strategies				CERQ less adaptive regulation strategies				
					PR	ReP	PoR	PP	AC	RU	CA	OB	SB
Anx	.505**	.421**	-.295**	.303**	.118*	.099*	.018	.166**	.264**	.289**	.326**	.212**	.372**
Dep		.593**	-.547**	.423**	-.023	-.012	-.103*	.218**	.263**	.246**	.500**	.294**	.470**
Str			-.525**	.292**	-.013	-.022	-.081	.240**	.253**	.219**	.387**	.251**	.409**
SE				-.346**	.108*	.132**	.225**	-.133**	-.177**	-.165**	-.341**	-.156**	-.374**
PDU					.003	-.022	-.096*	.203**	.175**	.156**	.324**	.320**	.258**

Note: Anx=Anxiety, Dep=Depression, Str=Stress, SE=Self-esteem, PDU=Potential Drug-use, PR=Positive Refocusing, ReP=Refocus on planning, PoR=Positive reappraisal, PP= Putting into Perspective, AC=Acceptance, RU=Rumination, CA=Catastrophizing, OB=Other-Blame, SB=Self-blame

The Effects of Mental Health Variables on Potential Drug-use: Table 3 presents the results of the multiple regression analyses on potential drug-use with mental health variables. The total model explained 23.6% of the variance of drug-use ($F = 11.97, df = 13, 449, p = .001$). Anxiety, depression, self-esteem significantly predicted potential drug-use, but not the stress score was identified as significant predictors. Besides, the other-blame strategy was a predictor of potential drug-use. All CERQ adaptive strategies were not predictive of potential drug-use.

Table 3: Summary of Multiple regression Analysis on Potential Drug-use With Mental Health Variables

Predictors		B	SE	β	t	p	R ²	corrected R ²	F
	(Constant)	60.20	5.50		10.95	.000			
	Anxiety	0.19	0.08	.11	2.24	.026	.257	.236	11.97***
	Depression	0.35	0.10	.22	3.58	.000			
	Stress	-0.13	0.16	-.04	-0.82	.413			
	Self-esteem	-0.50	0.18	-.15	-2.84	.005			
CERQ – ARS	Po_Refocus ^a	0.12	0.25	.03	0.49	.626			
	Re_Plan ^b	-0.16	0.27	-.04	-0.58	.565			
	Po_Reapprais ^c	-0.32	0.26	-.07	-1.26	.210			
	Put_Perspect ^d	0.30	0.22	.07	1.39	.164			
CERQ - LARS	Acceptance	0.13	0.25	.03	0.51	.610			
	Rumination	-0.12	0.22	-.03	-0.55	.580			
	Catasrophizing	0.18	0.22	.05	0.82	.412			
	Other-Blame	0.87	0.23	.18	3.73	.000			
	Self-blame	-0.05	0.24	-.01	-0.19	.846			

Note: Po_Refocus^a=Positive Refocusing, Re_Plan^b=Refocus on planning, Po_Reapprais^c=Positive reappraisal, Put_Perspect^d= Putting into Perspective

Discussion

This study reveals that the level of anxiety, depression, and stress of Nepali adolescents was within the range of mild and moderate level. However, adolescents feel 'moderate to severe' anxiety (30.2%) and 'severe' anxiety (6.7%), 'moderate' and 'severe' depression (28.3%), moderate stress (80.8%). This result shows that Nepalese teenagers feel depressed, anxious, and stressful enough to feel uncomfortable with their adaptation although they do not experience any pathological levels of anxiety, depression, and stress. Especially, anxiety, depression, and stress were found to be higher in female than male adolescents. Moreover, in this study, the higher the school level, the more anxiety, depression, and stress indicate that middle-to-late adolescence (ages 15-18) may be more vulnerable time. Therefore, female adolescents in Nepal are at a higher risk of anxiety, depression, and stress.

The prevalence of problematic self-esteem of Nepali adolescents is 32.2%. The mean score of Nepali adolescents' self-esteem is relatively lower than that of other countries adolescents [14-15]. Also, in the comparison analysis according to the school level, there was no significant difference. The results of the previous studies on the change of self-esteem according to the age of adolescents showed various variations. This result shows that there might be a slight difference according to cultures and countries.

Nepali adolescents use adaptive regulation strategies mainly such as 'Refocus of Planning,' 'Positive Reappraisal,' 'Positive Refocusing.' However, considering the results on the relationships with PDU, anxiety, depression, stress, only 'Positive reappraisal' had a weak negative association with them. 'Putting into Perspective' had even positive association. This means that adaptive regulation strategies of CERQ are not effective in coping stress events, and teaching and reinforcing regulation strategies such as 'Putting into Perspective' may result in negative effects on mental health. One more thing to consider is that though 'Acceptance' was classified as an adaptive strategy in one study [16], this study is consistent with the study that it is a less adaptive strategy [17] and is positively correlated with depressive symptoms.

The mean of SPDA among Nepali adolescents was under the cut-point, but 29.2% of the adolescents were at

risk for potential drug-use. This result can be compared with the study [18] in which the mean of the SPDA was 57.11 and 18.6% of the Korean middle school students were a potential drug-use group. In addition, this study reveals that potential drug-use is higher in male adolescents and increases according to age and grade. This result may be due to the Nepali environment where men are easy to get addictive substances and to the culture that substance use such as alcohol and marijuana are allowed to have socially. It suggests that the need of the education and programs to be provided.

Significant predictors among mental health variables on PDU were anxiety, depression, self-esteem, other-blame regulation strategy. This result is consistent with the previous studies in that depression and anxiety have a significant effect on substance abuse, that self-esteem affects substance abuse, and that less adaptive regulation strategies increase the possibility of drug-use. However, it is different from the previous studies in that stress does not appear to be a significant predictor. In the future, it is necessary to examine the effects of social stress on the drug-use in Nepali settings.

Conclusion

The anxiety, depression and stress level of adolescents in Nepal was in the range of 'mild and moderate,' and self-esteem was 'moderate,' and cognitive-emotional regulation strategies mainly used in stress situation were adaptive strategies. Mental health factors that have the most significant effect on potential drug-use were anxiety, depression, self-esteem, and other-blame regulation strategies. In the end, efforts to change the anxiety and depression and less adaptive regulation strategies of adolescents in Nepal are required to reduce the possibility of drug-use.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Detection of HGG and LGG Brain Tumors using U-Net

Sang-Geun Choi¹, Chae-Bong Sohn²

¹Ph.D. Candidate, ²Professor, Department of Electronics and Communications Engineering, Kwangwoon University, 20 Kwangwoon-Ro, Nowon-Gu, Seoul, 01897, Korea

ABSTRACT

Background/Objectives: Advancement in medical equipment has enabled accurate and quick diagnosis in medical field. However, an increase in the number of medical staff is slower than the rate of medical equipment development. It has resulted in increased risk of diagnostic misinterpretation. The purpose of this paper is to help diagnosis of medical staff through artificial neural network (ANN).

Method/Statistical Analysis: We selected U-Net among artificial neural networks. U-Net is highly accurate in medical imaging. The dataset for learning the network was obtained from the Brain Tumor Segmentation Challenge (BraTS). This dataset contains four classes of brain tumor data and it is suitable for learning variety of brain tumors. We used F-Score to measure the accuracy of the learned network.

Findings: In this paper, we compare the performance of the network by conducting two experiments. First, we checked the learning progress of the network. Second, we compared the results of learning with mixed and single datasets. In the first experiment, when allowing the network to learn for a total of 200 generations, it was confirmed that the results of 100 generations were the most accurate. In the second experiment, the network learned by three groups of datasets. The first group consisted of HGG data only, and the second group was composed of LGG data only, and the last group was made up of mixing HGG and LGG data. When comparing the results of the first group with the third group, the accuracy of HGG patient was 0.6696 and 0.6222, respectively. Subsequently, the results of the second and the third group were 0.6315 and 0.6228, respectively.

Improvements/Applications: In this experiment, we compared the results obtained when the datasets were mixed and when they were used singly. The results show similar accuracy. However, when using a mixture of datasets, the accuracy is lower, which is enough to assist the diagnosis of the medical staff. It is expected that this will help the development of the medical image processing field by confirming the position and size of the brain tumor accurately regardless of the data of any grade for brain tumor.

Keywords: Artificial Neural Network (ANN), U-Net, Brain Tumor Segmentation Challenge (BraTS), Brain Tumor, HGG, LGG

Introduction

Artificial neural networks (ANN) are applied in various fields. The medical field also shows a lot of activities using artificial neural networks. They are trying to prevent the occurrence of patients by collecting biometric information such as patient's life pattern, blood pressure, and body temperature^[1]. In the field of medical

imaging, there is an active movement for application of artificial neural network to various medical equipments. Ultrasound, computed tomography (CT), magnetic resonance imaging (MRI) and other devices have helped medical staff to make a diagnosis. However, with the development of these devices, the number of patients using them is increasing. In comparison, the number of medical staffs is limited. The possibility of misdiagnosis due to inaccurate reading caused by these issues has emerged as a serious problem. To solve these problems, there have been many attempts by introducing a medical image reading system through artificial neural network^[2].

In this paper, we apply artificial neural network to brain tumor detection to help more accurate diagnosis in

Corresponding Author:

Chae-Bong Sohn
Professor, Department of Electronics and
Communications Engineering,
Kwangwoon University, Korea
Email: cbsohn@kw.ac.kr

MRI image. We selected U-Net^[3], which is widely used in medical imaging field. The learning of the network was set to use the dataset provided by the Brain Tumor Detection Challenge (BraTS)^[4]. This dataset provides two main classes of brain tumors. Learning will proceed with the configuration of the dataset in two ways. The first one learns only a single grade of brain tumor and the second one learns regardless of the brain tumor grade.

In Chapter 2, we describe the network and dataset used in learning, the overall method of experiment, and the evaluation method to analyze the results. In Chapter 3, we will identify the performance and results of the network and analyze the results. Finally, in Chapter 4,

we will present the expected effects and future directions when using this paper.

Materials and Method

U-Net: Common CNN (Convolutional Neural Network) is used for classification. In this case, the label for the class is output as a result of the input image. However, localization results are required in image processing such as medical imaging. The reason we selected U-Net is as follow. First, this network is localizable and can detect tumor location and size. Second, to solve the problem caused by a small amount of training data, the learning is performed by dividing the image into patches^[3].

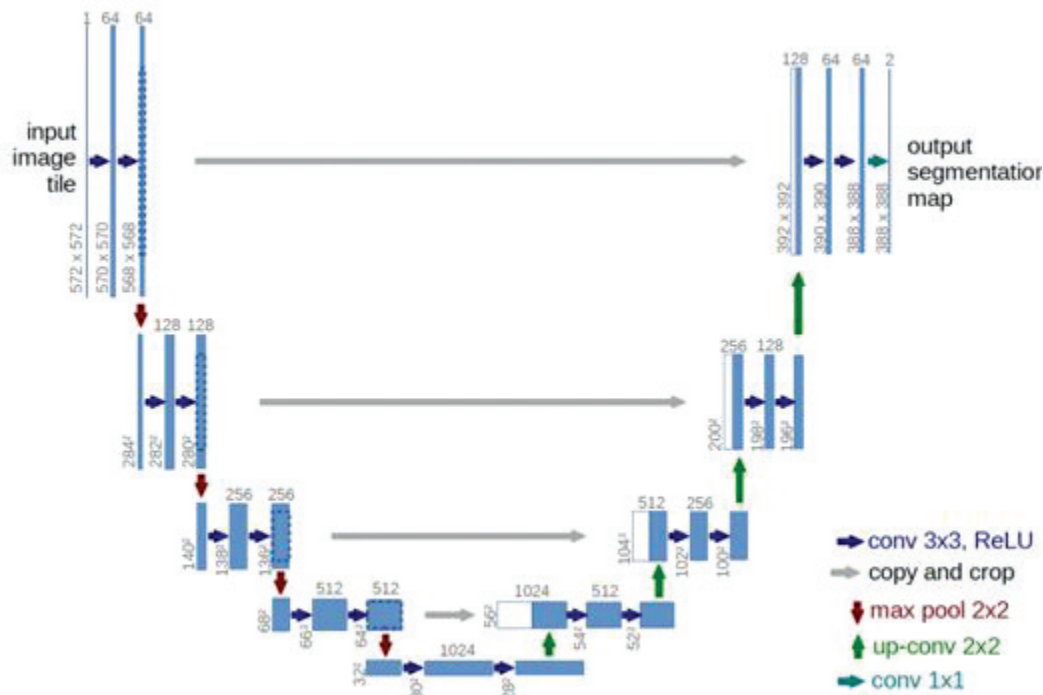


Figure 1: U-Net architecture

Network Architecture: Figure 1 shows the overall architecture of U-Net. It consists of a contracting path in left side and an expansive path in right side of Figure 1. The contracting path corresponding to down-sampling proceeds by repeating two convolution layer and max pooling operation. The feature channel doubles when down-sampling is performed. The expansive path corresponding to up-sampling is like the contracting path, but there are two differences. First, up-convolution is performed instead of max pooling. This reduces the feature channel in half and doubles the feature map. Second, when up-sampling is performed, the feature map is copied and cropped in the contracting path to connect.

Crop is required because the size of the corresponding feature map is smaller in the expansive path. This structure allows more accurate localization. This part was added in CNN, allowing U-Net to enable semantic segmentation. Finally, one by one convolution is performed to map the feature vector to the desired class.

Datasets for Training: The MRI image datasets used for training was a dataset provided by Brain Tumor Segmentation Challenge (BraTS)^[4]. These datasets consist of 220 sets of HGG data and 54 sets of LGG data. Each MRI set consists of four sets of images with different contrast: T1, T2, FLAIR and T1c. This image set consists of 150 brain tomographic images.

HGG and LGG: Gliomas are characterized by subtypes and by a numerical grading system. HGG and LGG are subtypes of glioma. The grade of a tumor means how the cancer cells appear under a microscope. Grade I tumors grow slowly and can sometimes be totally removed by surgery, while grade IV tumors are fast-growing, aggressive and difficult to treat [5,6,7].

According to the current World Health Organization (WHO) scheme, malignant astrocytomas are classified and graded as shown in Table 1.

Table 1: Grade chart of glioma

	Grade	Comments
LGG	I	Benign, slow-growing tumor Usually associated with long term survival Least likely to recur
	II	Increased hypercellularity No mitosis No vascular proliferation No necrosis Can recur as a higher-grade tumor
HGG	III	High rate of hypercellularity High rate of mitosis No vascular proliferation No necrosis High rate of tumor recurrence
	IV	Very high rate of hypercellularity Very high rate of mitosis Presence of vascular proliferation Presence of necrosis

For four grades of glioma, it can classify grade I and II as LGG and grade III and IV as HGG. Figure 2 shows MRI images of the brain corresponding to HGG and LGG, which are included in the dataset used for training.

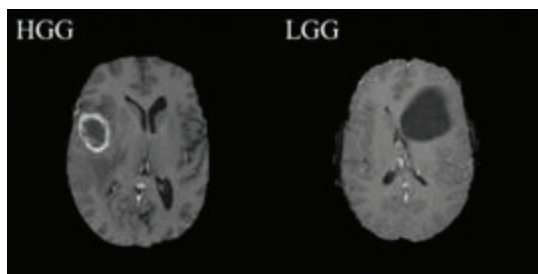


Figure 2: Brain MRI of patients with HGG and LGG

T1, T2, FLAIR and T1c: MRI images can acquire images of different contrasts according to different techniques or acquisition parameters. It is possible to

emphasize the desired area by adjusting the value of the weight or adjusting the shooting direction [8,9]. The dataset provided by BraTS consists of the following four images as shown in Table 2.

Table 2: Type of MRI images

Type	Feature
T1	T1-weighted MRI Measure T1 (longitudinal) relaxation time of tissue Tissue with short relaxation times are brighter
T2	T2-weighted MRI Measure T2 (transverse) relaxation time of tissue Tissue with long relaxation times are brighter
T1c	T1-weighted MRI after administration of contrast agent The signal for tumor increase
FLAIR	Fluid Attenuated Inversion Recovery MRI Bright signal of CSF (Cerebrospinal Fluid) is suppressed Can detect small hyperintense lesions better

The purpose of this paper is to detect tumors. For this reason, the training was performed using T1c-weighted MRI, which administration a contrast agent that enhances the signal of the tumor. Figure 3 shows MRI images of each type [11,12,13].

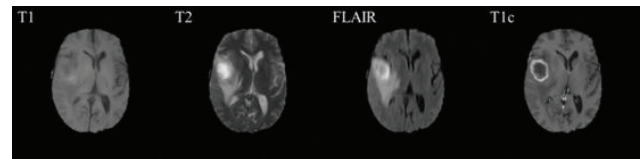


Figure 3: Brain MRI of patients with T1, T2, FLAIR and T1c

Experimental Methods: In this paper, the network will learn dataset of all three configurations. The first network will only have the HGG data, the second will only the LGG data, and finally the HGG and LGG will be learned and the results will be compared. Table 3 shows the number of datasets to be used for learning

Table 3: Amount of Training and Test

	a. HGG only	b. LGG only	c. HGG and LGG
Training	200 sets	50 sets	250 sets
Test	20 sets	4 sets	24 sets

At the same time, experiments were conducted to confirm learning progress of the network. This experiment trained the network over a total of 200 generations and confirmed the change in accuracy. The generations to be used for comparison are 10, 50, 100 and 200 generations of learning data.

F-Score: In this paper, F-Score was chosen to measure the accuracy of the results. For other methods, such as PSNR, which compares image differences, the entire region is compared, and the result is measured. However, in this paper, which is aimed at the detection of brain tumor, the size of non-tumor parts is relatively large when the image of the result is confirmed. Therefore, even if the result does not come out well, there is a problem that the score becomes large. The F-Score can be used to calculate more precisely because it only uses information about the part to be found and the parts that are not correctly found. F-Score can be measured by Equation (1) [10].

$$F = \left(\frac{\text{recall}^{-1} + \text{precesion}^{-1}}{2} \right)^{-1} = 2 \times \frac{\text{precesion} \times \text{recall}}{\text{precesion} + \text{recall}} \quad \dots(1)$$

In Equation (1), precision and recall are defined by Equation (2).

$$\text{precision} = \frac{TP}{TP + FP}, \text{recall} = \frac{TP}{TP + FN} \quad \dots(2)$$

Each element of Equation (2) follows the definition of the confusion matrix in Table 4.

Table 4: Confusion Matrix

		True condition	
		Condition Positive	Condition Negative
Predicted Condition	Predicted Condition Positive	True Positive (TP)	False Positive (FP)
	Predicted Condition Negative	False Negative (FN)	True Negative (TN)

Table 6: Comparison of three training sets

Trained sets	HGG Patient			LGG Patient		
	F-Score	Recall	Precision	F-Score	Recall	Precision
HGG only	0.669652	0.720442	0.625551	-	-	-
LGG only	-	-	-	0.631513	0.757418	0.5415
HGG and LGG	0.622251	0.701455	0.559118	0.622863	0.638845	0.607661

Results and Discussion

First, we compared the F-Score of each generation to confirm the progress of the network learning. Figure 4 is a chart showing F-Score for each generation of MRI test images. The MRI images used for the test are for HGG patients.

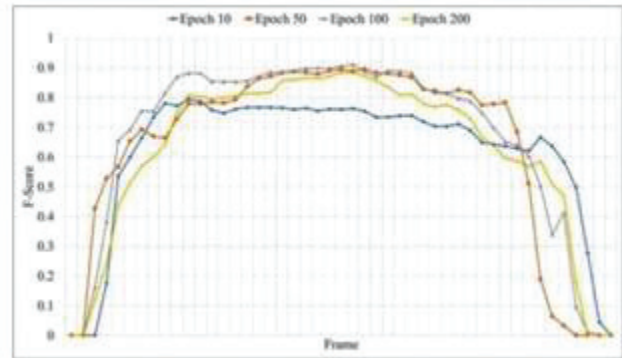


Figure 4: F-score for each epoch

Table 5 shows the average F-Score for each generation.

Table 5: Average of F-score for each epoch

Epoch	10	50	100	200
Average	0.613759	0.637009	0.669652	0.62122
Recall	0.824101	0.701977	0.720442	0.765566
Precision	0.488958	0.583047	0.625551	0.522671

From Figure 4 and Table 5, we can see that the overall network accuracy improves. However, the results of the 200th generation are lower than those of the 50th generation.

The next experiment compares the accuracy of the network with the different configuration of the dataset. The learning was proceeded with the configuration of Table 3. Based on above result, the network learning was carried out over 100 generation. Results were compared between group (a) and group (c) in Table 3, and between group (b) and group (c). MRI images of the patients to be used for test are those corresponding to HGG and LGG brain tumors, respectively. Table 6 shows the result of the comparison.

From the results in Table 6, the results of group (c) shows lower accuracy than group (a) and (b). The difference is 0.047401 for HGG patient and 0.00865 for LGG patient.

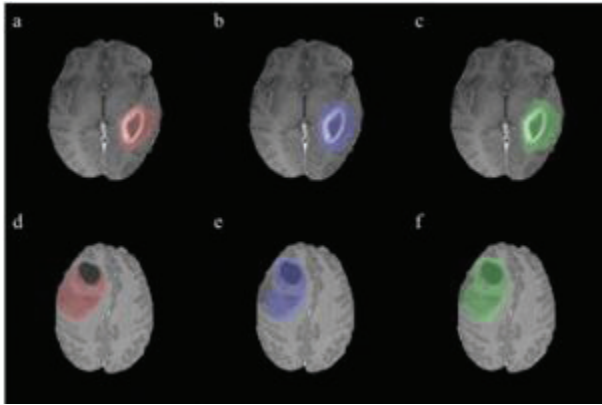


Figure 5: Brain Tumor Detection Result

Figure 5 shows the MRI images of two patients used as testsets in the experiment. The above three images are from HGG patient and the below three images from LGG patient. From left to right, ground truth, the result of learning a single grade of dataset, and the result of learning a mixture of datasets.

Conclusion

In this paper, we compare the learning progress of the network and the accuracy according to the dataset configuration. In first experiment, when the learning was conducted over a total 200 generations, it was confirmed that the accuracy was lowered after 100 generation. This may be due to overfitting or local minima. Indeed, the average of the results of the training set has an F-Score value of 0.7 to 0.8, which is significantly higher than the test results. It is expected that better results will be obtained by adding Dropout to prevent network overfitting.

The following experiment is a comparison of the accuracy according to the configuration of the dataset. The results show that group (c) is 0.02 to 0.04 less accurate than group (a) and (b). This difference can be confirmed in Figure 5. As shown in Figure 5, both networks accurately detect the location of the tumor. However, an error occurred in detecting the size. The difference in results was due to tumor size error. Another problem is that non-tumors are detected as tumors in the results of LGG patients. This problem is due to the similar parts and features of the tumors they exist in the MRI image.

Another reason is that overfitting is easily caused by lack of data for LGG patients used for learning.

In conclusion, it is possible to accurately detect the location of the brain tumor and it is expected to be of great help in the diagnosis of the medical staff. Furthermore, it is expected to be useful in various field such as diagnosis of pulmonary tuberculosis by x-ray image and diagnosis of cancer by CT image.

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Study of Relationships between Personal Information Protection perception, Electronic Medical Records (EMRs) Awareness and Job Engagement of Medical Staff

A Young Park¹, Ja-Ok Kim², Hae-Ryoung Park³

¹Professor, Dept. of Nursing, Gwangju University, Korea; ²Professor, Dept. of Nursing, Wonkwang Health Science University, Korea; ³Professor, Dept. of General Education, Kwangju women's University, Korea

ABSTRACT

Background/Objectives: Life and knowledge levels have improved and access to information has become more convenient. A system of a medical institution for prompt processing, therefore, was required. The purpose of this study was to examine relationships between perception of personal information protection, EMR awareness and job engagement of medical staff.

Method/Statistical Analysis: The cross-sectional descriptive design was used. A total of 243 nurses completed a questionnaire on personal information protection perception, EMR awareness and job engagement. The collected data were analyzed using SPSS/win 18.0 program. The general characteristics of the subjects resided in high frequency, percentage, mean and standard deviation. Data were analyzed with independent t-test, ANOVA and Pearson's correlation coefficients.

Findings: The personal information protection perception was 3.09 ± 0.42 , with the minimum value of 1.00, and the maximum value of 4.00. EMR awareness was 3.79 ± 0.50 , with the minimum value of 1.71, and the maximum value of 5.00. The mean occupational commitment was 3.54 ± 0.46 , with the minimum value of 2.00, and the maximum value of 4.89. The mean score of personal information protection perception was 3.09 out of 5.00, EMR awareness was 3.79 out of 5.00 and job engagement was 3.54 out of 5.00. There were statistically positive correlations between EMR awareness and job engagement ($r=.50, p<.001$). EMR awareness and job engagement were positively correlated with each other. Therefore, in order to improve the efficiency of nursing work, it is necessary to teach information ethics according to EMR awareness. Statistically significant results of job engagement were age ($F = 6.61, p < .001$), working years ($F = 5.51, p < .001$) and income ($F = 8.27, p < .001$). In summary, there was a significant relationship between job satisfaction ($t = -4.09, p < .001$), EMR related ethical education ($F = 4.31, p < .001$), and hospital job satisfaction ($F = 25.09, p < .001$).

Improvements/Applications: It is necessary to develop educational and manageable program to improve EMR awareness and job engagement of nurses. Further research is necessary to analyze the factors affecting the job commitment of nurses.

Keywords: EMR awareness, Job Engagement, Medical Staff, Nurse, Personal Information Protection

Introduction

As the wave of informationization spreads rapidly, living and knowledge levels were improving. A hospital information system was required which enables medical staff to manage medical institutions efficiently, conveniently and promptly. In the early 2000s, as medical information became available, many hospitals introduced an electronic medical record (EMR) system,

Corresponding Author:

Hae-Ryoung Park
Professor, Dept. of General Education,
Kwangju Women's University, Korea
Email: hrpark@kwu.ac.kr

which allows the entry, storage and exchange of patient information. The reason for this guideline was that the social demands for patient's privacy protection have increased. First, the medical institutions should be provided with the public health status, physical characteristics, unique identification information such as social security number, resident registration number, and other credit card number, including, various personal information such as passbook account number, work information, personal image information. Second, infringement of patient's personal information and self-determination rights prevents secondary damage, such as damage to medical institutions and workers.

As medical information was digitized, video information storage and recording, and computerization of hospital work, the medical information of patients were exchanged electronically, and the system can be accessed through various routes^[1].

The EMR information system is convenient. However, the personal information and medical information of the patient were continuously stored in the EMR information system of the medical institution, and the possibility of information leakage increases gradually^[2]. There was also a problem of sharing information between medical staff and medical institutions. Therefore, in March 2012, we established 'Personal Information Protection Guidelines' for medical institutions. However, sensitive personal information such as disease information can be easily leaked to the outside^[3].

Personal health information could not be used for purposes other than health care, administrative or economic purposes, and must be provided after receiving patient consent if used for purposes other than health care. In Korea, various issues related to the protection of personal information have become of interest^[4]. Efficiency of nurse's job was important for hospital management. There is a problem that nursing job immersion could not be performed by the electronic medical record system. The 69.2% of nurses perceive their information literacy as below average, and there is a need to improve nursing information utilization ability for job involvement^[5].

In order to improve business performance, it was necessary to raise the level of awareness and satisfaction of electronic medical records (EMR)^[6]. Nurses were more likely to provide better nursing care to their subjects

because they were able to maximize their abilities by engaging in nursing with their own duties^[7,8]. In this study, the relationship between the perception of personal information protection of nurses, the EMR awareness, and job involvement variables were studied. The purpose of this study was to provide a basic data for the efficiency of work and personal information protection management by finding ways to increase job commitment.

Materials and Method

Participants & Data Collection: This study was to investigate the relationship between nurses personal information protection awareness and job commitment according to EMR awareness. The subjects were 243 nurses. The data collection period was from August 1, 2017 to September 30, 2017.

Instrument

General Characteristics: The general characteristics are 12 items including age, sex, education, working period, income, job title, working department, computer certification, EMR moral education, paper nursing record experience, and hospital working satisfaction.

Perception of Personal Information Protection: The existing measurement tools were used ^[9]. A total of 13 items were scored with a 5 points scoring, 'strongly disagree = 1 point', 'disagree = 2 points', 'normal = 3 points', 'agree = 4 points', and 'strongly agree = 5 points' scale. Reliability analysis showed that Cronbach's α coefficient was .65.

Awareness of Electronic Medical Records (EMRs): The existing measurement tools were used ^[10]. The 28 items were scored with a 5 points scoring, 'strongly disagree = 1 point', 'disagree = 2 points', 'normal = 3 points', 'agree = 4 points', and 'strongly agree = 5 points' scale. The higher the score the higher the perception. Reliability analysis showed that Cronbach's α coefficient was .97.

Job Engagement: The existing measurement tools were used ^[11]. The tools used in the references were adapted to the situation of the medical facility nurse by modifying the vocabulary in this study. The nine items were evaluated with a five points scoring: 'strongly disagree = 1', 'disagree = 2', 'normal = 3', 'agree = 4', and 'strongly agree = 5'. Reliability analysis showed that Cronbach's α coefficient was .80.

Results and Discussion

As personal information was changed with age, technology, and people's perception. The subject and range also changed. Among them, personal medical information that was used and managed as information technology. However, information technology has improved as the access route and mobility increase. And the information dysfunctions such as personal information infringement have become important social problems.

In order to protect the privacy of patients, we have focused on protection technologies for enhancing personal information protection in websites and internal business systems. However, such a security system could not protect the patient's personal information^[12]. The use of various content and methods of training for confidentiality of patients was recommended^[13,14]. If medical personnel carelessly deal with the medical information of the patient who came across learned during the work process, the patient's medical information could not be protected.

All healthcare practitioners who deal with patient medical information must be aware of the importance of protecting medical information. It is necessary to know and practice the guidelines, security methods and procedures for this^[15].

The percentage of average age of the subjects was 47.4% for those under 30 years old, 32.5% for those aged 30 to 39 years, and 12.4% for those aged 40 to 49 years, with an average of 32.15 ± 8.75 years. The percentage of education was 20.9% for professional college graduates and 79.1% of university graduates. That of work duration was 45.7% for less than 5 years, 24.8% for more than 5 years, less than 10 years, 9.8% for more than 10 years, and 19.7% for more than 15 years. Income was 33.8% less than 30 million won, 48.3% for less than 40 million won, 40.4 million won, 9.4% for less than 50 million won, 8.5% for more than 50 million won. Positions percentage was 87.6% for general nurses and 12.4% for responsible nurses. 64.5% worked in wards, 10.7% in ICUs, 9.8% in emergency rooms(ER), and 15.0% in OPD & Special part. 49.6% had computer skills qualification and 50.4% did not. 51.3% had EMR moral education experience and 48.7% did not. 53.8% had the paper nursing record experience and 46.2% did not. For hospital working satisfaction, 36.8% were in satisfaction, 57.3% in middle, and 6.0% in dissatisfaction, as shown in Table 1.

Table 1: General Characteristics

Characteristics	Category	n	%	M ± SD
Age (yr)	<30	111	47.4	32.15 ± 8.75 (yr)
	30-39	76	32.5	
	40-49	29	12.4	
	≥50	18	7.7	
Gender	M	8	3.4	
	F	226	96.6	
Education	= College graduate	49	20.9	
	≥ University graduate	185	79.1	
Duration of work (yr)	<5	107	45.7	
	≥5, <10	58	24.8	
	≥10, <15	23	9.8	
	≥15	46	19.7	
Income (Year, 10,000won)	<3,000	79	33.8	
	≥3,000, <4,000	113	48.3	
	≥4,000, <5,000	22	9.4	
	≥5,000	20	8.5	
Position	General nurse	205	87.6	
	≥Charge nurse (Manager level)	29	12.4	
Working department	Ward	151	64.5	
	ICU	25	10.7	
	ER	23	9.8	
	OPD & Special part	35	15.0	
Computer certification	Yes	116	49.6	
	No	118	50.4	
EMR moral education	Yes	120	51.3	
	No	114	48.7	
Paper nurse record experience	Yes	126	53.8	
	No	108	46.2	
Hospital working satisfaction	Satisfaction	86	36.8	
	Middle	134	57.3	
	Dissatisfaction	14	6.0	

The perception of personal information protection of the subjects was age ($F = 2.83$, $p = .039$), years worked ($F = 4.34$, $p = .005$), income ($F = 4.48$, $p = .004$) ($T = 2.85$, $p = .005$), and there was a statistically

significant difference in the experience of paper nursing record ($t = 2.85$, $p = .005$). As a result of the Scheffe' test, significant increase in personal information protection perception was found in the group with 15 years or more working years than the group with less than 5 years. In

the income, the group of over 50 million won was more aware of personal information protection than the group of less than 30 million won and the group of less than 30 million won and less than 40 million won as shown in Table 2.

Table 2: Difference of Personal Information Protection Perception, EMR Awareness and Job Engagement by General Characteristics (N = 243)

Characteristics	Personal Information Protection Perception			EMR Awareness			Job Engagement		
	M ± SD	t or F	p	M ± SD	t or F	p	M ± SD	t or F	p
Age (yr)	39.33 ± 4.25	2.83	.039	105.14 ± 14.42	.83	.476	31.22 ± 3.69 ^a	6.61	<.001
	40.12 ± 6.98			106.61 ± 15.18			31.62 ± 4.86 ^b		
	42.24 ± 4.74			105.55 ± 11.69			32.45 ± 2.92 ^c	a<d, b<d	
	41.67 ± 4.23			110.61 ± 10.15			35.76 ± 3.35 ^d		
Gender	40.50 ± 4.69	.20	.844	107.13 ± 12.74	.21	.832	33.00 ± 4.81	.81	.420
	40.42 ± 5.44			106.05 ± 14.16			31.79 ± 4.14		
Religion	39.68 ± 6.04	-1.04	.301	106.65 ± 13.03	.51	.614	32.39 ± 4.09	1.67	.098
	40.43 ± 4.95			105.72 ± 14.77			31.47 ± 4.17		
Education	40.04 ± 5.46	-.13	.900	105.04 ± 13.97	-.58	.560	31.96 ± 3.61	.24	.81
	40.15 ± 5.41			106.36 ± 14.14			31.80 ± 4.30		
Duration of work (yr)	39.23 ± 5.39 ^a	4.34	.005	106.07 ± 13.88	.20	.900	31.62 ± 4.03 ^a	5.51	.001
	39.81 ± 5.72 ^b			105.64 ± 16.91			30.64 ± 4.34 ^b		
	40.22 ± 4.37 ^c	a<d		104.83 ± 12.02	33.84 ± 3.46 ^d		31.91 ± 4.38 ^c	a<d, b<d	
	40.13 ± 5.41 ^d	106.09 ± 14.09							
Income (Year, 10,000won)	39.13 ± 6.00 ^a	4.48	.004	103.56 ± 16.46	1.72	.163	30.65 ± 4.41 ^a	8.27	<.001
	39.93 ± 4.82 ^b			106.98 ± 13.15			31.80 ± 3.74 ^b		
	41.55 ± 5.32 ^c	a<d, b<d		106.41 ± 9.95	35.37 ± 2.93 ^d		33.23 ± 4.26 ^c	a<d, b<d	
	43.65 ± 4.82 ^d	110.65 ± 11.77							
Position	39.94 ± 5.44	-1.44	.150	105.98 ± 14.28	-.32	.752	31.43 ± 4.03	-4.09	<.001
	41.48 ± 5.05			106.86 ± 12.84			34.75 ± 3.98		
Working department	39.94 ± 6.07	.25	.863	104.05 ± 13.09	3.21	.024	31.42 ± 4.15	2.21	.087
	40.04 ± 4.26			111.44 ± 12.88			32.36 ± 3.77		
	40.57 ± 4.21			109.26 ± 15.32			33.70 ± 3.55		
	40.13 ± 5.41			108.94 ± 16.76			32.00 ± 4.58		
Computer certification	39.28 ± 5.50	-2.39	.018	106.65 ± 14.79	.60	.547	31.62 ± 4.32	-.77	.440
	40.96 ± 5.21			105.53 ± 13.40			32.04 ± 4.00		
EMR moral education	40.68 ± 5.83	1.62	.107	109.74 ± 11.95	4.19	<.001	32.94 ± 3.80	4.31	<.001
	39.54 ± 4.89			102.24 ± 15.15			30.68 ± 4.22		
Paper nurse record experience	41.05 ± 5.10	2.85	.005	105.93 ± 12.49	-.18	.86	32.55 ± 3.99	2.89	.004
	39.06 ± 5.58			106.27 ± 15.80			31.00 ± 4.21		
Hospital working satisfaction	39.48 ± 6.43	1.43	.241	110.94 ± 12.91 ^a	16.42	<.001	33.62 ± 3.86 ^a	25.09	<.001
	40.64 ± 4.49			104.60 ± 12.31 ^b			31.24 ± 3.66 ^b		
	39.21 ± 6.44			90.43 ± 21.76 ^c			a>b, a>c, b>c		

The results of this study were as follows: First, the EMR awareness of the subjects was statistically significant at the departments of work ($F = 3.21, p = .024$), EMR moral education ($t = 4.19, p < .001$), and hospital working satisfaction ($F = 16.42, p < .001$). There was a significant difference. The results of the Scheffe' test were higher than those of 'middle' and 'dissatisfactory' in 'satisfaction' of hospital working satisfaction.

The subjects' job involvement was age ($F = 6.61, p < .001$), duration of work (yr) ($F = 5.51, p < .001$) and income ($F = 8.27, p < .001$). The results of this study are as follows: First, there was a significant relationship between job satisfaction ($t = -4.09, p < .001$), EMR moral education ($F = 4.31, p < .001$), and Hospital working satisfaction ($F = 25.09, p < .001$) as shown in Table 2.

The results of the Scheffe' test were higher than those in the age of 30 and those in the age group of 30 to 39. More than 15 years of duration of work were less than 5 years and more than 5 years and less than 10 years. More than 50 million won in income was more than 30 million won and more than 30 million won in less than 40 million won. 'satisfaction' was higher than 'middle' and 'dissatisfaction' in hospital working satisfaction.

The personal information protection perception was 3.09 ± 0.42 , the minimum value was 1.00, and the maximum value was 4.00. EMR awareness was 3.79 ± 0.50 , the minimum value was 1.71, and the maximum value was 5.00. The mean occupational commitment was 3.54 ± 0.46 , the minimum value was 2.00, and the maximum value was 4.89 as shown in Table 3.

Table 3: Degree of Personal Information Protection Perception, EMR Awareness and Job Engagement

Variables	M $\pm$ SD	Minimum	Maximum	Range
Personal Information Protection Perception	3.09 ± 0.42	1.00	4.00	1~5
	40.13 ± 5.41	13.00	52.00	13~65
EMR Awareness	3.79 ± 0.50	1.71	5.00	1~5
	106.09 ± 14.09	48.00	140.00	28~140
Job Engagement	3.54 ± 0.46	2.00	4.89	1~5
	31.83 ± 4.16	18.00	44.00	9~45

Personal information Protection Perception, EMR awareness, and job engagement were not statistically significant. EMR awareness and job engagement showed a significant positive correlation. In other words, the higher the EMR awareness, the higher the job engagement as shown in Table 4.

Table 4: Correlation among Personal Information Protection Perception, EMR Awareness and Job Engagement

	Personal Information Protection Perception	EMR Awareness	Job Engagement
	r (p)		
Personal Information Protection Perception	1	.11(<.108)	.09(.162)
EMR Awareness		1	.50(<.001)
Job Engagement			1

Attitudes and subjective norms should be considered as measures to improve the performance of patient medical information protection. It is necessary to prepare a patient information protection education or ethics education program that incorporates various cases to have experience of medical information protection^[16].

Satisfaction with utilization should be easy to use standardized terminology, use necessary information, provide medical information, and access

information. It should also be convenient to share data between departments. Medical information sharing and satisfaction with communication were the most important. High utilization satisfaction has the advantage of data management, quick calculation of statistics, and quick record of medical records. And the satisfaction of the uniformity of the data processing^[17].

Paper or electronic medical records were communication tools that support clinical decision

making, service coordination, quality and efficacy assessment. Communication tools were research, legal protection, education, accreditation and regulatory processes. Records of a documented health care system refer to normal health care processes^[18,19]. Generally, health-related privacy and confidentiality should be maintained. Protecting personal information in the field of rights will be very important in the future.

Conclusion

The purpose of this study was to identify the relationship between nurses personal information protection perception, EMR awareness and job engagement, and to utilize it as a basic data to improve the job commitment. It is difficult to generalize the results of this study because it is based on a limited sample of nurses in one area. As a result of this study, personal information protection perception was 3.09 (out of 5), EMR awareness was 3.79 (out of 5), and job engagement was 3.54 (out of 5). In order to maintain human dignity, it is necessary to develop an education program that can raise awareness of EMR in order to increase information moral education and nurse's job engagement.

Ethical Clearance: Not required

Source of Funding: Gwangju University

Conflict of Interest: Nil

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Anger Expression, Depression and Interpersonal ability of University Students Majoring in Nursing in Accordance with their Childhood Emotional Trauma

Gye-Hyun Jung¹, Do-Young Lee²

¹Dept. of Nursing, Jeonbuk Science University, 509 Jeongeupsa, Jeongeup, Jeobuk, 56204, Republic of Korea; ²Dept. of Nursing, Changshin University, 262, Palyongro, Masanhoewon-gu, Changwon-si, Gyeongsangnam-do, 51352, Korea

ABSTRACT

Background/Objectives: This study is a descriptive study conducted to identify the association between the childhood emotional trauma of nursing students and their depression, anger expression and interpersonal ability.

Method/Statistical Analysis: Data were collected from freshman and sophomore students majoring in nursing studies at three universities in the C region. A total of 205 copies of the questionnaire were analyzed.

Finding: An analysis of the difference according to whether the subject had emotional abuse showed no statistically significant difference in anger expression or interpersonal ability, but there was statistically significant difference in depression. An analysis of the difference according to whether they had experienced emotional neglect showed no statistically significant difference in anger expression, depression or interpersonal ability, but when subjects had experienced emotional neglect, their interpersonal ability had decreased.

Improvements/Applications: This study will help identify the degree of emotional trauma, depression, anger expression and interpersonal ability in university students to provide for more interest in and programs for emotional stability.

Keywords: *Anger Expression, Depression, Interpersonal Ability, Childhood Emotional Trauma Experiences, Nursing Students*

Introduction

While there is awareness of the seriousness of physical or sexual abuse during childhood, there is less awareness of the scope of emotional abuse. Despite the share of incidence of emotional abuse being higher than other forms of abuse, it is not being addressed seriously ^[1]. Emotional trauma affects the development of children more than physical trauma ^[2]. University students who are in early adulthood are required to establish their self-identity and intimacy. Only when development tasks are achieved can intimacy be acquired, too. Interpersonal

issues can lead to distrust in others and hinder a positive life. This, in turn can have a negative impact on interpersonal relations and development of university students. Interpersonal relations and experience of childhood trauma are said to be highly correlated. Children who experienced abuse have more sensitive emotional responses, are more hostile and oppressed in interpersonal relations and can experience depression ^[3].

Anger occurs when one's internal border has been invaded or needs have not been met. It is a goal-oriented function but when it is unconditionally suppressed or expressed in extreme ways, it can lead to counter-productive behaviors of anger expression. Interest in anger has been increasing in recent years ^[4].

Corresponding Author:

Do-Young Lee
Professor, Department of Nursing,
Changshin University, Korea
Email: shine@cs.ac.kr

As such, this study seeks to review the degree of childhood emotional trauma, depression, anger expression and interpersonal ability of university students majoring in

nursing and identify the association between these factors to provide a basic set of data on how these students can grow into healthy members of society.

The study seeks to review the degree of childhood emotional trauma, depression, anger expression and interpersonal ability of nursing students in university. Specific objectives are as follows.

1. The degree of childhood emotional trauma, depression, anger expression and interpersonal ability will be identified.
2. The difference in general characteristics, depression, anger expression and interpersonal ability according to whether the nursing student experienced childhood emotional trauma will be reviewed.
3. The correlation between childhood emotional trauma, depression, anger expression and interpersonal ability of university students majoring in nursing will be reviewed.

Materials and Method

Design of the Study: This is a descriptive study conducted to review the degree of childhood emotional trauma, depression, anger expression and interpersonal ability of university students majoring in nursing and identify any correlation between these factors.

Study Subjects: Convenience sampling was used on university students majoring in nursing studies and enrolled in their freshman and sophomore years at three universities in the C region. The number of samples used was calculated based on Cohen's formula which is the G*Power 3.1.9.2 program [5]. When the significance level (α) of 0.05, power ($1-\beta$) of 95% and effect size (f) of 0.15 were set, the minimum number of samples was calculated to be 135. A total of 220 copies of the questionnaire were distributed given the drop-out rate. Among the retrieved 207 copies (94%), 205 copies (93%) were used for final analysis after excluding those with insufficient responses.

Research Tools

Experience of Emotional Trauma During Childhood: The CTQ (Childhood trauma Questionnaire) by [6] which was translated and revised by [7] was used as a basis to measure emotional trauma during childhood. This tool

consists of five categories of emotional abuse, emotional neglect, physical abuse, physical neglect and sexual abuse, with each category having five questions. In this study, the revised version of this tool by [8] which has 10 questions for emotional abuse and emotional neglect in the emotional trauma category was used. A 4 point Likert scale was used to measure emotional abuse or neglect experienced from parents or family members before age 18. A higher score indicates more exposure to abuse or neglect. In the study by [8], the overall Cronbach's α was .84, while Cronbach's α for emotional neglect was .73 and Cronbach's α for emotional abuse was .90. In this study, the overall Cronbach's α was .88, Cronbach's α for emotional abuse was .77 and Cronbach's α for emotional neglect was .93.

Depression: To measure depression, the revised tool of BDI (Beck Depression Inventory) by [9] which was translated by [10] was used. This tool consists of 21 questions on the emotional, cognitive, motivational and physiological symptoms of depression. Each response is scored one to four points to make the total score range from one to 84 points. A higher score indicates a greater degree of depression. In the study by [11], Cronbach's α was .89. In this study, Cronbach's α was .89.

Anger Expression: To measure anger expression, the scale of [12] which was revised to a Korean version by [13] was used. As sub-factors, anger suppression measures the psychological and behavioral process of hiding or suppressing anger. Anger expression measures the psychological and behavioral process of expressing anger towards an object or person. This tool consists of eight questions for each category, making 24 questions in total. Responses are measured on a 4 point Likert scale, with 'not at all' given one point and 'almost always so' given four points. Overall Cronbach's α for [14] was .70, while Cronbach's α for anger expression was .69, Cronbach's α for anger suppression was .76, and Cronbach's α for anger control was .79. In this study, overall Cronbach's α = .83, Cronbach's α for anger expression was .59, Cronbach's α for anger suppression was .61, and Cronbach's α for anger control was .60.

Interpersonal Ability Scale: To measure interpersonal ability, the Interpersonal Competence Questionnaire by [15] which was translated by [16] was used. This tool consists of a total of 40 questions measured on a four point Likert scale, with 'not at all' given one point and 'very much so' given four points. A higher score indicates

better interpersonal ability. At the time of development, Cronbach's α was .82, while it was .86 in [17]. In this study, Cronbach's α was .89.

Data Collection and Procedures

Data were collected from June to July, 2017 by visiting the department of nursing at three universities in province C, explaining the objective of this study and the process to the head of department and students, acquiring their consent and handing out a structured self-reported questionnaire. It took on average 15 minutes to fill out the questionnaire.

For ethical considerations, subjects were told that they can withdraw from the study at any point in time. A written consent form was acquired before proceeding with the study. It was also explained that to protect the privacy of subjects, collected data would be coded, only used for the study, and disposed of after a certain period of time. Confidentiality was also guaranteed. The advantages and disadvantages by taking part in the study were also explained. The contact information of the researcher was also given to subjects to minimize any issues.

Data Analysis

The collected data were analyzed using SPSS 20.0 (SPSS Inc, Chicago, IL, USA) as follows.

1. Analysis was conducted using the real numbers, percentage, mean and standard deviation to identify the general characteristics, childhood emotional trauma, depression, anger expression and interpersonal ability of the subjects.
2. To review the difference in general characteristics, depression, anger expression and interpersonal

ability according to childhood emotional trauma, χ^2 and t-test were used for analysis.

3. The correlation between childhood emotional trauma, depression, anger expression and interpersonal ability was analyzed using Pearson's correlation coefficients.

Results and Discussion

General Characteristics of Study Subjects: Of the total of 205 subjects, there were 35 male (17.1%) and 170 female (82.9%). Average age was 20.9 years. There were 86 subjects (42.0%) with a religion, while 119 subjects (58.0%) did not have a religion. In terms of number of co-habitants, 83 subjects (40.5%) answered three or fewer, 94 subjects (45.9%) answered four, and 28 subjects (13.7%) answered five or more. Twenty-one subjects (10.2%) had a monthly household income of two million Won or less, 72 subjects (35.1%) had a monthly household income between 2.01 million and 4 million Won, 82 subjects (40.0%) had a monthly household income between 4 million and 6 million Won, and 30 subjects (14.6%) had a monthly household income of 6 million Won or higher. In terms of childhood emotional trauma experienced, 141 subjects (68.8%) experienced emotional abuse, 64 subjects (31.2%) did not experience any. In terms of emotional neglect, 101 subjects (49.3%) had experienced, while 104 subjects (50.7%) had not <Table 1>.

A review of the difference in childhood emotional trauma according to general characteristics of subjects <Table 1> showed that there was a difference across genders depending on whether emotional abuse had been experienced ($\chi^2=2.66$, $p=.078$), but this difference was not statistically significant. There was no difference according to whether emotional neglect had been experienced.

Table 1: General Characteristics (N = 205)

Characteristics	Categories	Total	Childhood Emotional Trauma					
			Emotional Abuse			Emotional Neglect		
			No	Yes	χ^2 or t(p)	No	Yes	χ^2 or t(p)
		n(%) or M $\pm$ SD	n(%) or M $\pm$ SD	n(%) or M $\pm$ SD		n(%) or M $\pm$ SD	n(%) or M $\pm$ SD	
Gender	Male	35(17.1)	15(7.3)	20(9.8)	2.66 (.078)	18(8.8)	17(8.3)	0.01 (.928)
	Female	170(82.9)	49(23.9)	121(59.0)		86(42.0)	84(41.0)	
Age(years)		20.9 $\pm$ 4.48	21.04 $\pm$ 5.12	20.85 $\pm$ 4.18	-0.28 (.773)	21.14 $\pm$ 4.85	20.67 $\pm$ 4.08	-0.75 (.454)

Conted...

Religion	Yes	86(42.0)	29(14.1)	57(27.8)	0.43 (.543)	39(19.0)	47(22.9)	0.91 (.340)
	No	119(58.0)	35(17.1)	84(41.0)		62(30.2)	57(27.8)	
Inmate (No.)	3>	83(40.5)	24(11.7)	59(28.8)	0.49 (.783)	40(19.5)	43(21.0)	0.25 (.882)
	4	94(45.9)	30(14.6)	64(31.2)		48(23.4)	46(22.4)	
	5<	28(13.7)	10(4.9)	18(8.8)		13(6.3)	15(7.3)	
Monthly income of family (10,000won))	200>	21(10.2)	7(3.4)	14(6.8)	0.45 (.958)	12(5.9)	9(4.4)	1.846 (.605)
	201~400	72(35.1)	22(10.7)	50(24.4)		32(5.6)	40(19.5)	
	401~600	82(40.0)	27(13.2)	55(26.8)		44(21.5)	38(18.5)	
	600<	30(14.6)	8(3.9)	22(10.7)		16(7.8)	14(6.8)	

Difference in Anger Expression, Depression and Interpersonal Ability According to Childhood Emotional Trauma: Anger expression of subjects scored 1.93 points which was lower than the average. In the sub-categories, anger control was the highest at 1.96 points, followed by anger suppression at 1.92 points and anger expression at 1.90 points. Depression scored 31.91 points which was higher than the average. Interpersonal ability, too was higher than average at 3.58 points <Table 2>.

The difference in anger expression, depression and interpersonal ability in subjects was as seen in Table 2. An analysis of the difference depending on whether emotional abuse had been experienced showed that there was no significant difference in anger expression

but there was statistically significant difference in the sub-category of expression ($t=1.69$, $p=.091$). Depression had statistically significant difference ($t=2.62$, $p=.009$), but there was no difference in interpersonal ability. An analysis of the difference according to whether emotional neglect had been experienced showed that there was no statistically significant difference in anger expression ($t=2.01$, $p=.046$), while there was statistically significant difference in the sub-category of anger suppression ($t=2.21$, $p=.028$). Depression, too, had significant difference ($t=4.37$, $p<.001$), as did interpersonal ability ($t=-2.96$, $p=.003$), indicating that when emotional neglect is experienced, there was a decrease in interpersonal ability.

Table 2: Degree of the Variable of the Subject (N = 205)

Variables	Categories	M ± SD	Childhood Emotional Trauma					
			Emotional Abuse			Emotional Neglect		
			No (n=64)	Yes (n=141)	t(p)	No (n=104)	Yes (n=101)	t(p)
			M ± SD	M ± SD		M ± SD	M ± SD	
Anger expression	Total	1.93 ± 0.36	1.88 ± 0.32	1.95 ± 0.38	1.28(.200)	1.88 ± 0.33	1.98 ± 0.38	2.01(.046)
	Anger display	1.90 ± 0.40	0.83 ± 0.34	1.93 ± 0.42	1.69(.091)	1.85 ± 0.37	1.95 ± 0.43	1.65(.100)
	Anger adjustment	1.96 ± 0.40	1.92 ± 0.40	1.97 ± 0.40	0.93(.351)	1.92 ± 0.37	2.00 ± 0.42	1.44(.149)
	Anger suppression	1.92 ± 0.42	0.89 ± 0.36	1.94 ± 0.45	0.81(.417)	1.86 ± 0.39	1.99 ± 0.45	2.21(.028)
Depression		31.91 ± 8.06	29.75 ± 6.85	32.90 ± 8.39	2.62(.009)	29.57 ± 6.09	34.32 ± 9.10	4.37(<.001)
Interpersonal relationship		3.58 ± 0.36	3.60 ± 0.36	3.57 ± 0.36	-0.54(.584)	3.50 ± 0.36	3.50 ± 0.36	-2.96(.003)

Correlation between Childhood Emotional Trauma, Depression, Anger Expression and Interpersonal Ability: An analysis of the correlation between childhood emotional trauma, depression, anger expression and interpersonal ability showed the results as seen in <Table 3>. There was a positive correlation between childhood emotional trauma and anger expression ($r=.327$, $p<.001$), and with the sub-factors of anger expression ($r=.269$, $p<.001$), anger control ($r=.281$, $p<.001$), and anger

suppression($r=.319$, $p<.001$). While there was a positive correlation with depression ($r=.482$, $p<.001$), there was a negative correlation with interpersonal ability ($r=-.185$, $p=.008$). of childhood emotional trauma, the experience of emotional abuse had a positive correlation with anger expression ($r=.337$, $p<.001$) and its sub-factors of anger release ($r=.302$, $p<.001$), anger control ($r=.293$, $p<.001$) and anger suppression ($r=.302$, $p<.001$).

It also had a positive correlation with depression ($r=.375$, $p<.001$) but did not have any correlation with interpersonal ability. The experience of emotional neglect had a positive correlation with anger expression ($r=.237$, $p=.001$) and the sub-factors of anger release ($r=.174$, $p=.013$), anger control ($r=.201$, $p=.004$) and anger suppression ($r=.253$, $p<.001$). Depression, too had a positive correlation ($r=.451$, $p<.001$). There was a negative correlation with interpersonal

ability ($r=-.207$, $p=.003$). Anger expression had a positive correlation with depression ($r=.327$, $p<.001$) but did not have any correlation with interpersonal ability. Depression had a negative correlation with interpersonal ability ($r=-.222$, $p=.001$). That is, greater childhood emotional trauma experience was correlated with a higher degree of anger expression and depression, and a lower degree of interpersonal ability.

Table 3: Correlation between childhood emotional trauma, depression, anger expression and interpersonal ability (N = 205)

Variables	1	2	3	4	5	6	7	8
1 Childhood emotional trauma	1							
2 Emotional abuse	.386**							
3 Emotional neglect	.888**	.490**						
4 Anger expression	.327**	.337**	.237**					
5 Anger display	.269**	.302**	.174*	.869**				
6 Anger adjustment	.281**	.293**	.201**	.901**	.678**			
7 Anger suppression	.319**	.302**	.253**	.894**	.643**	.728**		
8 Depression	.482**	.375**	.451**	.327**	.205**	.286**	.377**	
9 interpersonal relationship	-.185**	-.104	-.207**	.101	.120	.137	.015	-.222**

** $p=.001$; * $p=0.05$

Conclusion & Suggestions

This study sought to identify the degree of childhood emotional trauma in university students majoring in nursing, their depression, anger expression and interpersonal ability, as well as correlation between these factors. Convenience sampling was used to select subjects from firstman and sophomore year students of nursing at three universities in the C region. A total of 205 copies were analyzed.

The findings show that 68.8% (131 subjects) had experienced emotional abuse, while 31.2% (64 subjects) had not. 49.3% (101 subjects) had experienced emotional neglect, while 50.7% (104 subjects) had not. As seen in this study, about half of the subjects experienced emotional abuse or neglect. Various studies seem to be needed on the depression, anger expression and interpersonal ability of university students who had had such an experience as a child.

In terms of difference according to whether one had experienced emotional abuse, there was statistically significant difference in anger expression which is a sub-category of anger. In particular, there was significant difference in depression. In terms of difference

according to whether one had experienced emotional neglect, there was statistically significant difference in anger expression, with significant difference found in the sub-categories of anger suppression, depression and interpersonal ability. As such, various programs and counseling should be considered for university students who had experienced emotional abuse or neglect.

Meanwhile, there was a positive correlation between childhood emotional trauma and anger expression, as well as with the sub-categories of anger release, anger control, and anger suppression. childhood emotional abuse had a positive correlation with anger expression and its sub-categories of anger release, anger control and anger suppression, as well as with depression. But there was no correlation with interpersonal ability. Depression had a negative correlation with interpersonal ability. That is, greater childhood emotional trauma was correlated with a higher degree of anger expression and depression and a lower degree of interpersonal ability. As such, various follow-up studies would be needed based on these findings of correlation.

This study was conducted based on data collected through convenience sampling from three nursing colleges.

As such, a more prudent approach to interpretation is needed. Follow-up studies with iteration and a wider sample are recommended. Studies are also suggested on the development and application of various programs for emotional well-being of nursing students in universities and verification of the benefits of such programs.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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A Low Complexity Decimator for Communication between a Basestation and a Base Station Control System of an Underwater Acoustic Network

Sunhee Kim

Professor, Dept. System Semiconductor Engineering, Sangmyung University, Korea

ABSTRACT

Background/Objectives: We designed a decimator for a basestation-basestation controller communication of an underwater acoustic sensor network. Since it cannot be supplied with power smoothly, we focused on a low-complexity decimator.

Method/Statistical Analysis: Many underwater acoustic communication systems including decimators have been implemented using a microprocessor because acoustic wave signals are typically processed at a lower operating frequency than operating frequency of microprocessors. However, we designed a specific hardware decimator that support a low-power underwater acoustic communication system based on specifications of Hoseo University research group to reduce power consumption. We used Matlab and Verilog-HDL to simulate our algorithm and architecture.

Findings: Although a CIC filter has a simple and regular structure, it has a wide transition region and a narrow passband. So it is not suitable for underwater communication where channel spacing is narrow. We added a halfband filter for fast attenuation in the transition region and a compensation filter for passband attenuation compensation. We constructed the sampling rate conversion in three stages with an individual CIC filter. Since the last CIC filter was the most influential on the signal attenuation, the compensation filter was designed for the three-stage CIC filter. The halfband filter and the compensation filter were cascaded before and after the three-stage CIC filter, respectively, to reduce power consumption. Since the transition region of the halfband filter is located at the 1/4 frequency of the sampling frequency of the input signal, the sampling down rate of the three-stage CIC filter is half. Therefore, the proposed decimator has a narrow frequency transition region and a flat passband suitable for underwater acoustic communication.

Improvements/Applications: Our proposed decimator makes it possible to realize a stable digital circuit in low frequency band signal processing such as sensor data processing as well as communication.

Keywords: *cic filter, decimator, half-band filter, underwater communication, down sampling*

Introduction

Recently, studies on the underwater network based on an acoustic communication have been actively conducted to observe and control the marine environment for marine resource development, marine disaster preparedness,

military defense, etc. ^[1-3]. In general, since an acoustic communication uses a low frequency of several tens of KHz, a data transmission speed is slower than an electromagnetic wave communication using a band of several hundred MHz to several tens of GHz. However, since the electromagnetic wave rapidly decreases according to the distance in the water, electromagnetic wireless communication cannot be established in the water. On the other hand, acoustic communication can be performed in the water up to several tens of kilometers. Therefore, most countries such as USA, Europe, China and Japan use acoustics for underwater communication ^[4-6]. The WHOI Acoustic Communications Group in the

Corresponding Author:

Sunhee Kim

Professor,

Department of System Semiconductor Engineering,
Sangmyung University, Korea

Email: happyshkim@smu.ac.kr

United States has established an acoustic communication system that links a number of underwater mobile-boat-buoy-underwater probe-submersibles^[4]. In the SUNRISE project supported by the EU, Underwater IoT based on Underwater WSN is studying^[5]. Japan JAMSTEC is studying underwater communication network while providing and analyzing real-time ocean information using satellite tracking buoy^[6]. In Korea, Hanwha, LIG NEX1, SK Telecom and Hoseo University, etc are studying underwater communication^[7,8].

In this paper, we have studied digital sampling rate down converter for acoustic communication between underwater basestation controller and underwater basestation based on the underwater acoustic communication system of Hoseo University research group^[8]. The underwater communication system needs a simple, low-power system because it is difficult to replace a power supply and a battery due to installation environment constraints. By the way, most of acoustic communication systems are implemented using a microprocessor based on software due to the use of acoustics that support low rate data processing. However, the Hoseo University research group uses OFDM and CDMA for the underwater acoustic communication system and has designed dedicated hardware. So, a low-complexity and low-power consumption digital down converter is required.

We designed the decimator of underwater acoustic communication system based on CIC filters^[9]. The CIC filter consists of two basic blocks, an integrator and a comb. The CIC decimator connects N integrator blocks operating at F_{in} sampling rate, a $1/R$ down sampler and N comb blocks operating at F_{in}/R . (F_{in} : the sampling frequency of the input signal, R : the ratio of the sampling frequency (F_{in}) of the input signal to the sampling frequency (F_{out}) of the output signal, $R = F_{out}/F_{in}$). The following is the transfer function of the CIC filter and the magnitude response at the output of the filter.

$$H(z) = \frac{(1 - z^{-RM})^N}{(1 - z^{-1})^N} = \left(\sum_{k=0}^{RM-1} z^{-k} \right)^N \quad \dots(1)$$

$$|H(f)| = \left| \frac{\sin(\pi M f)}{\sin\left(\frac{\pi f}{R}\right)} \right|^N \quad \dots(2)$$

where M is the differential delay. As shown in Equation (1), all coefficients of the CIC filter are '1'. So, the circuit can be constructed with only adders without

storages and multiplier operators, which is efficient in terms of design complexity, size and power consumption^[10]. In general, down sampling requires an anti-aliasing filter to avoid aliasing that occurs during this process.

Since the CIC filter includes the LPF function, it is not necessary to implement a separate LPF. However, as shown in Equation (2), the CIC filter has a sinc function form whose passband droop is large and transition region is wide. Particularly, since the carrier frequency is low in the underwater acoustic communication, the data link interval is narrow and a high-order filter having a narrow transition region is required. Therefore, in this paper, we propose a decimator for underwater acoustic communication that can compensate a narrow passband and a wide transition region.

In Section 2, we describe the frequency allocation of underwater acoustic communication system and then describe the hardware structure of the decimator. In Section 3, we show the results of the design simulation. Finally, Section 4 concludes the paper.

Method

Frequency Allocation: The distributed underwater acoustic sensor network consists of underwater basestation control systems, underwater basestations and underwater sensor nodes. Figure 1 shows the frequency allocation of a distributed underwater acoustic sensor network proposed by the Hoseo University research group. There are total eight communication links. Four communication links of them are defined between the underwater basestation and the underwater basestation control system as shown in the Figure 1. One downlink (DL) for transmitting data from underwater basestation control system to underwater basestation and two uplinks (UL0, UL1) for data transmission from underwater basestation to underwater basestation control system are allocated to frequencies lower than 20 KHz to allow communication up to 10 km, and one uplink (UL2) is allocated for utilization of high-speed transmission environments within 1 Km. Since uplink and downlink use different frequencies, full-duplex data transmission is possible. Table 1 shows various frequency requirements. Bandwidth of UL0 and UL1 is 4 KHz and transition region is 1 KHz. In other words, data links in underwater acoustic communication require a narrow passband and a rapidly-attenuated transition region.

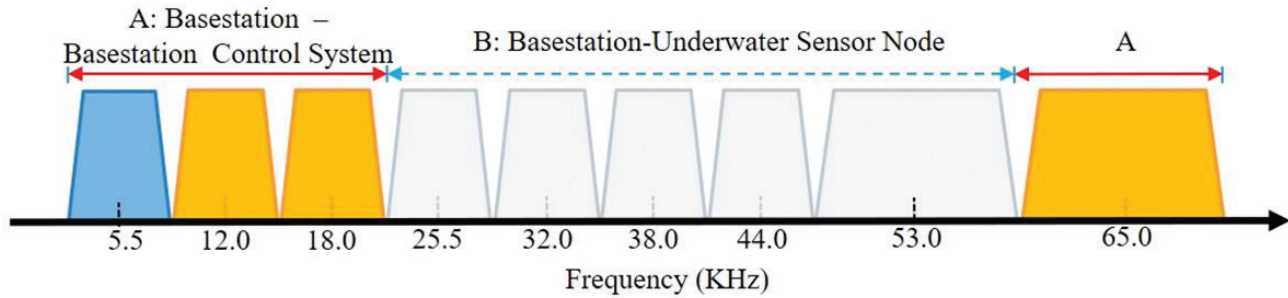


Figure 1: Frequency allocation of a distributed underwater acoustic sensor network proposed by the Hoseo University research group

Table 1: Carrier frequency F_c , bandwidth, transition region, passband signal sampling frequency(F_s), baseband data processing frequency(F_B), and sampling rate changing factor according to links ($R = F_B/F_s$)

Link	Carrier frequency (F_c , KHz)	Bandwidth (KHz)	Transition region (KHz)	Passband signal sampling frequency (F_s , KHz)	Baseband data processing frequency (F_B , KHz)	Sampling rate changing factor ($R = F_B/F_s$)
DownLink	5.5	5	1	500	5	1/100
UpLink 0	12	4	1	500	5	1/100
UpLink 1	18	4	1	500	5	1/100
UpLink 2	65	10	1	500	10	1/50

Architecture of a Decimator: As shown in Table 1, the highest carrier frequency of communication between the underwater basestation and the underwater basestation control system is 65 KHz (UL2) and the passband signals are sampled at 500 KHz (F_s), which is about 7.5 times of the highest carrier frequency. While the carrier frequency signals are converted to the baseband signals, the sampling rate is also converted. the baseband data processing frequencies are 5 KHz and 10 KHz for UL0, UL1, DL and UL2, respectively. Therefore, the sampling rate should be reduced by 1/100, 1/100, 1/100 and 1/50 for UL0, UL1, DL

and UL2, respectively. In this study, the data sampling rate conversion was divided into three stages.

Previous Architecture: We designed a decimator of an underwater acoustic sensor network by cascading three CIC filters^[9]. As shown in Table 2, the sampling rate was reduced to 1/5 in the first stage and in the second stage in common for all links. In the third stage, the sampling rate was reduced to 1/4 for UL0, UL1 and DL, and to 1/2 for UL2. Therefore, the total sampling rate was reduced to 1/100 and 1/50.

Table 2: Comparison of sampling rate changing factors between previous architecture and proposed architecture

Link	Sampling rate changing factor of previous architecture			Sampling rate changing factor of proposed architecture		
	the 1st stage	the 2nd stage	the 3rd stage	the 1st stage	the 2nd stage	the 3rd stage
DownLink	1/5	1/5	1/4	1/10	1/5	1/2
UpLink 0	1/5	1/5	1/4	1/10	1/5	1/2
UpLink 1	1/5	1/5	1/4	1/10	1/5	1/2
UpLink 2	1/5	1/5	1/2	1/5	1/5	1/2

Proposed Architecture: As mentioned above, the CIC filter has a relatively narrow passband and a wide transition region. However, since the underwater acoustic communication requires that transmission frequency band is low and a link interval is narrow, CIC

filters are not suitable for that communication. So, as shown in Figure 2, we added a compensation filter and a halfband filter to flat a passband and narrow a transition region, respectively, in order to overcome the problems of CIC filters.

Figure 3 shows the frequency response when only three CIC decimators are connected in series to change the sampling rate to 1/100 times in UL. Figure 3(a) shows the frequency responses for each of the three decimators and the three cascaded connection in 250 KHz and Figure 3(b) shows them in 5 KHz. As shown in Figure 3(b), the magnitude of the frequency response is -3.75 dB at 2.45 KHz and -3.92 dB at 2.5 KHz. That is, passband droop and aliasing occur.

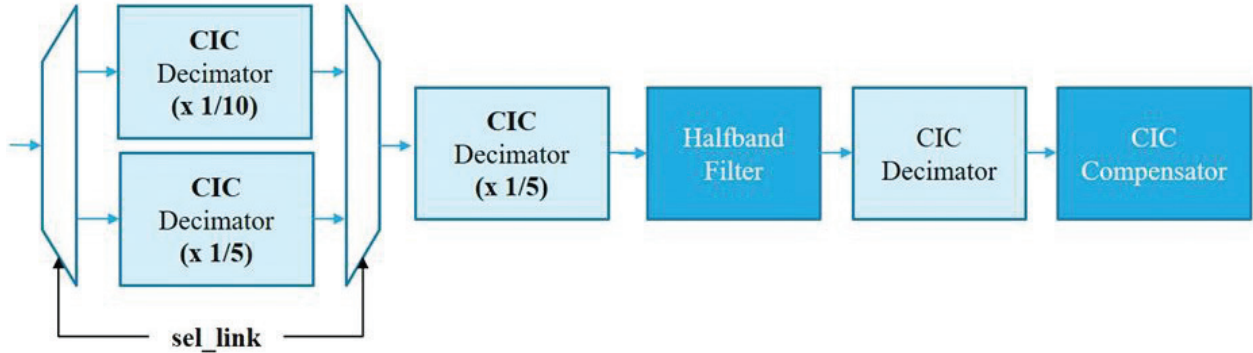


Figure 2: Blockdiagram of the proposed decimator

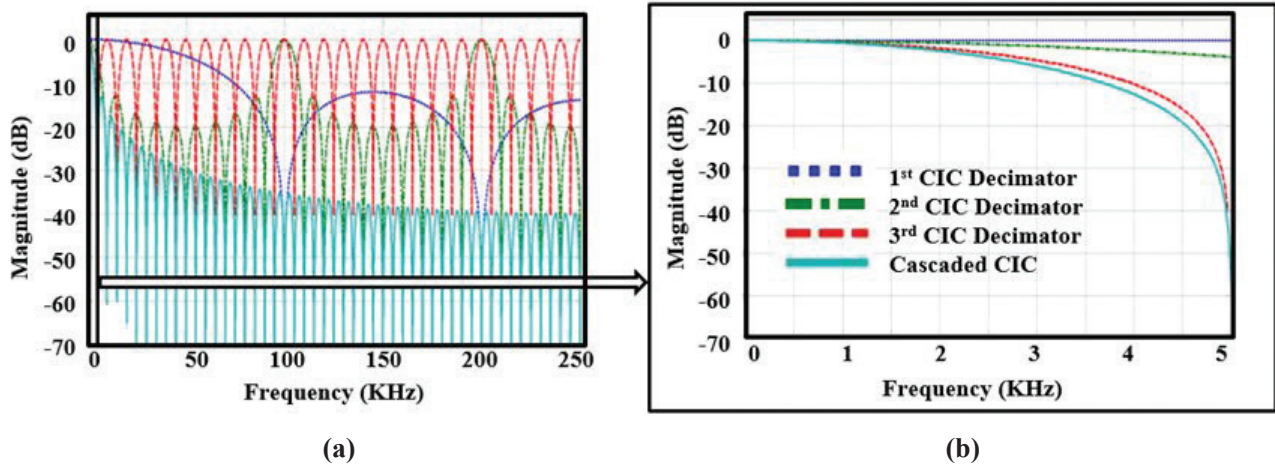


Figure 3: Frequency responses for each of the three decimators and the three cascaded connection (a) in 250 KHz and (b) in 5 KHz.

As shown in Figure 2, the sampling rate is highest at the first CIC filter input, and goes lower toward the backend. Therefore, placing a compensation circuit at the last stage of the circuit is preferable in terms of area and power consumption, so the compensator is connected behind the third CIC filter as shown in Figure 2. The compensation filter was implemented to have an inversed magnitude response of the third CIC filter as shown in the following equation^[11].

$$|G(f)| = \left| \frac{\sin\left(\frac{\pi f}{R}\right)}{\sin(\pi Mf)} \right|^N \approx \left| \frac{\pi Mf}{\sin(\pi Mf)} \right|^N = |\text{sinc}^{-1}(Mf)|^N \dots(3)$$

As shown in Figure 3(b), the first and second stage CIC decimators seems like all-pass filters in 2.5KHz band and the third stage one has the greatest effect on the final frequency response of the decimator. Therefore, it is necessary to add a compensation filter for the third CIC decimator to compensate the attenuation of the passband region, and a LPF with a narrow frequency transition region to prevent aliasing.

A halfband filter is a LPF that is often used to reduce the data bandwidth by a factor of 2 and its transition region is located at the 1/4 of the sampling frequency of the input signal. All even (or odd) coefficients of it are '0', and the other coefficients are symmetrical^[12]. We added this halfband filter before the third decimator. The third decimator reduces the sampling rate by half for all links. Sampling rate changing factor of proposed architecture is summarized in Table 2.

Results and Discussion

The proposed decimator was simulated using Matlab. Figure 4 shows the frequency response of the

third CIC filter, the compensation filter, and the filter in which two filters are connected in series. The passband of the cascaded filter is flattened by the compensation filter. However, the characteristics of the transition region are worse because the frequency response of the stop band also increases. An LPF is required to remove the signal from the stop band region.

Figure 5 shows the frequency response of the third CIC filter, the compensation filter, the halfband filter, and the filter in which three filters are connected in series. It is confirmed that the signal in the stopband region is sufficiently low to prevent aliasing. In the DL, the magnitude of the frequency response is -3.67 dB at the passband frequency of 2.45 KHz and -55 dB at the stopband frequency of 2.5 KHz. The frequency response in the pass band is improved and the frequency response at the stop band is sufficiently low to solve the problem of the aliasing.

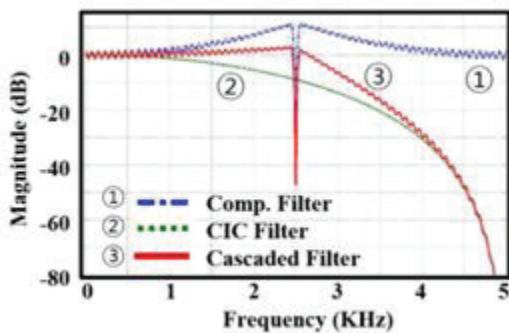


Figure 4: Frequency responses for the compensation filter ①, the third CIC filter ② and the cascaded filter of ① and ②

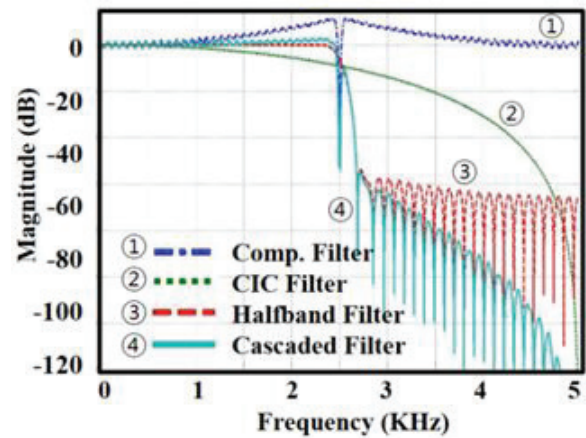


Figure 5: Frequency responses for the compensation filter ①, the third CIC filter ②, the halfband filter ③ and the cascaded filter of ①, ② and ③

Figure 6 shows function simulation results of verilog-hdl design using ModelSim. Input signal (`data_in`) of the decimator passes through the first and second CIC filters, the halfband filter, the third CIC filter, and the compensation filter, so that the sampling rate was lowered. We verified the verilog-hdl design by comparing Modelsim simulation results with matlab fixed-point simulation results. There were max 1-bit error in the last 16-bit data output signals (`data_out_comp`).

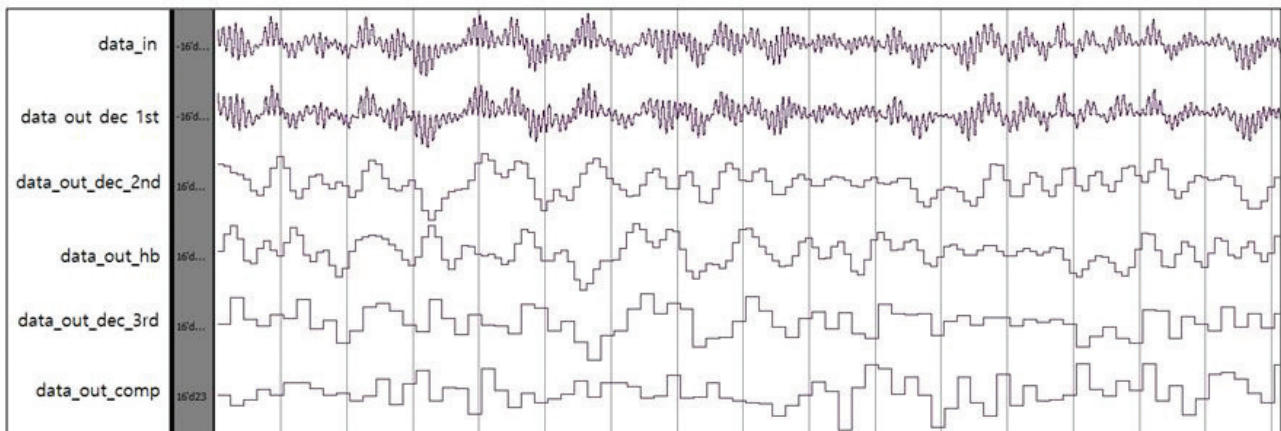


Figure 6: From the top, input signal of the decimator (`data_in`) and output signals of the 1st CIC filter (`data_out_dec_1st`), the 2nd CIC filter(`data_out_dec_2nd`) passes through the first and second CIC filters, the halfband filter, the third CIC filter, and the compensation filter

Conclusion

The low-complexity decimator was designed for communication between the underwater basestation control system and the underwater basestation of the

distributed underwater acoustic sensor network proposed by the Hoseo University research group. The decimator was based on three serially-connected CIC filters that consist of only adders without multipliers and storages.

Because the CIC filters had passband droop and a wide transition region, they were not suitable for underwater acoustic communication with narrow channel spacing. We designed the compensation filter for the third CIC filter that was the most influential on passband droop and connected it to the output of the decimator that operated at the lowest sampling rate to reduce power consumption. In addition, the halfband filter was added to attenuate high frequencies more steeply. We confirmed the frequency specification of our proposed decimator by simulation with Matlab and verilog-hdl, and verified the function through function simulation. The proposed decimator will be integrated with the modem system designed in Hoseo University research group in the future and used in the underwater acoustic sensor network.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Effects of Writing Reflection Journal on Learning Attitude and Reflective Thinking Level in Students Taking a Clinical Training

A Young Park¹, Ja-Ok Kim², Hae-Ryoung Park³

¹Professor, Dept. of Nursing, Gwangju University, Korea; ²Professor, Dept. of Nursing, Wonkwang Health Science University, Korea; ³Professor, Dept. of General Education, Kwangju women's University, Korea

ABSTRACT

Background/Objectives: Effects of a writing reflective journal on learning attitude and reflective thinking among nursing students in clinical training were studied.

Method/Statistical Analysis: A quasi-experimental study of a non-equivalent control group before and after test design was used. The treatment groups(n=33) wrote a reflective journal for 2 weeks while the comparison groups(n=35) wrote traditional nursing practice journal. Participants were sixty-eight undergraduate nursing students from G city's universities. Data were collected using self-reported structured questionnaires and analyzed with χ^2 -test and independent t-test using SPSS Win 21.0.

Findings: Analysis of homogeneity of general characteristics, self-directed learning attitude, and reflective thinking level between experimental and control groups before clinical practice showed that there was no significant difference and two groups were homogeneous. The students in the treatment group were reported to have significant positive changes to reflective thinking level but not to learning attitude. The purpose of this study was to investigate the effects of reflection journal writing on self - directed learning ability and reflection level of nursing students in clinical practice classes and to contribute to establish effective teachings and learning strategies. There was a statistically significant difference in the level of reflective thinking before and after the reflection log, but there was no significant difference in self-directed learning ability. The significance of this study is to show the applicability of reflection logbook activities in clinical practice subjects and to measure the effectiveness. Therefore, it was necessary to keep the reflection level of nursing college students constantly through the use of reflection in clinical practice class.

Improvements/Applications: Our study represented that writing a reflective journal was a useful strategy for improving the level of student's reflective thinking level.

Keywords: Clinical practice, Learning attitude, Nurse, Reflective journal, Reflective thinking

Introduction

Clinical practice in nursing curriculum was an essential learning process for professional nurses with integrated ability of knowledge and nursing. The role of the nurse should provide patients with complex and

rapidly changing medical services. In order to solve the health problems of patients with high severity, they should be equipped with situation awareness and problem solving ability based on critical thinking. Critical thinking should be judged based on facts and evidence, rather than guessing. It was a rational and reflective thinking, a cognitive process leading to problem solving and decision making^[1]. The proliferation of critical thinking education was connected with informatization and closely related to the characteristics of modern society. Critical thinking was needed to adapt quickly to new changes and solving problems. It was imperative to have adaptive cognitive ability to cope with the problems

Corresponding Author:

Hae-Ryoung Park
Professor, Dept. of General Education,
Kwangju Women's University, Korea
Email: hrpark@kwu.ac.kr

that arise in a new complex situation. Self-reflection was essential to develop critical thinking skills^[2].

Reflection was the process by which learners acquire new knowledge. It was the intellectual and emotional activity that a learner thinks when accepting new knowledge. It was not simply reproducing knowledge or recalling experience. It is a high-level thinking activity that reconstructs knowledge^[3]. We needed all the feelings of thinking, problem solving and concentration. We needed emotional regulation to remember, search, transmit, and connect all the information we already know. In the field of nursing, reflection was a process in which nursing practitioners critically evaluate the performance of their work. Ability to performed tasks in nursing education and clinical services has an impact. Nurses need to learn to think efficiently for their mission. And to change the practice of the future by applying the results back to their practices^[4]. The method of objectifying the learners reflexive thoughts and activities was to ask the learner to write a reflection. Thoughtful learning develops students' critical thinking skills. Learning experience was needed to analyze the experience and improve future performance. Students need to review the types of learning in order to deepen their learning. This can include a variety of activities, including self-review, peer review, and personal development plans^[5,6].

We aimed to investigate the effect of the reflection journal on the self-directed learning ability and the reflection level of nursing students in clinical practice class. Based on our results, basic data for establishing an effective teaching and learning strategy of nursing practice education were presented.

The following hypotheses were established to achieve your aims. First, the self-directed learning attitude will be higher in the experimental group who wrote the structured reflection log than the control group who wrote the unstructured practice journal. Second, the experimental group who wrote the structured reflection log would be more Reflective than the control group who wrote the unstructured practice journal.

Materials and Method

Experimental Design: To investigate the effect of reflection journal writing on the self-directed learning ability and reflection level of nursing students in clinical

practice class, the experimental group made a structured log of reflection during the 2 week clinical practice period. The control group prepared a traditional practice journal during the same period. Self-directed learning ability and reflection level were assessed beforehand in order to find the difference between self-directed learning ability and reflective thinking level between two groups. After experiments, the self-directed learning ability and the reflection level of the two groups were evaluated and the difference between the groups was analyzed.

Participants & Data Collection: Effects of the 'Nursing for Adult Health Practicum I' in Grade 3 students from April 25 to June 17, 2016 were examined. Students who understood the purpose of the study and agreed to participate in the study were identified. In order to prevent the error of the experiment, students of G hospital were used as an experimental group and students of C hospital were used as a control group.

The minimum sample size required for t-test was determined using a G * Power 3.1 program. As a result, the minimum sample size was determined with an effect size of 0.7, a significance level of .05, and a power of 0.80. Seventy-four patients in total were selected from the two groups with of 36 patients from each, considering 20 ~ 30% of the dropouts in each group. In the analysis of the final data, 68 participants were used in the experiment group with 3 questionnaires and 3 in the control group.

Instrument

Self-Directed Learning Attitude: Self-directed learning attitude was measured using 'Self-Directed Learning Readiness Scale (SDLS)' developed by Guglielmino^[7] and standardized by West and Bentley^[8]. SDLS has a total of 32 items, including attachment to learning, self-confidence as a learner, openness to challenge, curiosity about learning, self - understanding, and acceptance of responsibility for learning. Each item was rated on a Likert scale ranging from 'strongly disagree' to 'strongly agree'. The higher the score represented the higher the self-directed learning ability. West and Bentley was reliability analysis showed Cronbach's α coefficient was 0.73^[8]. In the study reliability analysis showed Cronbach's α coefficient was 0.88.

Reflective Thinking Level: Reflective Thinking Level was a tool that Jung MY^[10] modified and translated 'The Reflective Learning Continuum' developed by Peltier^[9]. Reflective thinking level consisted of 14 items in habitual

behavior, understanding, reflection, and critical reflection. Each item was rated on a Likert scale ranging from 'strongly disagree' to 'strongly agree'. The higher the score represented the higher the self-directed learning ability. Previous reliability analysis showed Cronbach's α coefficient was 0.71-0.75^[10]. In the study reliability analysis showed Cronbach's α coefficient was 0.75.

Ethics in Human Participants Research: The researchers will use the research purpose, research progress, anonymity, and collected data only for research purpose in the ethical aspect of the subject. I explained that I could withdraw the participation at any time during my participation and that I would not be disadvantaged at all. After the completion of the follow-up survey, all participants participated in the study and gave their appreciation for participation and cooperation. The control group was provided with the same education program after the completion of the post-survey.

Data Analysis

SPSS 21.0 program was used to analyze the data. Pre-homogeneity tests of the experimental group and control group were performed by χ^2 -test, Fisher's exact test, and independent t-test. Significant difference between the experimental group and control group was determined using, the independent t-test.

Results and Discussion

Students must be self-directed learners. In order to become a self-directed learner, a thoughtful level of thinking must be prepared. To maintain this thoughtful level of thinking, it is important to maintain a self-directed learning attitude and a reflective thinking level that have a positive impact on self-directed learning^[11]. The analysis of the general characteristics, self-directed learning attitude and reflective thinking level of experimental group and control group before clinical practice, showed no significant difference between experimental group and control group as shown in Table 1.

Table 1: Homogeneity Test of General Characteristics and Dependent Variables between the Treatment and Comparison Groups

Characteristics	Category	Treatment group (n = 33)		Comparison group (n = 35)		x ² or t	p
		n(%)	or M $\pm$ SD	n(%)	or M $\pm$ SD		
Age(yr)		21.45	$\pm$ 2.32	21.03	$\pm$ 1.34		.354
Sex*	Male	5	(7.4)	1	(1.5)		.101
	Female	28	(41.2)	34	(50.0)		
Satisfaction with major	Very high	3	(1.5)	4	(5.9)	1.958	.581
	High	13	(23.5)	12	(17.6)		
	Moderate	16	(19.1)	15	(22.1)		
	Poor	1	(4.4)	4	(5.9)		
Grade point average	4.00~4.50	6	(8.8)	8	(11.8)	.611	.894
	3.51~3.99	17	(25.0)	15	(22.1)		
	3.00~3.50	8	(11.8)	9	(13.2)		
	2.51~2.99	2	(2.9)	3	(4.4)		
Reflection education experience	Yes	14	(20.6)	22	(32.4)	2.846	0.92
	No	19	(27.9)	13	(19.1)		
Learning Attitude		111.45	$\pm$ 12.60	109.97	$\pm$ 10.25	.534	.595
Reflective thinking		45.42	$\pm$ 3.35	46.49	$\pm$ 4.00	-1.183	.241

*Fisher's exact test

The results of the hypothesis test were as follows. The first hypothesis is that 'the experimental group who wrote the structured reflection log would have a higher self-directed learning attitude than the control group who wrote the unstructured practice journal'. Hypothesis 1 was rejected because of no statistically significant

difference in the mean score between the experimental group and control group ($t = 1.45$, $p = .152$) as shown in table 2. There were no significant differences in the self-directed learning ability of nursing students in structured reflection journal and practice journal writing in clinical practice education as shown in Table 2.

Table 2: Differences between Treatment and Comparison Groups for Dependent Variables

Groups	Before test			After test			t	p
	M	±	SD	M	±	SD		
Learning Attitude								
Treatment group (n = 33)	111.45	±	12.60	109.97	±	10.25	1.45	.152
Comparison group (n = 35)	116.97	±	10.82	113.28	±	10.13		

In previous studies, introspection activities have positive effects on improvement of cognitive ability and self-confidence. Teachers of nursing students should provide positive feedback and encouragement to maximize student orientation toward internal control. Students should strengthen their self-esteem by nurturing optimistic attitudes, positive emotional experiences, and self-development^[12]. Positive correlation was found between self-directed learning ability and clinical competence with metacognition. The most powerful predictor of clinical ability was metacognition. To improve the clinical competence of nursing students, it was necessary to improve the metacognitive ability^[13]. Lack of motivation and confidence was said to affect other social and emotional qualities. Confidence and self-control skills were greatly influenced by support and coaching staff. Socially sensitive skills such as self-confidence were important because students were

increasingly obliged in demanding compliance with rules, goal-oriented activities, and positive peer and teacher relationships. And also affect learning emotions such as learning motivation and learning attitudes^[14,15]. It could lead to improving the active learning attitude of nursing college students and strengthening capacity as a preliminary nurse. In order to establish the nurses identity, an environment should be established to facilitate the reflection activities in clinical practice education.

The second hypothesis is that ‘the experimental group who wrote the structured reflection log would have higher reflective thinking than the control group who wrote the unstructured practice journal’. Hypothesis 2 was supported because the experimental group had higher post-test the post-test scores than the control group ($t = 7.45$, $p < .001$) as shown in Table 3.

Table 3: Differences between Treatment and Comparison Groups for Dependent Variables

Groups	Before test			After test			t	p
	M	±	SD	M	±	SD		
Reflective Thinking Level								
Treatment group (n = 33)	45.42	±	3.35	54.00	±	4.02	7.45	<.001
Comparison group (n = 35)	46.49	±	4.00	46.80	±	3.95		

Logbooks were powerful and effective educational tools for structuring and testing medical education and technology. The evaluation of the surgery journal explains that the current version should be adjusted to meet student and institutional requirements. Otherwise, it will be regarded as purely labor-intensive and will eventually fail. Clinical practice training using structured reflection logbooks was effective in enhancing reflective thinking of nursing students. This is in agreement with previous research that structured questions support learners’ reflection activities^[16,17,18]. During the clinical practice, students have to better organize the learning situation to optimize their learning. Student education has been developed to improve the structure of clinical practice education. In creating this logbook, students

must systematically register essential learning activities. Students routinely record the patient’s problems in the manner they face and in some way (passive, active, without feedback)^[19]. Family practice anesthesiology (FPA) even though residents use incoherent journals, the data obtained provides an initial description of the FPA education year’s composition. Resident journal explains that it provides a great tool for improving the goals of the standardized curriculum and assessment program for FPA education^[20]. The experimental group of this study carefully thought about various nursing problems that occurred in the clinical field through the reflection question provided. It is interpreted that reflexive thinking is promoted by recording seriously, learning through learning activities, and finding out the lack of oneself.

Conclusion

Effects of reflection journal writing on self-directed learning ability and reflection level of nursing students in clinical practice classes were investigated to find their contribution to establishing effective teaching and learning strategies. A statistically significant difference in the level of reflective thinking before and after the reflection log was found, but there was no significant difference in self-directed learning ability. The significance of this study could be the applicability of the reflection logbook activities in clinical practice subjects and measuring their effectiveness. Therefore, it is necessary to keep the reflection level of nursing college students constantly through the use of reflection log in clinical practice class.

Ethical Clearance: Not required

Source of Funding: Gwangju University

Conflict of Interest: Nil

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Correlation Study of Emotional Labor, Self-esteem and Perceived Health Status of Construction Supervisors

A Young Park¹, Ja-Ok Kim², Hae-Ryoung Park³

¹Professor, Dept. of Nursing, Gwangju University, Korea; ²Professor, Dept. of Nursing, Wonkwang Health Science University, Korea; ³Professor, Dept. of General Education, Kwangju women's University, Korea

ABSTRACT

Background/Objectives: We investigated the factors that negatively affect construction supervisors due to deterioration in the construction industry. The purpose of this study was to examine the correlation of emotional labor, self-esteem and perceived health status of construction supervisors.

Method/Statistical Analysis: To achieve our objectives, the cross-sectional descriptive design was used with a total subject of 102 construction supervisors. Data were analyzed with independent t-test, ANOVA, and Pearson's correlation coefficients.

Findings: Emotional labor was statistically significant in the presence of spouse ($t = -2.03$, $p = .045$), salary ($F = 4.38$, $p = .015$) and job satisfaction ($F = 7.41$, $p = .001$). Self-esteem was significantly associated with age ($F = 4.53$, $p = .013$), religion ($t = 3.77$, $p < .001$), salary ($F = 9.35$, $p < .001$) and job satisfaction ($F = 7.84$, $p = .001$), and the presence of hobbies ($t = 2.00$, $p = .049$). There was a statistically significant difference in perceived health status between the presence of religion ($t = 2.65$, $p = .010$) and job satisfaction ($F = 5.80$, $p = .004$). The mean score of emotional labor was 2.50 out of 5.00, self-esteem was 2.83 out of 5.00, and perceived health status was 3.20 out of 5.00. There were statistically positive correlations between self-esteem and perceived health status ($r = .27$, $p < .005$). The higher the self-esteem, the higher the perceived health status. However, emotional labor and self-esteem were not statistically significant. Emotional labor and perceived health status were not statistically significant.

Improvements/Applications: Further research is needed to find other possible affecting perceived health status of construction supervisors. It is necessary to develop a health promotion program and to verify its effectiveness to improve the health of construction supervisors.

Keywords: Construction Supervisor; Emotional Labor; Health promotion; Perceived Health Status; Self-esteem

Introduction

The recent construction market was in a difficult situation due to the government's SOC budget decline, new orders from public-sector large-scale construction companies are sluggish, and housing supply in the private sector has deteriorated. The number of disasters in the construction industry has been on an increasing

trend, reaching 26,570 in 2016 (an increase of 5.7% over the previous year)^[1].

This study investigated emotional labor, self-esteem and perceived health status of construction supervisors who manage construction sites. Emotional labor can include enhancing, counterfeiting, or suppressing emotions to correct emotional expressions. Many job roles have rules related to emotions that employees should disclose. Emotional labor says that other social relations can lead to emotional labor, not service activity. Emotional labor refers to the degree of effort, planning and control necessary to express the emotions required by an organization during large human interactions ^[2,3]. In addition, stress on service providers affects their health and organizational cultures^[4].

Corresponding Author:

Hae-Ryoung Park
Professor, Dept. of General Education,
Kwangju Women's University, Korea
Email: hrpark@kwu.ac.kr

Emotional labor was defined as the situation in which emotional expression varies according to changes in emotions and organizational norms while performing tasks^[2].

Self-esteem represented the cognitive and appraisal level of self. In the psychological sense, it was the sense of self-value that was formed according to feelings or values of oneself obtained from life experience^[5]. It was the basis for maintaining the quality of life that was the basis of mental and social health. Decreases in self-esteem decrease the belief in ability to control the environment. Decreases in self-esteem have a negative impact on health status^[6].

Perceived health status refers to an individual's assessment of all his or her health^[7]. Perceived health status is widely used as an index to assess individual health status^[8]. Therefore, this study aimed to investigate the relationship between emotional labor, self-esteem and perceived health status of construction supervisors. We seek to improve the perceived health status and create a health management program for health promotion of construction supervisor. Also, we propose its use as a basic data for making a health education program.

Materials and Method

Participants & Data Collection: To find out the relationship between emotional labor, self-esteem and perceived health status of construction supervisors the subjects were 102 construction supervisors to collect data.

Instrument

Emotional Labor: Based on existing research^[2], we used measurement tools developed in consideration of socio-cultural backgrounds in accordance with the characteristics of Korean adults. Reliability analysis showed that Cronbach's α coefficient was .70.

Self-Esteem: Based on existing research^[9,10], the ten questions were scored with a four points scoring. The points scoring was 4 = very good, 3 = relatively good, 2 = relatively poor, and 1 = very poor. The response to the negative problem was reversed. Self-esteem scores range were from a minimum of 10 to a maximum of 40. The higher the score represented the higher the self-esteem. Reliability analysis showed that Cronbach's α coefficient was .75.

Perceived Health Status: Based on existing research^[11,12], the three questions were scored with a five

points scoring. The points scoring was 5 = very good, 4 = relatively good, 3 = fair, 2 = relatively poor, and 1 = very poor. The score range of the perceived health status was from a minimum of 3 to a maximum of 15. The higher the score were the better the perceived health status. Reliability analysis showed Cronbach's α coefficient was .81.

Data Analysis

The data were collected using SPSS/win 18.0 program. The general characteristics of the subjects were presented as frequency, percentage, mean and standard deviation. The subjects' emotional labor, self-esteem, and perceived health status were presented as mean, standard deviation, maximum value, and minimum value. According to general characteristics, the subjects' emotional labor, self-esteem, and perceived health status were analyzed by independent t-test and one-way ANOVA. Post hoc analysis was analyzed by Scheffe' test. The subjects' emotional labor, self-esteem, and perceived health status were analyzed by Pearson's correlation coefficients.

Results and Discussion

The process of emotional labor interaction between the supervisor and the subordinates is concerned with the emotional labor of the subordinate to supervisors with high social status. In daily work, subordinates must work under the supervisor's instructions, and subordinates follow the supervisor's instructions through emotional labor, which is the duty of subordinates^[13,14,15]. Effective clinical teaching and learning requires the instructor's emotional efforts. Understanding emotional labor in all manifestations will help to create a clinical learning environment that cares for student nurses in Malawi^[16].

The general characteristics of the subjects were 3.9% for those under 40 years of age, 39.2% for those aged 40 to 49 years, and 56.9% for those over 50 years old, with an average of 50.40 ± 6.36 years. Sex was 99.0% for male and 1.0% for female, and religion was 49.0%, not for 51.0%, and 88.2% for no spouse or 11.8% for spouse. The degree of education was 4.9% for college graduates and 95.1% for college graduates. In the working form, 74.5% for resident work and 25.5% for non-resident work. The annual salary was less than 30 million won, for 9.8 percent, 33.3 percent less than 40 million won, and 56.9 percent more than 40 million won. At the construction site, the number of supervisors is moderate (45.1%) and insufficient (54.9%).

In the case of client, 55.9% was for public works construction and 44.1% for non-public construction work. There was a hobby 35.3%, 64.7% was not. In the field work experience were Yes. 96.1% and No. 3.9%. The supervisory career was 6.9% for Supervision (Elementary), 18.6% for Supervisor (Intermediate), and 74.5% for Chief Supervisor (Superior). Satisfaction with job satisfaction was 14.7%, average 78.4%, dissatisfied 6.9% as shown in Table 1.

Table 1: General Characteristics

Characteristics	Category	n	%	M ± SD
Age (yr)	<40	4	3.9	50.40 ± 6.36
	40-49	40	39.2	
	≥50	58	56.9	
Gender	M	101	99.0	
	F	1	1.0	
Religion	Yes	50	49.0	
	No	52	51.0	
Spouse	Yes	90	88.2	
	No	12	11.8	
Education	= College graduate	5	4.9	
	≥ University graduate	97	95.1	
Working form	resident work	76	74.5	
	non-resident work	26	25.5	
Income (Year, 10,000won)	<3,000	10	9.8	
	≥3,000, <4,000	34	33.3	
	≥4,000	58	56.9	
Number of Supervisors	moderate	46	45.1	
	insufficient	56	54.9	
Client	public works construction	57	55.9	
	Non-public works construction	45	44.1	
Hobbies	Yes	36	35.3	
	No	66	64.7	
Field Work Experience	Yes	98	96.1	
	No	4	3.9	
Supervisory Career	Supervision (Elementary)	7	6.9	
	Supervisor (Intermediate)	19	18.6	
	Chief Supervisor (Superior)	76	74.5	
Job Satisfaction	Satisfaction	15	14.7	
	Middle	80	78.4	
	Dissatisfaction	7	6.9	

The results of the subjects' emotional labor, self-esteem and perceived health status represented mean, standard deviation, minimum and maximum values. The mean value of emotional labor was 2.50 ± 0.26 , the minimum value was 2.00 and the maximum value was 3.25. The self-esteem was $2.83 \pm .28$, the minimum value was 2.30 and the maximum value was 3.80. The perceived health status was $3.19 \pm .50$, the minimum value was 2.00, respectively as shown in Table 2.

Table 2: Degree of Emotional Labor, Self-esteem and Perceived Health Status

Variables	M ± SD	Minimum	Maximum	Range
Emotional Labor	$2.50 \pm .26$	2.00	3.25	1-4
Self-esteem	$2.83 \pm .28$	2.30	3.80	1-4
Perceived Health Status	$3.19 \pm .50$	2.00	5.00	1-5

Emotional labor was statistically significant in the presence of spouse ($t = -2.03$, $p = .045$), income ($F = 4.38$, $p = .015$) and job satisfaction ($F = 7.41$, $p = .001$). As a result of the Scheffe' test for significant variables, emotional labor was lower in the group with less than 30 million won than in the group with less than 30 million won. Emotional labor was lower in the satisfied group than in the normal group.

Self-esteem was significantly associated with age ($F = 4.53$, $p = .013$), religion ($t = 3.77$, $p < .001$), income ($F = 9.35$, $p < .001$) and job satisfaction ($F = 7.84$, $p = .001$), and the hobbies ($t = 2.00$, $p = .049$).

As a result of the Scheffe' test, significant self-esteem was higher in the 30s than in the 50s and over. In the annual salary groups, the group with less than 30 million won had higher self-esteem than the group with less than 3,000 to 40 million won and the group with more than 40 million won. Satisfaction with self-esteem was higher in the satisfied group than in the normal group.

There was a statistically significant difference in perceived health status between the presence of religion ($t = 2.65$, $p = .010$) and job satisfaction ($F = 5.80$, $p = .004$). As a result of the Scheffe' test, significant differences were found in satisfaction with job satisfaction, and perceived health status was higher than that of dissatisfied group.

In the correlation between variables, self-esteem and perceived health status showed a positive correlation ($r = .27$, $p = .005$). The higher the self-esteem the higher the perceived health status as shown in Table 2. However,

emotional labor and self-esteem were not statistically significant. Emotional labor and perceived health status were not statistically significant as shown in Table 3.

Table 3: Correlation among Emotional Labor, Self-esteem and Perceived Health Status

	Emotional Labor	Self-esteem	Perceived Health Status
	r (p)		
Emotional Labor	1	.17(<.096)	-.08(<.442)
Self-esteem		1	.27(<.005)
Perceived Health Status			1

Differences in perceived health status were found between sick and healthy people, but differences in self-esteem were not significant. The average scores of the body images of the RA and HLT groups were similar, but the scores of the SLE subjects were low. Perceived health status was directly related to self-esteem but not to body image. Age and time after diagnosis were weakly correlated with perceived health status. Two similarities and differences have been identified in the problems, needs and fears of RA and SLE subjects^[17].

There is statistically significant difference between the experimental group and the control group after applying the reflection log, but there is no statistically significant difference between the learning attitude and the self-efficacy^[18]. This affects learning attitudes if you write reflections and if you have positive feedback from your teachers. Teaching method applies learning reflection logbook in the writing subject and applies the reflection journal of the teacher who is suited to the needs of the students and the writing feedback gives the learning efficiency.

Conclusion

Our study was to investigate the relationship between construction supervisors emotional labor, self-esteem and perceived health status and to use it as a basic data to find out ways to increase perceived health status. In this study, the emotional labor was 2.50 (out of 5), self-esteem was 2.83 (out of 5), and perceived health status was 2.83 (out of 5) of construction supervisors.

The self-esteem of the construction supervisor and the perceived health status showed a significant correlation. Therefore, the higher the self-esteem of the construction supervisor the higher the perceived health status. In order to improve the health status of

construction supervisors, the state needs social policy management.

Legal guarantees of regular breaks during working hours, health care in periodic public health centers was essential. In order to increase the perceived health status of construction supervisors, it is necessary to develop health promotion program and education program that can enhance self-esteem.

This study investigates the correlations between emotional labor, self-esteem, and perceived health status of construction supervisors. Clinical outcomes have been used to improve the health of workers in public health. Educational outcomes could be provided as evidence for educational program development.

Ethical Clearance: Not required

Source of Funding: Gwangju University

Conflict of Interest: Nil

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A Study on Empathy of Korean Nursing College Students

Young Hee Jeong¹, Mi Jin Kim²

¹Dept. of Nursing Science, Woosong College, Korea; ²Dept. of Nursing Science, Daejeon Institute of Science and Technology, Korea

ABSTRACT

Background/Objectives: This study was attempted to confirm the relationship between nursing student 's self -awareness, others-awareness, schema for persons with disabilities, and empathy. The study subjects were 280 nursing students.

Method/Statistical Analysis: To investigate the relationship between the main variables, correlation and regression analysis were used the SPSS/PC. 19 program.

Findings: The results showed that there was a significant correlation between the self-awareness, the schema for the disabled, other-awareness and empathy of the nursing students. Hierarchical regression analysis was performed to confirm the influence of major variables affecting empathy ability. Results: Self-awareness, schema for the disabled, and other-awareness variables were influenced by the explanatory power 13.7% of nursing student's empathy ($F=15.764$, $p=.000$). These results are interpreted as the higher the self-awareness, the higher the others-awareness, the more positive the schema for the disabled, the higher the empathy ability of nursing college students.

Improvements/Applications: Therefore, education methods and strategies are needed to increase self-awareness, other-awareness, and positive schema formation for the disabled to improve empathy of nursing students.

Keywords: *self-awareness, other-awareness, schema for the disabled, empathy, nursing students.*

Introduction

Nurses provide care for people, and this job requires empathy as an important attribute. Educational institutions, therefore, need detailed education strategies for development and improvement of attributes.

In Korean nursing education, the importance of nurse's empathy has been realized and studies on empathy of nurses and nursing undergraduates have been conducted to identify factors and explanatory power of each factor to be evidence of education. However, explanatory power of the related variables affecting empathy is weak, and therefore, exploration of more variables and replication studies are required consistently.

Empathy is one of essential factors to provide good nursing. It contributes to appropriate responses to emotion and mentality of patients and building of a meaningful relationship. In particular, nurse's empathy facilitates individualized nursing depending on patient's feeling and nurses would be able to predict patient's action to improve the quality of nursing provided for welfare of patients ^[1]. Nurses help and guide patients as active participants to lead change of health behaviors to solve real or potential problems of patients. In this specialized job, empathy is delivered to patients by responses of a nurse, and it helps interaction with patients and formation of an amicable relationship ^[2]. Thus, nursing educational institutions should provide education to improve empathy required for therapeutic care and relationship building. Korean nurse training centers provide regular classes and non-academic classes, such as volunteer work, to improve empathy, and these systematic curricula would promote empathy^[3].

Previous studies in Korean nurses and nursing undergraduates have focused on identification of

Corresponding Author:

Mi Jin Kim

Professor, Dept. of Nursing Science,

Daejeon Institute of Science and Technology, Korea

Email: mjkim@dst.ac.kr

variables affecting empathy and explanatory power, and main factors were suggested including self-awareness, other-awareness, stress, ways of coping, self-esteem, ego-resiliency, sex, clinical experience, and major satisfaction [3-8].

In the previous studies, self-awareness was frequently reported among variables affecting empathy of nursing undergraduates. Self-awareness was highlighted based on the results showing that understanding of others and empathy could be improved by self-understanding. Kang [4] analyzed the effect of self-awareness and other-awareness on empathy, and demonstrated that the level of empathy significantly increased as self-awareness and other-awareness were getting higher, which suggests that curricula for emotional empathy of nursing undergraduates should be provided. In other words, relevance between empathy of nursing undergraduates and self-awareness is high and self-understanding can improve understanding of others to eventually affect empathy in the theoretical structure.

Self-awareness is to recognize inner thinking or feeling of oneself. It is defined as recognition of oneself as a social object affecting others, recognition of concern about others' assessment of oneself, recognition of discomfort against others, and anxiety about recognition of oneself as a social object [9]. Self-awareness of nurses can prevent potential countertransference and understand patients as they are, with empathy [3]. In addition, it can be a vital source in relationship with patients. Other-awareness, one of main variables affecting empathy, is to care about the inner side of others, and it is in the process of understanding others based on information of the inside and outside of others [4]. In the results of previous studies, a correlation among self-awareness, other-awareness, and empathy was high, and self-awareness and other-awareness were main factors improving empathy. However, since the effect of both variables was not strong, replication studies and exploration of additional variables affecting empathy are needed [10].

In the previous studies, right self-awareness of nurses could reduce stigma on patients [10,11]. Nurses with high self-awareness had less stigma on patients to accept them for who they were. It may suggest that higher self-awareness leads lower stigma and higher empathy on specific patients, such as the disabled. Thus, it needs to be identified whether nurses with high self-awareness have high other-awareness, low stigma, i.e. negative schema, on the disabled, and high empathy.

In the present study, based on the previous studies on empathy, we identified relevance among self-awareness, other-awareness, empathy and a schema for the disabled, and investigated the impact of variables improving empathy of nursing undergraduates and additional factors. Our results could contribute to strategy development for improvement of empathy of nursing undergraduates and suggest basic data for reform of curricula.

Materials and Method

Research Design & Model: The purpose of this study is to investigate the effect of self-awareness, other-awareness, and a schema for the disabled on empathy of college students.

Subjects and Data Collection: In the study, undergraduates in the Department of Nursing Science were recruited and the purpose and methods of the study were explained. The undergraduates who provided informed written consent were included in the study. A structured questionnaire was used in data collection. A total of 280 questionnaires were collected and statistically analyzed. The data was collected from May 2016 to June 2016. The investigator conducted a survey with the questionnaire.

Statistical Method: The effect of self-awareness, other-awareness, and a schema for the disabled on empathy of nursing undergraduates was analyzed using version 19 of the Statistical Package for the Social Sciences (SPSS). The general characteristics of the participants were summarized. Correlation analysis among main variables and hierarchical regression were performed.

Survey Tools

The tools used in this study are as follows.

Self-awareness Tool: Self-awareness was measured using a modified self-awareness test of Eun^[12] based on the test of Fenigstein, Scheier, Buss^[13]. The tool included 20 questions composed of 9 questions of self-awareness, 5 questions of public self-awareness and 6 questions of social anxiety. The questions used a 1 to 5-scale from 'strongly disagree' (1 point) to 'strongly agree' (5 points). A high score means high self-awareness. The reliability (Cronbach's alpha) of the tool was 0.74 in the study of Eun^[12] and 0.69 in the present study.

Other-awareness Tool: Other-awareness was measured using a tool modified for Korean adolescents by Eun [12]. The tool included 21 questions composed of 12 questions of internal other-awareness, 5 questions of external other-awareness, and 4 questions of fancied other-awareness. The questions used a 1 to 5-scale from 'strongly disagree' (1 point) to 'strongly agree' (5 points). A high score means high other-awareness. The reliability (Cronbach's alpha) of the tool was 0.90 in the study of Eun [12] and 0.92 in the present study.

Schema for the Disabled: To measure a schema for the disabled, we used a semantic differential scale using adjectives of Koreans developed by Jang [14] based on the semantic differential scale of Osgood [15]. The tool used in the study included 9 pairs of adjectives selected by a pilot test to measure a schema for the disabled. The selected adjectives used a 1 to 10-scale from left to right. A high score means a negative schema for the disabled. The reliability (Cronbach's alpha) of the schema tool in the present study was 0.75.

Empathy Tool: Empathy was measured using a tool modified by Kim et al. [10] based on the tool of Davis [16] and Bryant [17]. A high score means high empathy. The tool included 30 questions composed with a 1 to 5-scale from 'strongly disagree' (1 point) to 'strongly agree' (5 points). A high score means high empathy. The reliability (Cronbach's alpha) of the tool was 0.85 in the study of Kim et al. [10] and 0.83 in the present study.

Results and Discussion

General Characteristics of the Participants: The general characteristics of the participants are shown in Table 1. Among 280 participants, 27 (9.6%) were male and 253 (90.4%) were female. In the result of academic achievement, 5 (1.8%), 51 (18.2%), and 136 (48.6%) were 'very satisfied', 'satisfied' and 'neither satisfied nor dissatisfied', respectively. In the result of major satisfaction, 10 (3.6%), 96 (34.3%), and 136 (48.6%) were 'very satisfied', 'satisfied' and 'neither satisfied nor dissatisfied', respectively. In satisfaction from friendship, 35 (12.5%), 154 (55.0%), and 83 (29.6%) were 'very satisfied', 'satisfied' and 'neither satisfied nor dissatisfied', respectively. Most of the participants were above the average.

Table 1: General Characteristics of Study Participants (n = 280)

Characteristics	Categories	n(%)
Gender	male	27(9.6)
	female	253(90.4)
Academic achievement	very satisfied	5(1.8)
	satisfied	51(18.2)
	moderate	136(48.6)
	unsatisfied	69(24.6)
	very unsatisfied	19(6.8)
Satisfaction in major	very satisfied	10(3.6)
	satisfied	96(34.3)
	moderate	136(48.6)
	unsatisfied	31(11.1)
	very unsatisfied	7(2.5)
Satisfaction in friendship	very satisfied	35(12.5)
	satisfied	154(55.0)
	moderate	83(29.6)
	unsatisfied	3(1.1)
	very unsatisfied	5(1.8)

General characteristics and a level of self-awareness, other-awareness, schema for the disabled, and empathy

General characteristics including academic achievement, major satisfaction and friendship satisfaction, and main variables including self-awareness, other-awareness, schema for the disabled, and empathy were analyzed and the result is shown in Table 2. The score of self-awareness, other-awareness, schema for the disabled, and empathy was 3.30 ± 6.84 , 3.34 ± 11.83 , 5.58 ± 7.10 , and 3.54 ± 11.13 , respectively.

Table 2: The Degree of General Characteristic, Self-awareness, Other-awareness, Schema for the disabled, Empathy (n = 280)

Variable	M $\pm$ SD
Academic achievement	2.80 $\pm$.87
Satisfaction in major	3.22 $\pm$.82
Satisfaction in friendship	3.72 $\pm$.80
Self-awareness	3.30 $\pm$ 6.84
Other-awareness	3.34 $\pm$ 11.83
Schema for the disabled	5.58 $\pm$ 7.10
Empathy	3.54 $\pm$ 11.13

Correlation analysis among self-awareness, other-awareness, schema for the disabled, and empathy

In the result of correlation analysis among self-awareness, other-awareness, schema for the disabled, and empathy, a significant correlation was found (Table 3). In particular, there was a positive correlation between empathy and self-awareness ($r=.297$, $p<.000$), and between empathy and other-awareness ($r=.203$, $p=.001$). A negative correlation between empathy and a schema for the disabled ($r=-.220$, $p<.000$) was also found.

Table 3: Correlations between empathy and major variables (n = 280)

Variables	Pearson Correlation (p)			
	a)	b)	c)	d)
a) Self-awareness	1			
b) Schema for the disabled	-.102 (.089)	1		
c) Other-awareness	-.309 (.000)	.111 (.063)	1	
d) Empathy	.297 (.000)	-.220 (.000)	.203 (.001)	1

3.4 The effect of self-awareness, other-awareness, and a schema for the disabled on empathy

Self-awareness, other-awareness, and a schema were included in independent variables, and empathy was included in a dependent variable in hierarchical regression analysis to identify the effect of self-awareness, other-awareness, and a schema for the disabled on empathy. In the result as shown in table 4, the Durbin-Watson statistic was 1.96, which suggests no residual autocorrelation between independent variables. Homoscedasticity assumption and normal distribution assumption of the standardized residuals were satisfied. All the variance inflation factor (VIF) scores were under 10, and therefore, multicollinearity was deemed not important for the independent variables. In the result of regression analysis, self-awareness ($\beta=.227$), a schema for the disabled ($\beta=-.214$), and other-awareness ($\beta=.156$) affected empathy significantly ($F=15.764$, $p=.000$) with 13.7% of Adjusted R^2 . In other words, empathy of nursing undergraduates increased as self-awareness and other-awareness rose and a schema for the disabled was more positive.

Table 4: Influencing factors on empathy (n = 280)

Independent Variables	Model			
	SE	β	t (p)	VIF
Constant	7.914	-	11.170 (.000)	
Self-awareness	.096	.227	3.831 (.000)	1.129
Schema	.089	-.214	-3.786 (.000)	1.034
Other-awareness	.056	.156	2.644 (.009)	1.132
Statistic	$R^2=.146$, Adjusted $R^2=.137$, $F=15.764$, $p=.000$, Durbin-Watson=1.966			

Discussion

In the study, we found variables based on the previous studies on empathy, and then self-awareness, other-awareness, a schema for the disabled, and empathy of nursing undergraduates were investigated. The variables affecting empathy were explored and a correlation was identified. In the result, a score of self-awareness and other-awareness of the participants was 3.30 ± 6.84 and 3.34 ± 11.83 (a 1 to 5-scale), respectively. The score of self-awareness in our study was higher than 2.82 ± 0.74 in the previous study of Kang [4], and lower than 3.40 ± 0.32 of Oh et al. [18], 3.45 ± 0.40 of Park et al. [19], 3.49 ± 0.38 of Kim et al. [10], and 3.50 ± 0.38 of Park et al. [20]. A developmental stage was different, but our result was similar to the result (3.31) of Eun [12] who investigated middle and high school students. Thus, it was confirmed that self-awareness in the present study was generally similar to the results of previous studies. However, the score in the subjects in the same developmental stage in other studies was different from our result, and therefore, additional replication studies are needed.

Other-awareness of the participants was 3.34 ± 11.83 in a 1 to 5-scale, and was similar to Kang's result (3.34 ± 0.65) [4] while it was lower than the result (3.41 ± 0.50) reported by Oh et al. [18] and higher than the result (3.19 ± 0.60) by Eun [12]. Due to a different design, the results cannot be compared directly. Self-awareness and other-awareness seem to be higher in nursing undergraduates in the Department of Nursing Science who were educated by curricula for improvement of self-awareness and other-awareness than those who were not educated. However, evidence is not enough.

Further studies to compare non-medical undergraduates in the same developmental stage are needed to identify the effect of education.

A score of a schema for the disabled was 5.58 points, which is higher than 5.23 from the study of Kim et al. [21] who also investigated nursing undergraduates. A high score of schema for the disabled means a negative schema. A semantic differential scale was used to measure a schema for the disabled (a 1 to 10-scale). The average score of a schema was moderate, not extremely negative or positive.

In the analysis result of empathy, a score was 3.54 ± 11.13 , which is lower than 3.58 ± 0.41 of Kim et al. [10] and 3.67 ± 0.39 of Kang [4]. Although we also recruited the participants from the Department of Nursing Science, our participants were sophomores due to convenient sampling. They have not completed the whole course of the Department of Nursing Science, and it might be the reason of a lower score. However, Kim et al. [10] reported 3.60 ± 0.42 and Kang [4] reported 3.61 ± 0.39 of empathy in the same grade, which are higher than our result. Thus, further replication studies are needed to identify a significant difference in empathy among universities.

In the result of correlation analysis among self-awareness, other-awareness, a schema for the disabled, and empathy, a correlation between empathy and other variables was found. There was a positive correlation between self-awareness and empathy and between other-awareness and empathy while a negative correlation between a schema for the disabled and empathy. In one previous study, right self-awareness reduced stigma [11]. However, a correlation between self-awareness and a schema for the disabled, which has been reported in the previous study, was not found. It needs to be identified in further replication studies with validity of a tool considered.

In the analysis result of the variables affecting empathy, self-awareness, other-awareness, and a schema for the disabled were demonstrated and their explanatory power was 13.7%. The power of self-awareness was the greatest, followed by a schema for the disabled and other-awareness. This result is similar to the result of Kim et al. [10]. Nursing undergraduates with high self-awareness may understand other's feelings well and make good use of their emotion to improve empathy for others [10]. In addition, it is interesting that a schema for the disabled

was identified to affect empathy. It suggests that a positive schema for the disabled improves empathy. The result supports that institutionalization of volunteer work in facilities for the disabled and disability awareness education contribute to improvement of empathy of undergraduates in the Department of Nursing Science. It provides evidence to support the existing education and programs.

In the present study, it was confirmed that a schema for the disabled affected empathy, as one of additional factors affecting empathy. Our results support that self-awareness and other-awareness could improve empathy as reported by previous studies.

Conclusion

In the study, we found variables based on the previous studies on empathy, and then self-awareness, other-awareness, a schema for the disabled, and empathy of nursing undergraduates were investigated. In the analysis result of the variables affecting empathy, self-awareness, other-awareness, and a schema for the disabled were demonstrated and their explanatory power was 13.7%. To conclude, nursing educational institutions need to provide curricula to promote self-awareness and other-awareness, and actively institutionalize voluntary work to form a positive schema for the disabled, or run disability awareness educational programs.

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Influencing Factors of Fatigue, Perceived Stress, Self-efficacy and Social Support in the Middle Age on Health Conservation

Eun-Hee Shin¹, Gyun-Young Kang²

¹Department of Nursing, Munkyeong College, Korea; ²Kyungdong University College of Nursing, Korea

ABSTRACT

Background/Objectives: This study is descriptive survey study to factors influencing health conservation among middle age.

Method/Statistical Analysis: The study subjects are 173 middle age who reside in M & C city area, and data-collection was done in period from March 05 to 23, 2018. The collected data was analyzed with Pearson's correlation, multiple linear regression with stepwise method analysis.

Findings: The result showed Health conservation was negatively correlated with fatigue and perceived stress, positively correlated with self-efficacy and social support. The major factors that affect health conservation in middle age were self-efficacy, social support, perceived stress, which explained 31.8% of health conservation.

Improvements/Applications: The findings can provide the basis for the development of nursing interventions to improve health conservation.

Keywords: Health conservation, Fatigue, Perceived Stress, Self-efficacy, Social support

Introduction

The middle age is between the young age and the old age, and is usually defined to be in between 40 and 65 years old. Middle-ages, which occupy about one-third of the total population, are heads of household taking adults or caring for children at home and play a role of backbone socially that their weight is greater than expected¹. Therefore, it is important for middle-aged people to conserve their bodies healthy at this time, and the health in this period can be continued to the old age, so health conservation in this age is also necessary to improve the quality of life in old age.

People are exposed to stress by experiencing various changes such as changes in roles, physiological and psychological changes in middle age². In order to

qualitatively improve such middle-aged life, a health-conservation approach that maintains integrated well-being in physical, psychological, psychological and social aspects is required³. Health conservation refers to maintaining physical, mental, and social well-being or maintaining a balance between physical, mental, social and psychological integration³. In previous studies, health conservation has been influenced by health promoting behavior, wisdom, pain, self-care behaviors, subjective health status and health concern⁴.

Fatigue is common in everyday life, but physical symptoms such as fatigue are mixed with medical and psycho-social factors and can be chronicized by interactions of various factors⁵. In particular, middle-aged women are reported that they felt more fatigue than men due to their family responsibilities and physical and physiological changes such as menopause^{6,7}. However, middle-aged men are also reported that they feel a decrease in sexual desire, change in mood, fatigue and anger⁸ that the demand for fatigue management is considered to be an important issue.

Thomas⁹ found that 66% of middle-aged men were exposed to high stress due to physical decline and

Corresponding Author:

Gyun-Young Kang

Assistant Professor,

Kyungdong University College of Nursing,

Wonju-si, Gangwon-do, KOREA

Email: mental74@kduniv.ac.kr

energy loss, family health problems, lack of time for roles and responsibilities, uncertainty about their future, and negative thinking⁹. Such physical change, changes in family system and role are the stresses in middle age, and middle age stress is an important factor affecting all areas of life.

Self-efficacy is a factor that helps in minimizing the impact of actual problems with confidence and enables successful performance of certain tasks¹⁰. Thus, self-efficacy is an important factor in promoting behavioral change and motivation for middle-aged problems¹¹. The results of this study were as follows: First, there was a significant relationship between self-efficacy and perceived self-efficacy, and self-efficacy had a positive effect on health beliefs, choice of health promoting behaviors and is a major determinant of the quality of life^{12,13}.

Social support is one of the important factors influencing individual health behavior, treatment compliance, and health outcomes^{14,15}. Particularly in middle age, which is in a period of various changes in physical and psychological, the social support through social interaction such as family, friends, neighbors is more important. In previous studies, there was a correlation between social support and health promoting practice¹⁶, and it was also found to affect mental health of middle-aged women¹⁷.

Middle-aged women may be able to reduce weight and increase bone density through proper exercise¹⁸, and reduce the severity of menopausal symptoms to alleviate and prevent problems related to menopause and aging¹⁹. In addition, exercise is also effective in mental health and social aspects, so exercise is needed to conserve middle-aged health.

Health conservation is important for middle-aged people in time of various changes, because it gives meaning to their lives, affects their physical and psychological treatment effects on the disease, and motivates their activities to conserve health²⁰. In addition, identifying the fatigue, stress, self-efficacy, social support and exercise that may affect the health conservation of the middle age will be an important factor in promoting health promotion behavior. The purpose of this study is to develop a nursing intervention program that helps maintaining the integrated state of wellbeing by identifying the degree of health conservation in middle age and examining the effects of fatigue, stress, self-efficacy and social support.

Research Method

Research Design: This study is a descriptive research study to identify fatigue, perceived stress, self-efficacy, social support and exercise, which are factors affecting middle-aged health conservation.

Subjects of Research: The subjects of this study were 173 middle-aged people aged 40 to 64 living in two regions. The size of the study sample was calculated using the G * POWER 3.1 program. The number of predictors needed for multiple regression analysis was 16, medium effect size: .15, significance level: .05, and power: .80. Therefore, finally, 173 subjects were selected as subjects and the required number of samples was met.

Research Tools

Fatigue: Fatigue was measured using the Multidimensional of Assessment Fatigue (MAF) developed by Tack²¹. This scale is composed of sub-concepts of degree of fatigue and fatigue effect. Ten points were assigned to each question, and the higher the score on the Likert scale, the higher the fatigue. Cronbach's α in this study = .940 in this study.

Perceived Stress: Perceived stress was developed and modified by Cohen et al.²². This scale means the degree to which an individual's life has been unpredictable, uncontrollable, and burdensome over the last month. This tool was composed of 5 points for each question and a Likert scale. In this study, Cronbach's α = .719.

Self-Efficacy: Self-efficacy was measured by the general self-efficacy scale developed by Chen, Gully, and Eden²³. The tool consists of 8 questions, with 5 points assigned to each question. The higher Likert scale means higher self-efficacy. In this study, Cronbach's α = .908.

Health Conservation: The health conservation scale was developed by Sung³. This tool consists of 37 questions, 14 questions on personal unity, 8 questions on energy conservation, 8 questions on structural integrity, and 7 questions on social integrity. Four points were assigned to each question, and the higher the score of the Likert scale, the higher the degree of health conservation. Cronbach's α = .880 in this study.

Exercise: Exercise was measured by four questions corresponding to exercise in sub-domains in the Health Promotion lifestyle Profile (HPLP), a tool developed by Walker, Sechrist and Pender²⁴. The higher the score, the higher the exercise level. Cronbach's α = .948 in this study.

Data Analysis

Data was analyzed using SPSS/WIN 22.0. The general characteristics of the subjects were calculated using descriptive statistics, real number, percentage, mean and standard deviation. The differences in health conservation according to general characteristics of the subjects were analyzed by t-test and ANOVA. Pearson correlation coefficient was used for the relationship between fatigue, perceived stress self-efficacy and health conservation. Multiple linear regression with

stepwise method was used to analyze factors affecting health conservation.

Results

Health Conservation according to Characteristics of Subjects: The degree of health conservation according to general characteristics was statistically determined according to the monthly income ($F = 3.045$, $p = .019$), economic condition ($F = 7.518$, $p = .001$) and pain intensity ($F = 4.974$, $p = .002$) showing a significant difference in statistics as shown in table 1.

Table 1: Health conservation according to characteristics of subjects

Characteristics	Categories	N (%)	M $\pm$ SD	t/F(p)
Gender	Male	58(33.5)	2.99 $\pm$.33	.009 (.494)
	Female	115(66.5)	2.85 $\pm$.30	
Age(year)	40-49	58(33.5)	2.86 $\pm$.29	.247 (.964)
	50-64	115(66.5)	2.92 $\pm$.33	
Marital status	Married	148(85.5)	2.90 $\pm$.31	1.780(.153)
	Unmarried	12(6.9)	2.90 $\pm$.35	
	divorced	7(4.0)	2.65 $\pm$.23	
	Bereavement	6(3.5)	3.00 $\pm$.35	
Education	Primary School	11(6.4)	2.69 $\pm$.40	1.851(.140)
	Middle School	20(11.6)	2.94 $\pm$.30	
	High School	64(37.0)	2.90 $\pm$.29	
	College or above	78(45.1)	2.92 $\pm$.33	
Occupation	Worker	23(13.3)	2.90 $\pm$.23	.748 (.632)
	Engineer	17(9.8)	2.93 $\pm$.40	
	Profession	38(22.0)	2.30 $\pm$.36	
	Business	21(12.1)	2.90 $\pm$.33	
	Agriculture	9(5.2)	2.82 $\pm$.33	
	Day labor	30(17.3)	2.86 $\pm$.31	
	Inoccupation	15(8.7)	2.81 $\pm$.35	
	Other	20(11.6)	2.86 $\pm$.21	
Religion	Buddhism	57(32.9)	2.91 $\pm$.32	.634 (.639)
	Christianity	63(36.4)	2.93 $\pm$.33	
	Catholic	7(4.0)	2.80 $\pm$.21	
	irreligion	42(24.3)	2.85 $\pm$.32	
	Other	4(2.3)	2.92 $\pm$.27	
Inmate	Spouse	34(19.7)	2.89 $\pm$.33	.651 (.627)
	Children	9(5.2)	2.75 $\pm$.34	
	Spouse&Children	113(65.3)	2.91 $\pm$.31	
	None	10(5.8)	2.86 $\pm$.36	
	Other	7(4.0)	2.97 $\pm$.37	
Monthly income	Less than one million won	25(14.5)	2.75 $\pm$.27	3.045 (.019)
	More than one million won - Less than two million won	41(23.7)	2.83 $\pm$.29	
	More than two million won - Less than three million won	38(22.0)	2.95 $\pm$.30	
	More than three million won	52(30.1)	2.97 $\pm$.35	
	Non fixed income	17(9.8)	2.94 $\pm$.28	

Conted...

Economic status	Upper	9(5.2)	3.11 ± .54	7.518 (.001)
	Middle	133(76.9)	2.92 ± .29	
	Lower	31(17.9)	2.73 ± .27	
Payer	The person himself	126(72.8)	2.92 ± .33	1.805 (.181)
	Family	47(27.2)	2.84 ± .27	
Smoking	Yes	14(8.1)	2.86 ± .38	.187 (.666)
	No	159(91.9)	2.90 ± .31	
Alcohol	Yes	42(24.3)	2.91 ± .32	.043 (.836)
	No	131(75.7)	2.90 ± .32	
Pain area	Neck	13(7.5)	2.93 ± .28	2.034 (.076)
	Shoulder	39(22.5)	2.89 ± .26	
	Low back	68(39.3)	2.97 ± .34	
	arm, leg	29(16.8)	2.76 ± .27	
	Knees	20(11.6)	2.87 ± .37	
	Other	4(2.3)	2.79 ± .32	
Treatment Period	Less than 6 months	69(39.9)	2.90 ± .29	.114 (.736)
	More than 6 months	104(60.1)	2.90 ± .34	
Pain intensity	none	10(5.8)	3.12 ± .26	4.974 (.002)
	mild	76(43.9)	2.95 ± .30	
	moderate	70(40.5)	2.80 ± .33	
	severe	17(9.8)	2.92 ± .26	

Relations between Fatigue, Perceived Stress, Self-efficacy, Social Support and Health Conservation: The relationship between fatigue, perceived stress, self-efficacy, social support, and health conservation was as follows. The health conservation and fatigue ($r=-.129$, $p=.001$), perceived stress ($r=-.634$, $p=.001$) showed to have negative correlation, and the health conservation and self-efficacy ($r=.598$, $p=.001$) and social support ($r=.516$, $p=.001$) and exercise ($r=.357$, $p=.001$) showed to have positive correlation. In other words, the less the fatigue, less stress, higher self-efficacy, more social support, more exercise, the higher health conservation degree is shown in table 2.

Table 2: Correlations of fatigue, perceived stress, self-efficacy, social support, exercise and health conservation (N = 173)

	Fatigue	Perceived stress	Self-efficacy	Social support	Exercise	Health conservation
Fatigue	1					
Perceived stress	0.500** ($<.001$)	1				
Self-efficacy	-0.352** ($<.001$)	-0.625** ($<.001$)	1			
Socialsupport	-0.246** ($<.001$)	-0.383** ($<.001$)	0.539** ($<.001$)	1		
Exercise	-0.239** (.002)	-0.312** ($<.001$)	0.360** ($<.001$)	0.308** ($<.001$)	1	
Health conservation	-0.429** ($<.001$)	-0.643** ($<.001$)	0.598** ($<.001$)	0.516** ($<.001$)	0.357** ($<.001$)	1

Impact Factors on Health conservation of Subjects: In order to identify the factors affecting the subject's health conservation, the regression model was analyzed ($F = 37.559$, $p < .001$). The perceived stress ($\beta = -.360$, $p = .001$), social support ($\beta = .220$, $p = .001$) and self-efficacy ($F = .190$, $p =$ (Table 3) were appeared to be the factors affecting health conservation of the subjects. In addition, these variables were descriptive (51.7%) for health conservation.

Table 3: Influencing factors of health conservation according to fatigue, perceived stress, self-efficacy, social support, health conservation (N = 173)

Variables	B	SE	β	t	p	Adjus-ted R ²	F	p	Dubin-watson
Constant	2.779	.213		13.072	.001	.517	37.559	<.001	1.947
Fatigue	-.025	.014	-.109	-1.759	.080				
Perceived stress	-.219	.045	-.360	-4.877	.001				
Self-efficacy	.093	.037	.190	2.509	.013				
Social support	.101	.029	.220	3.444	.001				
Health conservation	.022	.016	.079	1.359	.176				

Discussion

This study attempted to understand the degree of middle-aged health conservation and to identify the factors that affect health conservation. Based on this, the researcher would like to provide basic data for the development of a nursing intervention program to help the middle-aged maintain an integrated well-being status.

According to general characteristics, health conservation showed significant differences according to monthly income, economic status, and intensity of pain. In previous studies for elderly people, there was significant relationship between pocket money and economic status²⁵, gender, age, and disease²⁶. Although most of the studies are for elderly people, it is difficult to compare them, but it is confirmed that economic condition and pain are factors affecting health conservation. In the middle ages, it is necessary to activate occupational health services and education in order to promote health conservation behavior because the middle age is the age where the activity related to income and labor is the most active while physiological and psychological change occurs such as menopause. Such that, the occupational health service and education for health conservation behavior promotion need to be activated for the middle-aged.

As a result of analyzing the correlation between fatigue, perceived stress, self-efficacy, social support, exercise and health conservation, the health conservation, fatigue and perceived stress showed to have negative correlation while self-efficacy, social

support and exercise showed to have positive correlation with health conservation. That is, the less the fatigue, the lower the stress, the higher the self-efficacy, the more the social support, the more exercise, the higher the degree of health conservation is. The middle ages are exposed to a lot of fatigue and stress due to complex roles and physical changes such as job life and changes in roles within the family, and the prevalence of chronic diseases is also rapidly increasing. Therefore, interest and approach are needed to maintain physical, psychological, mental and social well-being for middle-aged health conservation. Social support, in turn, affects mental health conservation²⁷, such as reducing stress and forming self-esteem and trust²⁸. The higher the self-efficacy, the more likely the health behaviors of middle-aged¹⁶ are supported. Therefore, for middle-aged adults, physical, psychological and mental health conservation will motivate integrated health conservation activities to maintain health.

Finally, factors affecting health conservation were self-efficacy, social support, and perceived stress. In previous studies, social support has influenced the quality of life in middle age²⁹, protecting health from stress and leading health behaviors³⁰. Therefore, in order to practice health conservation activities, personal and social environment should be supported¹⁶. It is necessary to maintain effective and continuous interactions with others, such as forming positive interpersonal relationships and utilizing community resources.

Self-efficacy is a factor influencing health promotion behavior¹⁶, and is a major factor influencing health-

related behaviors as well as health-related behaviors³¹. Therefore, the self-efficacy of middle-aged adults is an important index for health maintenance. Also, they may confirm the importance of motivation with the belief that middle-aged can do appropriate actions for health conservation. This suggests that a positive awareness of self leads to self-confidence, which leads to motivation for health conservation behavior.

The most important thing for middle-aged health conservation is positive awareness, belief and support for oneself. Therefore, this study is meaningful in that it suggests the direction of nursing intervention development for middle-aged health conservation. In order to improve the efficiency of intervention, it is necessary to consider the influential factors in this study.

Conclusion and Suggestion

This study is a descriptive research to identify the degree of health conservation in middle-aged adults and to identify factors affecting it. The results showed that social support, perceived stress and self-efficacy were the factors affecting the health conservation of middle-aged adults. This study is significant in that it suggests the direction of nursing intervention for middle-aged health conservation. Based on the above results, the researcher proposes a study on concrete implementation plan for health conservation of middle-aged adults.

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Development of a Tool to Evaluate the Quality of Mentoring for Nurses

Hyun-Gyung Kim¹, Ji-Mee Kim², Mee-Ran Park³

¹Department of Nursing, Baekseok Culture University, 58 Munam-ro Dongnam-gu Cheonan-si Chungcheongnam-do, 31065, Korea; ²Department of Nursing, Dongnam Health University, 50 Cheoncheon-ro 74-Gil Jangan-gu Suwon-si Gyeonggi-do, 16328, Korea; ³Nursing Department, Kangbuk Samsung Hospital, 29 Saemun-ro Jongno-gu Seoul, 03181, Korea

ABSTRACT

Background/Objectives: This study developed a tool to evaluate the quality of mentoring(QOM) for nurses and verified its validity and reliability before implementing a mentoring system as a strategy to manage them.

Method/Statistical Analysis: One hundred twelve preliminary questions were derived from literature and the tool included 74 questions with a content validity at 0.75 or higher selected by an expert group. Ninety nine mentees participated in the prior survey and the main survey, respectively. Their general characteristics were analyzed using the SPSS Windows 18.0 program. The tool's construct validity and internal consistency reliability were analyzed using factor analysis and Cronbach's α coefficient, respectively.

Findings: The subjects of this study were 99 nurses who had participated in a mentoring system for new nurses as mentees in an advanced general hospital located in Seoul. The general characteristics of the subjects are as follows: The subjects' average age was 24.8. Females accounted for 92.9% of the subject population. The subjects' average clinical experience was 14.4 months. The final version of the tool to evaluate the quality of mentoring consisted of 32 questions. To examine the construct validity of the tool, an exploratory factor analysis was performed. The tool to evaluate the QOM was composed of three factors and five domains: the structure factor (mentoring program domain), the process factor (psychosocial function, career development function, and role model function domains), and the outcome factor (mentoring value domain). Cronbach's α , a measure of the tool's internal consistency reliability, was 0.96.

Improvements/Applications: This study developed a tool to comprehensively evaluate the quality of a mentoring program to apply an effective mentoring system and establish an efficient human resource management strategy in nursing.

Keywords: *mentors, Mentorships, Interprofessional Relations, Surveys and Questionnaires, Reproducibility of Results*

Introduction

Mentoring, a type of efficient human resource management strategy, was found to decrease organizational members' turnover intent and increase their career and organizational commitment^[1,2,3,4].

Mentoring is a useful and valuable means to help new nurses in role socialization and professional growth^[5], thereby decreasing their anxiety, promoting their self-efficacy, and positively influencing their interpersonal relationship. It is conducive to their performing a new role as a nurse^[6]. Accordingly, mentoring programs have recently been presented as an efficient human resource management strategy for the securing and maintaining of excellent nurses. In mentoring, new nurses, or, mentees, form a relationship of emotional commitment with experienced nurses, or, mentors. The mentees continuously receive formal and informal

Corresponding Author:

Jimee Kim
Assistant Professor, Department of Nursing
Dongnam Health University, Korea
Email: jmkchoi7@dongnam.ac.kr

support from their mentors for continuous advice, expertise, role development, and career development while interacting with them^[7]. In mentoring, experienced nurses support new nurses so that they can further develop their self-esteem as professional nurses in all nursing areas such as clinical practice, nursing education, research, and administration, thereby helping them to become more professional nurses. Mentoring also provides experienced nurses opportunities to exert their leadership. Therefore, mentoring is a crucial element in developing the career of both new nurses and experienced nurses^[7,8]. Mentoring has positive effects on an organization as well as the participating individuals. Nonetheless, most domestic research on mentoring involved the mediating effects of a mentoring program and correlation among mentoring, turnover intent, and organizational commitment^[1,9,10]. Only one research studied the functional aspects of a mentoring program^[11]. There was no research that comprehensively measured the quality of a mentoring program in terms of its structure, process, and outcome. This study is a methodological study that intends to develop and verify the validity of a tool to comprehensively measure the quality of a mentoring program before implementing a mentoring system that will be employed effectively for the efficient management of nurses in a nursing organization.

Materials and Method

Study Design: This study is a methodological study to develop a tool to evaluate the quality of mentoring based on Donabedian's theoretical framework for the quality of medical care drawn from three categories of structure, process, and outcome^[12,13] and to test the reliability and validity of the developed tool before implementing a mentoring system that will be employed effectively as an efficient human resource management strategy in a nursing organization^[15,16].

Definitions of Terms Used

The Quality of Mentoring (QOM)

Theoretical Definition: Mentoring refers to the mentors' guidance and instruction provided to the mentees. This includes passing on the wisdom the mentors obtained through their organizational lives so that the mentees can adapt to their new organizational lives and develop their careers^[14].

Operational Definition: In this study, the QOM signifies the overall evaluation of the structure, process(function), and the outcome of a mentoring program. The score on the QOM was measured with a tool developed by this study. The higher the score was, the higher the QOM would be.

Ethical Consideration: This study was approved by the Institutional Review Board for advanced general hospitals in Seoul (IRB No: 2016-03-041-001). The purpose and methods of this study were explained to the subjects. Written explanations were distributed to the participants so that the comprehensive content could be read thoroughly. A written consent for subjects to voluntarily participate in this study was obtained from the participants. It was specified in the written consent that personal information obtained for this study would not be used for purposes other than research. The written consent also stated that the subjects participated in this study on a voluntary basis and that they could discontinue participation at anytime.

Tool Development Procedure

Composition of Preliminary Questions for the Tool:

The preliminary evaluation tool was written based on domestic and overseas literature examinations. One hundred twelve preliminary questions were included in the tool to evaluate the QOM.

Expert Test: To check the content validity of the preliminary questions, an expert group composed of five nursing professors and three field experts was formed. A content validity index (CVI) was computed for each of six items—career function, psychosocial function, organizational commitment, self-efficacy, degree of self-satisfaction, and turnover intent (never valid: zero points, extremely valid: four points) using a four-point scale (extremely valid: 4 points, mostly valid: 3 points, not valid: 2 points, and never valid: 1 point). Then, 74 questions for the mentees whose CVI was 0.75 or higher in each item were derived.

Prior Survey on Preliminary Questions: A prior survey was conducted from April 4 to 22, 2016 to check the subjects' degree of understanding on the items in the draft whose verification of content validity had been completed. The survey also examined the time it took for the subjects to complete the questionnaire. Nineteen nurses working in an advanced general hospital located in Seoul were surveyed. Each nurse received his or her

own questionnaire. The nurses' degree of understanding on the surveyed items was scored on a four-point scale (extremely easy: 4 points, mostly easy: 3 points, mostly difficult: 2 points, and extremely difficult: 1 point). Then, 32 questions for the mentees whose CVI was 0.75 or higher in each item were derived.

Main Survey: The main survey was conducted from May 9 to May 27, 2016, with an evaluation tool composed of 32 revised and supplemental questions for mentees to reflect the outcomes of the expert verification and the prior survey. The questionnaires completed by 99 mentees were then collated. The researcher explained the purpose of this study to the nurses in an advanced general hospital located in Seoul. A five-point scale (extremely important: 5 points, never important: 1 point) was used to measure the nurses' perception about the importance of the items.

Tool Evaluation: Validity, Reliability: Data was collected from the nurses in an advanced general hospital located in Seoul using the tool to evaluate the QOM developed by this study. An exploratory factor analysis aimed at examining whether the tool to evaluate the QOM was effectively measuring the basic construct concepts was conducted to test the construct validity. The analysis method was a principal component analysis using the varimax method. Items whose eigenvalue was 1.0 or higher, whose factor loading value was 0.4, and whose communality value was 0.4 or higher was selected. In addition, the tool's Cronbach's α coefficient, a measure of the tool's internal consistency reliability, was calculated to test the homogeneity of the tool's content. As a result, the overall reliability of the tool was 0.96 and its reliability in the five domains ranged from 0.67 to 0.94.

Development of a Final Tool: The construct validity and internal consistency reliability of the tool, which comprised 32 questions selected by the prior survey, were verified and the tool to evaluate the QOM was finally developed.

Data Analysis Method

Statistical data analysis was conducted using SPSS 18.0 Windows. The subjects' general characteristics were analyzed with frequency, percentage, and standard deviation. The tool's construct validity and internal consistency reliability were also analyzed.

Results and Discussion

The subjects' general characteristics are as follows: The subjects' average age was 24.8. Females accounted for 92.9% of the subject population. The subjects' average clinical experience was 14.4 months.

The tool to evaluate the QOM was composed of 32 questions. CVI results in each item were derived as seen in Table 1.

Table 1: CVI results of a Tool to Evaluate the Quality of Mentoring (n = 99)

No.	Question	CVI
1.	My mentor informs me of the stages of my work life and encourages me.	0.94
2.	My mentor recommends that I prepare in advance to perform the job in a future, more developed organization.	0.94
3.	My mentor treats me as a human being.	0.90
4.	If I become a mentor in my workplace, I will try to emulate my mentor's behaviors.	0.78
5.	I was able to understand the mentoring program through the orientation course for the program.	0.91
6.	I am satisfied with the way that the mentors, who work in different departments, are randomly assigned.	0.91
7.	I think the point in time at which the mentoring program was initiated is appropriate.	0.89
8.	I think my mentor has sufficient professional abilities as a mentor.	0.96
9.	My mentor expresses his/her emotions well.	0.91
10.	My mentor expresses his/her trust in me.	1.00
11.	My mentor shows considerable interest in my personal matters.	0.95
12.	My mentor offers adequate encouragement when I experience anxiety or fear.	0.80
13.	I know that my mentor regularly reads professional books to improve his/her nursing expertise.	0.96
14.	The diverse types of information I received from the mentoring program is conducive to my adaptation in my hospital.	0.72
15.	Owing to the mentoring program, I developed a more active attitude toward my hospital life.	0.84

Conted...

16.	I resolve most tasks related to my nursing job by myself.	0.88
17.	The work performed by a nurse requires commitment.	0.92
18.	I think the official mentoring duration period is appropriate.	0.79
19.	I think my mentor has shared with me knowledge and indirect experiences.	0.92
20.	I think my mentor has supported me for my mental stability.	0.93
21.	My mentor has a high sense of morality and ethics.	0.87
22.	My mentor has the ability to understand my hospital as an organization.	0.88
23.	I am benefiting from many aspects in my workplace.	0.95
24.	I feel a sense of belonging at my workplace.	0.83
25.	I think I will be able to perform my job as a nurse well.	0.91
26.	I have a firm attitude about and a sense of ethics on the nursing job.	0.88
27.	I think the nursing job is more essential than any other job.	0.93
28.	I think my nursing work is very important.	0.86
29.	Mentoring was helpful for me to learn new techniques.	0.98
30.	Mentoring prepares me to have a greater sense of responsibility.	0.81

Conted...

31.	Mentoring was a valuable experience to me.	0.94
32.	I am satisfied with the mentoring program I experienced.	0.93

Factor analysis was conducted to divide the questions into five domains. Based on Donabedian's theoretical framework for the QOM, which was drawn from three categories of structure, process, and outcome, the questions were included in the three upper concepts of the five domains—the structure factor (mentoring program domain), the process factor (psychosocial function, career development function, and role model function domains), and the outcome factor (mentoring value domain).

The construct validity was examined to check whether the items grouped through factor analysis were valid as seen in Table2. The total cumulative explained variance was 67.37%. Factor 1's eigenvalue was highest at 14.80 among those with an eigenvalue of 1 or higher, which explained the 23.56% value of the entire variance. Factor 2's eigenvalue was 2.72 which explained the 17.19% value of the entire variance. Factor 3's eigenvalue and factor 4's eigenvalue was 1.52 and 1.39, respectively, explaining the 10.77% and 9.90% values, respectively, of the entire variance.

The total Cronbach's α coefficient (Table 2), which is an indicator of the common meanings of the questions of the tool share, was high at 0.96. Each factor's Cronbach's α coefficient ranged from 0.67 to 0.94 (Table2).

Table 2: Results of Exploratory Factor Analysis (n = 99)

Factor	Domain	No.	Question	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor of Structure	Mentoring Program	11	My mentor shows considerable interest in my personal matters.	.774				
		9	My mentor expresses his/her emotions well.	.773				
		10	My mentor expresses his/her trust in me.	.755				
		19	I think my mentor has shared with me knowledge and indirect experiences.	.742				
		20	I think my mentor has supported me for my mental stability.	.727				
		12	My mentor offers adequate encouragement when I experience anxiety or fear.	.712				
		21	My mentor has a high sense of morality and ethics.	.674				

Conted...

Factor of Process		8	I think my mentor has sufficient professional abilities as a mentor.	.627				
		22	My mentor has the ability to understand my hospital as an organization.	.586				
		31	Mentoring was a valuable experience to me.	.564				
		7	I think the point in time at which the mentoring program was initiated is appropriate.	.516				
		13	I know that my mentor regularly reads professional books to improve his/her nursing expertise.	.514				
		18	I think the official mentoring duration period is appropriate.	.502				
		3	My mentor treats me as a human being.	.406				
	Psychosocial Function	28	I think my nursing work is very important.		.840			
		26	I have a firm attitude about and a sense of ethics on the nursing job.		.819			
		27	I think the nursing job is more essential than any other job.		.812			
		24	I feel a sense of belonging at my workplace.		.747			
		25	I think I will be able to perform my job as a nurse well.		.740			
		23	I am benefiting from many aspects in my workplace.		.632			
		17	The work performed by a nurse requires commitment.		.623			
	Career Development Function	29	Mentoring was helpful for me to learn new techniques.			.701		
		14	The diverse types of information I received from the mentoring program is conducive to my adaptation in my hospital.			.659		
		30	Mentoring prepares me to have a greater sense of responsibility.			.588		
		15	Owing to the mentoring program, I developed a more active attitude toward my hospital life.			.539		
	Role Model Function	5	I was able to understand the mentoring program through the orientation course for the program.				.747	
		1	My mentor informs me of the stages of my work life and encourages me.				.723	
		2	My mentor recommends that I prepare in advance to perform the job in a future, more developed organization.				.557	
		4	If I become a mentor in my workplace, I will try to emulate my mentor's behaviors.				.461	
		16	I resolve most tasks related to my nursing job by myself.				.459	

Conted...

Factor of Outcome	Mentoring Value	6	I am satisfied with the way that the mentors,who work in different departments, are randomly assigned.					.740
		32	I am satisfied with the mentoring program I experienced.					.521
Eigenvalue				14.80	2.72	1.52	1.39	1.13
Variance(%)				23.56	17.19	10.77	9.90	5.95
Cumulative variance(%)				23.56	40.75	51.52	61.42	67.37
Cronbach's α Coefficient				.94	.91	.91	.80	.67

Conclusion

The number of mentoring programs for nurses has recently been increasing in the nursing field. However, the evaluation on these programs has only involved the participants' degree of satisfaction with those programs or their impact. There was no credible and comprehensive tool to evaluate the QOM that can be used as a human resource management system for nurses.

In addition, even when the QOM was evaluated, the functional aspects of mentoring, the participants' degree of satisfaction with mentoring, or the mentors or mentoring programs in the relevant institutions were primarily evaluated separately.

To resolve such limitations, this study attempted to develop a valid evaluation tool that comprehensively measures the QOM of a mentoring program based on Donabedian's theoretical framework for the quality of medical care drawn from three categories of structure, process, and outcome. To this end, literature was examined and 112 preliminary questions for the tool were subsequently derived. Seventy-four questions, whose content validity was verified by an expert group composed of 8 people, were selected. Then, a prior survey on 19 nurses was conducted. Factor analysis was conducted based on 32 questions, which were derived from the main survey completed by 99 mentees-nurses who had participated in a mentoring program. The factor analysis aimed at verifying the construct validity of the tool to evaluate the QOM. Then, Cronbach's α coefficient was calculated to verify the tool's internal consistency reliability. A final tool to evaluate the QOM was developed with three factors and five domains within them—these included the factor of structure (mentoring program), factor of process (psychosocial function,

career development function, and role model function), and the factor of outcome (mentoring values). The tool's total cumulative explanatory power was 67.37 and its Cronbach's α coefficient, which demonstrates the tool's overall reliability, was 0.96. From this process, a valid and reliable tool was developed.

The evaluation of the quality of a mentoring program for new nurses will make positive contributions to organizational socialization. These benefits include a decrease in turnover rate, career commitment, and an increase in productivity of nursing organizations in the short term.

Because the subjects comprised those who had participated in an official mentoring program for new nurses in an advanced general hospital, the total subject sample size was small. The researcher plans to refine the tool through follow-up research.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Effects of Warmed Fluid Irrigation Intervention and Forced-Air Warming Intervention on Hypothermia in Transurethral Operation Under Spinal Anesthesia

Eun-Hui Seok¹, Mi-Young Chon²

¹Graduate School of Nursing, ²Department of Nursing, Konkuk University, South Korea

ABSTRACT

Background/Objectives: The purpose of this study was to investigate an effective nursing intervention for prevention of hypothermia and thermal discomfort in patients undergoing transurethral procedure under spinal anesthesia.

Method/Statistical Analysis: A total of 63 patients were randomly assigned to one of 3 groups. During the procedure, the warmed fluid irrigation group received warm irrigation fluid at 37°C, while the forced-air warming group received forced-air warming by means of Bair Hugger set at 38°C. The control group received room-temperature irrigation fluid.

Findings: Body temperature measured immediately after the procedure showed a significantly higher in the warmed fluid irrigation group than in the control group. The level of thermal discomfort on arrival at the recovery room was significantly lower for the warmed fluid irrigation group than for the other two groups.

Improvements/Applications: The present results suggest that warmed fluid irrigation is more effective than forced-air warming for preventing hypothermia and thermal discomfort during a transurethral procedure under spinal anesthesia.

Keywords: *Warmed fluid irrigation, Forced-air warming, Hypothermia, Body temperature, Thermal discomfort, transurethral operation, spinal anesthesia*

Introduction

Humans have properties of homeothermic animal that can maintain their core temperature within 37°C $\pm$ 0.2°C even when the ambient temperature changes, and can maintain active life even under a wide range of climatic conditions by keeping their core temperature constant^[1]. However, during surgery, it is difficult to maintain a patient's body temperature due to various factors including indispensable body exposure, application of cold disinfectant, use of cleansing solutions for internal organs, injection of saline solution, loss of blood and low temperature of operating room for prevention of infection.

These cause hypothermia during surgery at 50 to 90 percent of surgical patients^[2]. Transurethral operation can give off body heat from the surgical site and lower core temperature caused by injecting a large amount of irrigation fluid without heating up in order to secure visibility and prevent bleeding^[3], which is particularly prone to hypothermia. In such case, the temperature of irrigation fluid is set to room temperature, which can cause heat loss, hypothermia and tremble to the patient during surgery if using a temperature lower than the body temperature^[4]. In fact, patients who underwent a transurethral resection of prostatic hypertrophy suffered a heat loss of approximately 0.98°C during surgery^[5]. Especially, most of patients who underwent transurethral operation are elderly patients. The elderly is more likely to suffer from heat loss due to the reduced ability to maintain body temperature, the reduced basal metabolic rate, decreased cardiovascular ability, thin skin and decreased muscle mass.

Corresponding Author:

Mi-Young Chon
Professor, Department of Nursing,
Konkuk University, South Korea
Email: mychon@kku.ac.kr

Since transurethral operation has a high incidence of hypothermia as mentioned above, it is recommended to apply warming intervention to patients during surgery in order to prevent hypothermia^[6]. In case of partial anesthesia such as spinal anesthesia, ASPAN's (American Society of PeriAnesthesia Nurses) evidence-based clinical practice guideline recommends to measure body temperature, tremble and thermal discomfort of each patient at regular intervals and to provide patient with a waterbed, insulated thermal blanket, radiant warmer and forced-air warming system to be circulated according to patient's body temperature when hypothermia occurs. However, it is true that patients subject to transurethral operation with spinal anesthesia have a short surgical time, do not appeal the cold and are negligent in managing their body temperature. Other inconveniences such as lack and difficulties in application of heating equipment result in using such equipment selectively in actual clinical circumstances only when a prolonged large operation is anticipated or a serious hypothermia is concerned during surgery. There is no exact protocol for application of warming, and warming intervention is being done by preference of medical staff.

Most of researches related to 'warming intervention for the surgical patients' conducted in Korea were for the general anesthesia patients^[7-9], and researches for patients who underwent spinal anesthesia were those using warmer (Bair-hugger Warming Unit) before surgery and electro-circulating water blanket (Blankroll) during surgery^[10], and those applying warmed saline solution, forced-air warmer and warmed blanket^[11]. However, there is little research on warming intervention for patients with spinal anesthesia using a large amount of irrigation fluid. Whereupon, this study applies an irrigation fluid warming intervention which was proven to significantly reduce the body temperature drop^[5] and a forced-air warming intervention which is the most recommended clinical practice in recent days with advantages of maintaining normal body temperature in a wide range of operations^[12], in a transurethral operation whose operation time is relatively short but uses a large amount of irrigation fluid and shows discomfort resulting from body temperature change after surgery, and then presents the effects, and provides basic data for the development of nursing interventions and protocols for the management of body temperature of patients who will undergo transurethral operation in the future.

Materials and Method

This research is a randomized control group pretest-posttest design that randomly assigns research targets to two experimental groups and one control group for patients undergoing transurethral operations under spinal anesthesia.

Research Subjects: Research subjects are persons for whom preoperative treatment (Mobinul 0.2mg, Midazolam 1mg IM) and anesthesia method (spinal anesthesia) are the same and whose vitals sign is under normal condition, out of patients who underwent transurethral operations under spinal anesthesia for the period from October 2013 to January 2016 in a hospital. Using G*Power 3.1 Program based on the preceding research^[13], the sample counts were calculated at significant level (α) .05, power ($1-\beta$) .80 and effect size .40, and finally, a total of 63 patients were included: 21 patients in each experimental group respectively and 21 patients in control group.

Research Tools

Body Temperature: The central body temperature was measured using a tympanic thermometer (Infrared Thermometer IRT 4520, Braun GmbH, Germany).

Thermal Discomfort: A tool developed by ^[14] was used. The higher the score on 7-score scale, the higher the degree of thermal discomfort.

Intervention

Warmed Irrigation Fluid Group: 3L of physiological saline solution was maintained at 37°C using a digital heating cabinet (DHT-1800, Donghwa System, Incheon, Korea) and then used as a cleansing solution.

Forced-air Warming Group: 38°C temperature, which is most similar to the temperature of warming irrigation fluid, was applied using a forced-air warmer (Warming unit model 505, Arizant Healthcare Inc. Minnesota, USA). The application method was to cover a patient removed operating gown with a cotton sheet, and to apply a warmed air blanket thereon from shoulder to belly button except the face.

Control Group: As usual, the patient was covered with a cotton sheet under the condition of removing operating gown, and the irrigation fluid of physiological saline solution at room temperature (23~24°C) was used as a bladder cleansing solution when conducting surgery.

Ethical Consideration: This study was approved by the research ethics committee of a general hospital(***IRB 2013-039), and then the researcher collected data in collaboration with nurses of anesthesiology and pain medicine, urology and operating room. The researcher selected patients who were suitable for the selection criteria of research targets, explained them the research purpose, method and research ethics when wiring a surgery consent form, and then received a documented consent to participate in the research.

Data Analysis

The collected data were analyzed using IBM SPSS Statistics 21 program. The general properties and the surgical-related characteristics of research targets were analyzed with real number, percentages, mean and standard deviations, and the homogeneity test for three groups was analyzed using t -test, One-way ANOVA, respectively. Further, the body temperature and thermal discomfort of the experimental group and the control group were analyzed

using One-way ANOVA. Post-test was conducted with Tukey HSD(honestly significant difference). All statistical significant levels are adopted at $<.05$.

Results and Discussion

Homogeneity Test: As a result of conducting homogeneity test on the general characteristics of experimental group and control group in this study, there was no significant difference among three groups, and homogeneity of three groups was secured. As a result of conducting homogeneity test on surgery-related properties, there was no significant difference among three groups in ASA score, spinal anesthesia level, average operation time, average amount of fluid, cleansing volume, and homogeneity of three groups was secured. As a result of conducting a preliminary investigation on body temperature and thermal discomfort immediately after entering into the operating room, there was no statistically significant difference among three groups, and homogeneity of three groups was secured[Table 1].

Table 1: Homogeneity Test of Study Variables for Groups

Characteristics		EI (n = 21)	EII (n = 21)	Control group (n = 21)	F/ χ^2	p
		M $\pm$ SD or n(%)	M $\pm$ SD or n(%)	M $\pm$ SD or n(%)		
Age		69.71 $\pm$ 8.10	69.19 $\pm$ 7.75	69.90 $\pm$ 6.70	0.05	.951
Height(cm)		162.53 $\pm$ 5.69	165.17 $\pm$ 5.90	163.04 $\pm$ 6.59	1.11	.335
Weight(kg)		66.5 $\pm$ 8.33	62.56 $\pm$ 6.70	67.03 $\pm$ 8.01	2.11	.130
Cold*	often feel	6(9.5)	7(11.1)	8(12.7)	1.06	.973
	normal	13(20.6)	13(20.6)	12(19.0)		
	do not feel	2(3.2)	1(1.6)	1(1.6)		
ASA score*	1	2(9.5)	5(23.8)	1(4.8)	3.88	.433
	2	13(61.9)	9(42.9)	13(61.9)		
	3	6(28.6)	7(33.3)	7(33.3)		
Level of spinal anesthesia	under T9	15(23.8)	9(14.3)	15(23.8)	4.84	.089
	over T10	6(9.5)	12(19.0)	6(9.5)		
Anesthetic time(min)		78.10 $\pm$ 27.68	80.71 $\pm$ 21.87	77.14 $\pm$ 22.67	0.72	.696
Operating time(min)		51.19 $\pm$ 27.79	49.29 $\pm$ 19.58	47.38 $\pm$ 20.77	0.12	.940
Infusion fluid(ml)		552.38 $\pm$ 237.42	566.67 $\pm$ 189.30	561.90 $\pm$ 165.76	0.03	.973
Irrigation fluid(ml)		17,260.95 $\pm$ 8,172.90	20,074.76 $\pm$ 9,445.24	18,876.19 $\pm$ 9,096.24	0.53	.594
Body Temperature($^{\circ}$ C)		36.48 $\pm$ 0.29	36.62 $\pm$ 0.35	36.62 $\pm$ 0.32	1.31	.276
Thermal discomfort		3.86 $\pm$.73	4.29 $\pm$ 1.01	3.76 $\pm$ 0.77	2.30	.109

Note: EI: Experimental groupI=warmed fluid irrigation group, EII: Experimental groupII=forced-air warming group
Control group=room temperature irrigation fluid group, *Fisher exact test

Research Hypothesis Test

Hypothesis 1

Hypothesis 1: Postoperative body temperature of experimental group to which the warmed irrigation fluid and forced-air warming applied will be different from that of control group.

There was a statistically significant difference among groups in body temperature immediately after surgery ($F=3.50$, $p=.037$). The warmed irrigation fluid group showed a higher body temperature than the control group [Table 2]. Therefore, the first hypothesis was supported.

As I could not find any study applying air warming therapy and warmed irrigation fluid to patients who had undergone transurethral prostatic resection under spinal anesthesia, the timing of these changes in body temperature was difficult to directly compare with results of each research, but similar to the result of research applying warming intervention to patients who underwent transurethral operation. However, the difference with this study was that study^[7] was targeting at patients who underwent transurethral operation under a general anesthesia, and intervention was applied to this study from the beginning of actual surgery, but to study^[7] from the beginning of anesthesia. Also, there was a difference in intervention application method that study^[7] applied water-circulating pad to both experimental group and control group. As for the research results, the study^[7] showed that the body temperature of airway warming group and control group continued to decrease from 30 minutes after starting surgery, but this study showed a significant difference at the end of surgery. This is because study^[7] applied intervention immediately after the general anesthesia, that is, including pre-operative preparation time, but this study applied intervention from the beginning of actual surgery, as it was an operation under spinal anesthesia. In the study^[5] on intravenous injection of warmed irrigation fluid and warmed saline solution at 38°C for patients who underwent prostatectomy, the results were consistent with this study, showing that the average body temperature decrease was greater in the group using irrigation fluid and saline solution at room temperature at the end of prostatectomy than the group using warmed irrigation fluid and saline solution at room temperature. Further, the average body temperature of the group using

warmed irrigation fluid and warmed saline solution was increased by 0.12°C from the beginning of surgery, but was not significant. The study used both saline solution and irrigation fluid for intravenous injection, which was different from this study. This study also showed that there was significantly less temperature variation in the warmed irrigation fluid group than the forced-air warming group immediately after surgery, compared with the control group. This is in contrast to the result of study^[15] on existing in vivo warming method and in vitro warming method. In the study^[15], the result of comparing the warming therapy with 37°C saline solution and 37°C skin warming therapy for the laparotomy patients showed that the skin warming therapy combined with the radiant heat had a higher body temperature retention and a less body temperature drop than the warming therapy with saline solution. It is judged this is due to the fact that study^[15] combined radiant heat to the skin warming group, and the amount of saline solution in the warming saline solution therapy was 2,273ml on average, which was considerably less than the average cleansing amount of warming irrigation fluid group in this study, 20,075ml.

Hypothesis 2

Hypothesis 2: There will be differences in postoperative thermal discomfort between experimental groups to which warmed irrigation fluid and forced-air warming applied and the control group.

There was statistically significant difference in thermal discomfort between the groups when entering into the recovery room after surgery ($F=3.94$, $p=.025$). The warmed irrigation fluid group showed the less thermal discomfort than the control group and the forced-air warming group [Table 2]. Therefore, the second hypothesis was supported.

Even though it is not possible to compare directly due to the different method of surgery, anesthesia and intervention, this result is consistent with the result of study^[16] showing that in case of the subjective thermal discomfort of abdominal surgical patients, the application of warmed saline solution (37°C) was less than the application of the warming blanket (38°C). But, a study^[17] to apply the warmed saline solution therapy (42°C) and the forced-air warming therapy (43°C) for the patients who underwent gastric cancer surgery showed that the forced-air warming group had a significantly less thermal discomfort than the warmed

saline solution group when entering into the recovery room, which was in contrast to this study. It is judged that this is because the amount of warmed saline solution was about 500ml in the study^[17], which largely differed from the amount of irrigation fluid in this study and 3100ml of saline solution in study^[16]. As mentioned above, when a large amount of saline solution is used for intravenous injection or cleansing solution, warming intervention of saline solution and cleansing solution may be effective, and the body temperature control during surgery leads to a decrease in the patient's discomfort after surgery.

Table 2: Comparison of Body Temperature and Thermal Discomfort between Groups

	Body Temperature (Immediately after procedure)	Thermal Discomfort (Arrival at recovery room)
EI ^a (n=21) M ± SD	36.00 ± 0.30	4.10 ± 0.54
EII ^b (n=21) M ± SD	35.81 ± 0.56	4.76 ± 1.09
C ^c (n=21) M ± SD	35.64 ± 0.40	4.76 ± 0.94
F(p) Tukey	3.50(.037) a>c	3.94(.025) a<b,c

Note: EI: Experimental groupI=warmed fluid irrigation group,

EII: Experimental groupII=forced-air warming group,

Control group=room temperature irrigation fluid group

Conclusion

Taken together the effect of warming intervention method on the postoperative body temperature and thermal discomfort in the transurethral operation under spinal anesthesia, the warmed irrigation fluid group has a statistically and significantly less body temperature drop and a less thermal discomfort than the control group and the forced-air warming group immediately after surgery. The incidence of hypothermia was also lower in order of control group, forced-air warming group and the warmed irrigation fluid group. Therefore, it is concluded that the

warmed irrigation fluid, an in vivo warming method, is more effective than the forced-air warming method, an in vitro warming method, in transurethral operation. This is thought to be due to the characteristics of transurethral operation using a large amount of cleansing solution. In conclusion, the result of this study suggests that the warmed irrigation fluid intervention is more effective than the forced-air warming intervention in transurethral operation under spinal anesthesia.

Ethical Clearance: Obtained written consent from the subjects

Source of Funding: Self

Conflict of Interest: Nil

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Effects of Orofacial Muscles Exercise Program on Swallowing Function and Satisfaction in Sub-Acute Stroke Patients with Dysphagia

Jong-Hoon Moon¹, Sung-Jin Heo², Jin-Hwa Jung³

¹Researcher, Department of Healthcare and Public Health Research, National Rehabilitation Research Institute, National Rehabilitation Center, Republic of Korea; ²Researcher, Research Institute for convergence of Biomedical Science and Technology, Pusan National University Yangsan Hospital, Republic of Korea;

³Professor, Department of Occupational Therapy, Semyung University, Republic of Korea

ABSTRACT

Background/Objectives: The aim of present study was to examine the effect of orofacial muscle exercise programs on swallowing function with smartphone video as well as satisfaction with outcome in sub-acute stroke patients with dysphagia.

Method/Statistical Analysis: We enrolled sub-acute phase of sixteen stroke patients with dysphagia. The participants were randomly assigned to the study group (orofacial muscle exercise program using smartphone video) or control (paper-based orofacial muscles exercise program). All subjects completed their prescribed orofacial muscle exercise programs 20 min/day, 3 times per week, for 4 weeks. The outcome measures were the FDS (Functional Dysphagia Scale), PAS (Penetration-Aspiration Scale) and VASS (Visual Analog Satisfaction Scale). Main analysis was Mann-Whitney U test for comparison between groups.

Findings: After intervention, there were no significant differences in swallowing function between the two groups. Nevertheless, in study group satisfaction was significantly higher than that of the control group.

Improvements/Applications: Authors suggest that orofacial muscle exercise programs using smartphone can have a more positive impact on satisfaction than can paper-based orofacial muscle exercise programs in sub-acute stroke patients with dysphagia.

Keywords: Oral cavity, Stroke, Swallowing function, Dysphagia, Swallowing disorder

Introduction

Stroke is a chronic disease that causes motor and sensory function disorder, speech disorder, dysphagia, etc. Dysphagia refers to problems that occur during the process of food moving from the oral cavity to the stomach. It has been reported that the occurrence of stroke with dysphagia varies from 25% to 63% [1]. The main symptoms of patients with oropharyngeal dysphagia after stroke are weakness and functional disorders in the

tongue, pharynx, lips, cheeks, and masticatory muscles. These problems become the cause of death and are associated with decreased quality of life [2].

There are some methods for the interventions of dysphagia. The interventions that have been introduced include head lift exercise [3], effortful swallow and Mendelsohn maneuver [4], lingual strength training [5], expiratory muscle strength training [6], oromotor exercises [7], etc. Oromotor exercises are methods that strengthen the muscles used in the oral phase as well as the pharyngeal muscles, are relatively easy for patient training compared to other interventions.

The muscles that make up the cheeks, lips and tongue are called the orofacial muscles, and greater muscular strength in the orofacial muscles translates

Corresponding Author:

Jin-Hwa Jung

Professor, Department of Occupational Therapy,
Semyung University, Republic of Korea

Email: otsalt@nate.com

to safer and more effective chewing and swallowing [8]. Orofacial muscle exercise improves muscular strength and movement in the muscles associated with tongue, lips, face, and chewing [9]; it can also be beneficial for patients with delayed oral and pharyngeal transit time [10]. Orofacial muscle exercise is also used in patients with decreased tongue movements, those with decreased sensation and coordination in the oropharyngeal muscles, or patients with reduced bolus control [7-10].

The number of people worldwide using the Internet with their smartphones went over 80% of the global population in 2015 [11]. As an IT powerhouse, South Korea is one of the countries that shows high rate of smartphone ownership and use [12]. One of the biggest advantages of smartphones is that they are easy to carry and can be used anytime and anywhere. Many studies have reported about rehabilitation intervention and assessment using smartphone [13,14], but little has been studied on the effectiveness of orofacial muscle exercise program using smartphone. Researches related to swallowing, in particular, are seriously lacking in studies on smartphone-based measurement and intervention [13,14]. Given the widespread use of smartphones equipped with video playback function among the general public in Korea, implementing orofacial muscle exercise while watching an instructional video instead of following the existing method of booklet-based implementation may yield higher effectiveness and satisfaction.

Therefore, this study aims to investigate whether an orofacial muscle exercise program using smartphone will have greater effects than the existing method of orofacial muscle exercise using the booklet on the swallowing function and intervention satisfaction in stroke patients with dysphagia.

Materials and Method

Subjects: Sixteen subacute patients with stroke and dysphagia voluntarily participated in present study. The criteria used in the selection of participants were as follows: A patient 1) who has been diagnosed with stroke and is confirmed of dysphagia by a medical specialist, 2) who is in stable medical condition, 3) whose onset of stroke has been no less than a week but less than 3 months [15], and 4) who has scored 21 or higher in the Korean Mini-Mental State Examination and is capable of understanding the intervention program. Visual impairment was used as the exclusion criterion. After informed consent agreements, all subjects voluntarily participated in the study.

Measurements

Functional Dysphagia Scale (FDS): Functional Dysphagia Scale (FDS) is assessed through video fluoroscopy. The score ranges from a minimum of zero point to a maximum of 100 points. The higher score, more severe the dysphagia. FDS is not intended simply to distinguish between penetration and aspiration but is a measure used for assessing the motor functions of the structures related to the swallowing function. This scale is useful for quantitative assessment of dysphagia. The inter-tester reliability of FDS is .59 [16].

Penetration-Aspiration Scale (PAS): Penetration-Aspiration Scale (PAS) assess the severity of penetration and aspiration through a video fluoroscopic swallowing study. The score ranges from level 1 to 8 depending on whether the bolus enters the airway and how the bolus is ejected once it is in the airway. Level 1 is normal swallowing, while level 8 is silent aspiration, which is the most severe stage of dysphagia. The test-retest reliability of PAS is .91 [17].

Visual Analog Satisfaction Scale (VASS): Visual Analog Satisfaction Scale (VASS) was used in this study to assess the satisfaction of both the experimental and the control group with respect to their respective interventions. In using this measurement instrument, the level of satisfaction was determined by using a 100 mm horizontal line drawn on a A4 paper with the left end marked as 0 and the right end as 10 and having the subject indicate on the line his/her level of satisfaction. A subject's score closer to 0 meant that he/she is less satisfied with the intervention. On the contrary, a subject's score closer to 10 suggests he/she has higher satisfaction with the intervention [18]. The VASS was administered after the completion of all interventions.

Procedures: Sixteen subjects who met the selection criteria were recruited in present study. All subjects were randomly assigned to experimental group or control group, 8 persons each. A pre-intervention assessment was conducted on all the subjects. Both groups received the same 30-minute-long traditional dysphagia therapy three days in a week for four weeks, twelve sessions in total. In addition, both groups performed orofacial muscle exercise under guardian supervision in a hospital room. The experimental group performed 20 minutes of orofacial muscle exercise by following an instructional video played back on a smartphone, and the control group performed 20 minutes of orofacial muscle exercise using the existing method of booklet guide.

The orofacial muscle exercise performed by both groups was composed of fifteen different movements in the following order; opening the mouth wide, moving the jaw from side to side with the mouth wide open, moving the jaw backward and forward with the mouth wide open, smiling, lifting the angle of the mouth to each side one after another, pouting the lips, sucking in the lips then bouncing them off, blowing from the mouth, sticking out the tongue, sticking out the tongue and moving it from side to side, making a candy inside the mouth with the tongue, swiping the gums with the tongue, inflating the cheeks, sucking in the cheeks and inflating one side of the cheek after another. The orofacial muscle exercise video was produced by having an occupational therapist model the movements. The total length of the video was seven minutes, and each movement was repeated five times. The experimental group was asked to perform the orofacial muscle exercise while watching the 7-minute video three times so as to repeat each movement fifteen times. Meanwhile, the control group was asked to perform the orofacial muscle exercise looking at a booklet with pictures of the fifteen movements. As in the experimental group and control group was asked to repeat each movement fifteen times. All subjects performed the orofacial muscle exercise for 20 minutes per session. Every session was monitored and guided by an occupational therapist for accurate performance of the exercise. All the subjects completed twelve sessions

of intervention. Post-intervention assessment was conducted after completing the 4-week intervention.

Statistical Analysis

The collected data were analyzed using SPSS 22. The general characteristics and pre-intervention data between the groups were compared and analyzed using the Mann-Whitney U test and the Chi-square test. The Wilcoxon signed rank test was used to confirm the statistical difference between the two groups before and after intervention. The Mann-Whitney U test was used to compare and confirm the amount of variation in the both groups. The statistical significance level was set at .05.

Results and Discussion

There was no significant difference between the two groups of stroke patients with dysphagia in terms of general characteristics and swallowing function prior to the intervention ($p > 0.05$) [Table 1]. Two groups, however, showed significant improvement in swallowing function after the intervention ($p < 0.05$) [Table 2]. There was no significant difference between the groups in the amount of variation of swallowing function after the intervention ($p > 0.05$) [Table 3]. In satisfaction level, the experimental group was significantly higher than that of the control group after the intervention ($p < 0.05$) [Table 4].

Table 1: Comparison of general characteristics and swallowing function

	Study group (n = 8)	Control group (n = 8)	p
Age (year), mean $\pm$ SD	54.13 $\pm$ 5.41	55.38 $\pm$ 14.88	.224
Gender, n (%)			.614
Male	5(62.5)	4(50)	
Female	3(37.5)	4(50)	
Lesion side, n (%)			.614
Right side	4(50)	5(62.5)	
Left side	4(50)	3(37.5)	
Stroke type, n (%)			1.000
Ischemic	7(87.5)	7(87.5)	
Hemorrhagic	1(12.5)	1(12.5)	
Lesion location, n (%)			.614
Supratentorial	5(62.5)	4(50)	
Infratentorial	3(37.5)	4(50)	
Onset period (day), mean $\pm$ SD	22.75 $\pm$ 9.21	21.00 $\pm$ 9.02	.713
K-MMSE, mean $\pm$ SD	24.00 $\pm$ 3.38	24.25 $\pm$ 2.92	.813
FDS	27.75 $\pm$ 5.50	28.50 $\pm$ 3.96	.916
PAS	5.38 $\pm$ 1.51	5.50 $\pm$ 1.31	.911

Footnotes: K-MMSE = Korean Mini-Mental State Examination; FDS =Functional Dysphagia Scale; PAS =Penetration-Aspiration Scale.

Table 2: Comparison of swallowing function between pre and post-intervention within groups

	Study group (n = 8)		p	Control group (n =8)		p
	Pre	Post		Pre	Post	
	Mean $\pm$ SD	Mean $\pm$ SD		Mean $\pm$ SD	Mean $\pm$ SD	
FDS	27.75 $\pm$ 5.50	16.25 $\pm$ 5.28	.012*	28.50 $\pm$ 3.96	19.00 $\pm$ 4.41	.012*
PAS	5.38 $\pm$ 1.51	2.63 $\pm$ 1.19	.010*	5.50 $\pm$ 1.31	2.88 $\pm$ 0.64	.010*

Footnotes: *p<0.05, FDS =Functional Dysphagia Scale; PAS =Penetration-Aspiration Scale.

Table 3: Change score of swallowing function between two groups

	Study group (n = 8)	Control group (n = 8)	p
	Mean $\pm$ SD	Mean $\pm$ SD	
FDS	-11.50 $\pm$ 5.32	-9.50 $\pm$ 4.50	.368
PAS	-2.75 $\pm$ 0.71	-2.63 $\pm$ 0.92	.606

Footnotes: FDS =Functional Dysphagia Scale; PAS =Penetration-Aspiration Scale.

Table 4: Comparisons of satisfaction in the both groups after intervention

	Study group (n = 8)	Control group (n = 8)	p
	Mean $\pm$ SD	Mean $\pm$ SD	
VASS	8.90 $\pm$ 0.92	7.47 $\pm$ 0.82	.011*

Footnotes: *p<0.05, VASS =Visual Analog Satisfaction Scale.

The effectiveness of orofacial muscle exercise could not be ascertained until now due to serious lack in studies on the effects of orofacial muscle exercise training programs. Thus, this study investigated whether implementing a smartphone-based orofacial muscle exercise program instead of the existing booklet-based orofacial muscle exercise program will have a better effects on swallowing function and intervention satisfaction in subacute patients with stroke and dysphagia. The main three results are as follows:

First, both groups showed significant improvement in swallowing function after performing the orofacial muscle exercise. The orofacial muscle exercise program used in this study largely involved training the jaw, mouth, cheeks and tongue. Among these exercise for the jaw, mouth, cheeks and tongue, the jaw and the tongue exercises have been reported to be effective

in strengthening the suprahyoid muscles (SH) [19-21]. According to previous studies, jaw opening exercise improves hyoid bone movement in patients with chronic dysphagia and is an effective training for improving muscular strength of the SH [19]. In this study, all of the jaw movements performed during the orofacial muscle exercise were tasks involving repeated forward and backward as well as side to side open-jaw movements. Therefore, the jaw movements are thought to have helped strengthen the SH. Muscle strengthening training in the SH improves the opening function of the upper esophageal sphincter by increasing the anterior and the upper movements of the hyoid bone [22]. Improvement of the upper esophageal sphincter opening reduces the residue of pyriform sinuses after swallowing [23] and protects the airway in a safer manner. Therefore, it appears that improved swallowing function resulted from the muscle training on the jaw, mouth, cheek and tongue through the orofacial muscle exercise.

It is surmised that the tongue movements performed in the orofacial muscle exercise program helped improve the upper esophageal sphincter opening from enhancing chewing movement and the strength of the SH [21-22]. The muscles that make up the mouth and the cheeks, such as the orbicularis oris muscle, buccinator muscle and superior pharyngeal constrictor, work with the tongue to provide adequate pressure to the food during chewing and swallowing and help ensure safe and effective swallowing [24]. Therefore, it appears that the mouth and the cheek movements performed during the orofacial muscle exercise program helped improve chewing movement and the strength of the SH, having a positive effect on improved swallowing function.

Second, although both groups showed improved swallowing function after the intervention, there was no significant difference in swallowing function between the groups. This can be explained as a combined outcome involving the neurological recovery after stroke and the

intervention effect from swallowing rehabilitation [25, 26]. Studies have demonstrated that a great deal of recovery happens in the early stage after the onset of stroke and that swallowing rehabilitation during this stage is effective [3-7]. This result also supports the recovery of dysphagia through neurophysiological repair and brain reorganization after two to three months from the onset of stroke, which is based on the theory of neuroplasticity [27]. Another possible explanation for the result showing no difference between the two groups is that the research period of four weeks was rather short and the sample size too small to yield significant intervention effect.

Third, after completing the intervention, the experimental group showed higher level of satisfaction for the intervention than the control group. This suggests that the intervention incorporating video watching can have a positive influence on the effectiveness in intervention for stroke patients with dysphagia. Higher satisfaction of rehabilitation leads to stronger motivation and more enthusiastic participation in rehabilitation [28, 29]. Thus, this result implies that the longer the intervention period is implemented, it is likely that the orofacial muscle exercise using video instructional guide will be perceived more positively by the patients compared to the orofacial muscle exercise using booklet guide.

This study is meaningful in that it presents an exercise intervention that can be performed in a hospital room using an easy-to-carry and easy-to-use smartphone. In order to improve the physiological functions and quality of life in stroke patients with dysphagia and to overcome the limitations in the current rehabilitation system, it is necessary to develop, implement and evaluate interventions using a variety of device. Despite its merits, our study has the following limitations. The small sample size makes it hard to generalize the findings of present study to other stroke patients with dysphagia. And the research period of four weeks was rather short. Finally, long-term or sustained effects of the orofacial muscle exercise program could not be ascertained because a follow-up research was not conducted.

Conclusion

The purpose of present study was to examine whether an orofacial muscle exercise program using smartphone will have greater effects than the existing method of orofacial muscle exercise using the booklet on the swallowing function and intervention satisfaction

in patients with dysphagia and stroke. There was no significant difference between the two groups in the amount of variation of swallowing function after the intervention, but in satisfaction level, the experimental group was significantly higher than that of the control group. These findings show that, compared to the orofacial muscle exercise program using a booklet, the orofacial muscle exercise program implemented while watching an instructional video using a smartphone does not result in better swallowing function but does lead to higher level of satisfaction for the intervention in stroke patients with dysphagia.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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The Effects of Lateral Shift Correction Squat on Muscle Activation and Dynamic Balance in Scoliosis

Byoung-Hyoun Moon¹, Ji-Won Kim²

¹Research Scholar, Dept. Graduate School, ²Professor, Department of Physical Therapy, Nambu University

ABSTRACT

Background/Objectives: The purpose of this study was to effects of the muscle activity of elector spinae and gluteus maximus and dynamic balance ability during lateral shift correction squat in scoliosis.

Method/Statistical Analysis: The subjects of this study were 17 female and 11 male who has scoliosis were recruited. Surface electromyography data were collected from the both of elector spinae(T6 and L3) and gluteus maximus. Dynamic balance was collected from bio-resque device. A Paired t - test was performed to examine the effect of both of elector spinae(T6 and L3) and gluteus maximus muscle activity and dynamic balance during lateral shift correction squat.

Findings: The results of this study show that the trunk lateral shift correction squat increased ratio of elector spinae(T6 and L3) and gluteus maximus compared with general squat. Also dynamic balance ability was increased during lateral shift correction squat compared with general squat.

Improvements/Applications: This study suggests that lateral shift squat maybe useful in subject with scoliosis.

Keywords: Electromyography, Elector spinae, Level bar, scoliosis, Squat

Introduction

Scoliosis is defined as a cobb's angle of 10 degrees or more, which is a three-dimensional deformity of the vertebral curvature that takes place in its normal posture [1]. Scoliosis exhibits reduced flexibility and balance compared to normal subjects due to asymmetrical posture and muscle imbalance of the trunk.

The treatment of scoliosis is divided into surgical and non - surgical conservative treatment. Conservative therapies include braces, electrical stimulation, traction, and exercise. Many researchers recommend exercising for scoliosis because it release or/and strengthens the muscles of the unbalanced spine to enhance a balanced posture. Therapeutic exercise for scoliosis can reduce the deformation of the vertebrae, preventing the decline in cardiopulmonary function and improving the

unbalanced posture. Simon et al.(1999) stated that the muscular strengthening exercises around the spine and pelvis prevent the lateral bending of the spine. It has also been reported that sustained exercise therapy improves vertebral deformity and flexibility [2].

Exercise for scoliosis consists of breathing technique, muscular strengthening exercises to correct the lateral displacement and rotation deformation of the vertebrae. Squat is exercises to strengthen muscles around the spine and pelvis. In a squat exercise, the correct posture should be that the gaze is directed forward, the trunk is raised from the sagittal plane, and the knee is bent so that the knee does not cross the toe line. The squat movement is a closed kinematic chain in which is a movement wherein the distal part is fixed, as when the sole of the foot makes contact with the ground or the exercise equipment. Therefore, it is important to exercise in the right posture as the weight increases the risk of injury if you exercise with wrong posture. Mcconell (2002) showed that when Meconnell taping was intervened in a patient with patellofemoral pain syndrome, increased the ratio of muscle activity of the vastus medialis/vastus lateralis muscles Meconnell taping was recommended [3].

Corresponding Author:

Ji-Won Kim

Professor, Department of Physical Therapy,
Nambu University, Korea

Email: rehab@nambu.ac.kr

Kim(2013) reported that squat exercises using visual feedback reduced the quadriceps-angle for knee femur pain syndrome and, reduction of the quadriceps-angle to be helpful in the hypermobility of the knee joint and in the knee joint instability [4].

In previous studies, squat-related exercise control studies are mostly related to the correction of knee joints. Squat exercises with incorrect trunk alignment cause back problems and pain. However, there is a lack of research on squat exercises using trunk correction intervention for scoliosis. The purpose of this study was to compare the muscle activity of elector spinae and gluteus maximus and dynamic balance ability during intervention during trunk correction intervention for scoliosis.

Method

Prior to this study, preliminary measurements were performed with five subjects and the problems of the measurement method were identified and corrected during the preliminary measurement. The subjects of this study were 28 men and women who had positive response to scoliosis test who agreed to participate and listen to the explanation and purpose of the study. The general characteristics of the subjects are as follows [Table 1].

Table 1: General characteristics of subjects (Mean $\pm$ SD)

	Male (11)	Female (17)
Height(cm)	171.08 $\pm$ 5.35	160.94 $\pm$ 38.50
Weight(kg)	66.83 $\pm$ 14.55	55.12 $\pm$ 15.26
Angle($^{\circ}$)	6.00 $\pm$ 2.41	5.94 $\pm$ 2.06
BMI(kg/m ²)	23.22 $\pm$ 5.56	20.00 $\pm$ 6.94

The inclusion criteria for this study are as follows.

- Subjects with a scoliometer angle more than 5 degrees.
- Subjects do not have orthopedic or neurological disorders in the lower extremity.
- Those without knee joint disease or surgical history.
- Subjects with a range of motion and strength who can perform a squat exercise
- The difference between the left and right leg lengths is less than 2cm

Measuring Tool

Test for Scoliosis: The method of measuring scoliosis is to bend the subject's back 90 $^{\circ}$ forward and measure with a scoliometer at the maximum projecting area. When the angle of the scoliometer is 5 $^{\circ}$, the vertebrae are warped about 11 $^{\circ}$ on the X-ray [Figure 1, Figure 2].



Figure 1: Adam forward bending test



Figure 2: Scoliometer

Surface Electromyogram: The surface EMG WEMG-8 (LXM 5308, Laxtha, Korea) was used to measure muscle activity of both elector spinae and gluteus maximus muscles during squat exercise. The sampling rate of the signal was set at 1024Hz and a 60Hz notch filter was used. Telescan program was used for EMG signal storage processing. EMG signals of each muscle were analyzed by root mean square (RMS).

Bio-rescue: Bio-rescue was used for balance measurements during the squat exercise. The bio-rescue consists of a platform that can detect the COP (center of pressure), a data collection device and an analysis program. The moving area, distance, velocity and density are calculated using an analysis program. The composition of Bio-rescue is composed of 610 $\times$ 580 $\times$ 10mm force plate and computer. The pressure sensor of the force plate consists of 1600 pieces, and the sampling rate of the data through the force plate sensor is to be obtained at 100 Hz.

EMG Attachment: Before measuring the muscle activity of elector spinae and gluteus maximus on both sides, the hair was shaved off with a razor to reduce skin resistance, and the skin was cleaned with sterilized alcohol. gluteus maximus was attached to the middle of the caudal and large protrusions, and the attachment site of ES was attached to T6 and L3 [5]. EMG pads were attached according to the direction of muscle fibers [Figure 3].

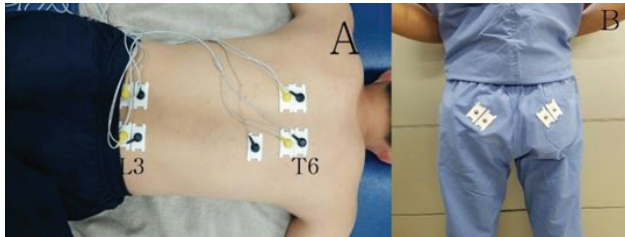


Figure 3: EMG attachment
(A) Elector (B) Gluteus maximus

Application: In this study, to improve the balance of right and left trunk during squat exercise, a mobile phone was attached to the weight bar to provide biofeedback to those with vertebrae. The biofeedback used a smartphone application, Bubble Level (Antoine Vianey, France) [Figure 4], and fixed with velcro in the center of the weight bar. In order to provide visual feedback, the slope of the weight bar was output to the notebook in real time using Side Sync(Samsung Electronics, Korea).

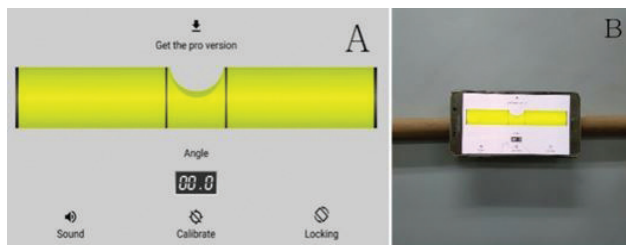


Figure 4: Application

(A) Bubble level (B) Bubble level attached to weight bar

Maximal Voluntary Isometric Contraction; MVIC): The maximum isometric contraction method was referenced to Kendall[Figure 5]. During the maximum isometric contraction of each muscle, muscle activity was measured three times for 5 seconds and treated with root mean square (RMS). Then, the mean EMG signal intensity for the middle 3 seconds except the first and last 1 second was used as% MVIC. The following is a formula for normalizing electromyogram signals



Figure 5: Maximal isometric contraction
(A) Thoracic spine 6 level (B) Lumbar spine 3 level(C) Gluteus maximus

Squat Exercise: The squat exercise was performed with the weight bar spread over the shoulder, with the feet spreading to the shoulder width. In this study, the knee angle was set to 70 °. A rod was used to apply the same knee angle between experiments. The total squat exercise time was 12 seconds, divided into the descending phase (0-4 seconds), the holding phase (4-8 seconds), and the ascending phase (8-12 seconds). All squat exercises were allowed to take one minute of rest for each measurement to minimize fatigue. All squats were performed three times.

General Squat: The subjects were given a comfortable and natural squat [Figure 6 A].

Lateral Shift Correction Squat: In order to apply trunk intervention during the squat exercise, we provided visual feedback in real time to the subject in front of the 13.3 inch notebook. The subject was squatted so that the trunk did not deviate to the left or right as much as possible through the level meter measured by the notebook.[Figure 6 B]

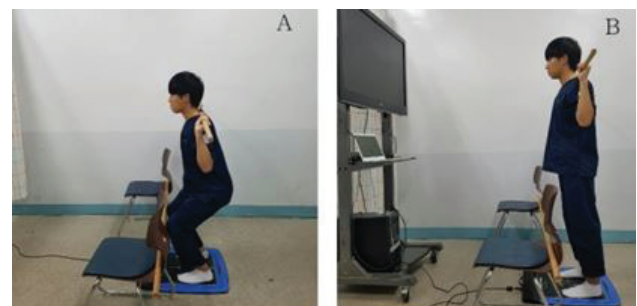


Figure 6: Squat exercise

(A) General Squat (B) Lateral shift correction squat

Analysis

A Paired t - test was performed to examine the effect of both T6 and L3 on elector spinae and gluteus maximus muscle activity and dynamic balance. The statistical significance was $\alpha = 0.05$. The collected data were analyzed using the SPSS statistics 18.0 software program for Windows

Results and Discussion

Results

Muscle activity of trunk and hip during descending phase of squat: There was a significant difference in elector spinae and gluteus maximus muscle activity in descending phase [Table 2].

Table 2: Muscle activity of trunk and hip during descending phase of squat

Muscle	Squat	Corrective Squat	Squat ratio	Corrective Squat ratio	t	p
Left T6	20.28 ± 10.88	18.27 ± 8.62	0.57 ± 0.23	0.78 ± 0.15	4.6	.00*
Right T6	17.67 ± 11.72	17.72 ± 8.85				
Left L3	14.18 ± 7.55	13.91 ± 7.56	0.71 ± 0.14	0.87 ± 0.1	6.17	.00*
Right L3	14.35 ± 7.5	13.91 ± 7.56				
Left GM	4.14 ± 1.32	4.03 ± 1.36	0.77 ± 0.16	0.84 ± 0.13	2.6	.01*
Right GM	3.89 ± 1.13	4.03 ± 1.36				

Holding Phase: There was a significant difference in elector spinae in holding phase. (P<.05)[Table 3].

Table 3: Muscle activity of trunk and hip during holding phase of squat

Muscle	Squat	Corrective Squat	Squat ratio	Corrective Squat ratio	t	p
Left T6	24.56 ± 14.55	24.95 ± 13.92	0.61 ± 0.22	0.78 ± 0.15	5.1	.00*
Right T6	28.29 ± 16.47	24.95 ± 13.92				
Left L3	17.39 ± 7.66	17.1 ± 7.74	0.73 ± .013	0.86 ± 0.09	6.17	.00*
Right L3	18.1 ± 9.66	17.1 ± 7.74				
Left GM	4.32 ± 0.81	5.38 ± 5.64	0.75 ± 0.18	0.82 ± 0.12	1.47	.15
Rihgt GM	4.5 ± 1.78	5.38 ± 5.64				

Ascending Phase: There was a significant difference in elector spinae and gluteus maximus muscle activity in ascending phase (P<.05)[Table 4].

Table 4: Muscle activity of trunk and hip during Ascending phase of squat

Muscle	Squat	Corrective Squat	Squat ratio	Corrective Squat ratio	t	p
Left T6	17.31 ± 8.63	18.36 ± 8.89	0.61 ± 0.23	0.78 ± 0.15	4.06	.00*
Right T6	19.34 ± 8.31	18.36 ± 8.89				
Left L3	16.24 ± 6.67	16.22 ± 6.82	0.77 ± 0.14	0.86 ± 0.08	3.73	.00*
Right L3	16.11 ± 6.68	16.22 ± 6.82				
Left GM	5.5 ± 2.01	5.24 ± 2.24	0.76 ± 0.14	0.85 ± 0.12	3.05	.01*
Right GM	5.42 ± 3.18	5.24 ± 2.24				

Dynamic Balance: There was a significant difference in sway speed and sway length. (P<.05) [Table 5].

Table 5: Comparison of change in balance

Phase		Squat	Corrective Squat	t	p
descending	Swayspeed (mm/s)	1.82 ± 1.12	1.38 ± 0.97	4.04	.00*
	Sway length (mm)	6.29 ± 1.72	4.53 ± 1.38	6.83	.00*
holding	Sway speed (mm/s)	2.42 ± 0.77	0.72 ± 0.48	2.68	.01*
	Sway length (mm)	3.05 ± 1.05	0.84 ± 0.39	4.71	.00*
ascending	Sway speed (mm/s)	3.66 ± 1.1	1.06 ± 0.84	5	.00*
	Sway length (mm)	5.23 ± 1.59	1.53 ± 1.17	5.58	.00*

Discussion

Spinal deformity can be caused by weakness of the muscles supporting the spine due to lack of exercise. Therefore, therapeutic exercise is needed to prevent and treat scoliosis^[6].

In this study, the ratio of muscle activity of left and right of T6 was significantly increased in the descending phase, holding phase, and ascending phase during the lateral shift correction squat movement compared to the general squat ($p < .05$). Lee (2015) compared the muscle balance around the spine with asymptomatic patients and scoliosis, and confirmed muscle imbalance in scoliosis compared with asymptomatic^[7]. As a result of applying the therapeutic exercise to the scoliosis, there were differences in muscle thickness and muscle activity of left and right T7. The deformity of the vertebrae is a fixed contralateral spinal coupling pattern associated with lateral bending and axial rotation of the vertebrae. The spinous processes rotate in a horizontal plane toward the concave surface of the fixed thoracic spine, which generally results in a rib hump in the convex surface in a frontal plane and the ribs follow the rotation of the spine. Due to the strong bending torque applied to the ribs, the upper lumbar region receives intensive bending stress. Therefore, correction of scoliosis is important because it may damage the bony structures.

In this study, the ratio of muscle activity of left and right erector spinae of T6 was significantly increased during lateral shift correction squat exercise that the stress of the bony structure in the ribs could be reduced.

In this study, the ratio of muscle activity of left and right of L3 was significantly increased in the descending phase, holding phase, and ascending phase of the lateral shift correction squat compared to the general squat. Kennelly and Stokes (1993) reported that the cross-sectional area of the multifidus in the concave

and convex parts of the vertebrae differs between the scoliosis and asymptomatic subjects^[8]. This means that the ability to adjust the balance of the trunk is decreased in scoliosis compared to asymptomatic. The importance of exercise has been emphasized because erector spinae is developed to maintain the posture and stability of the spine and pelvis when the therapeutic exercises to improve muscle imbalance are applied to the scoliosis.

In this study, when we applied the lateral shift correction squat to scoliosis, the ratio of left and right erector spinae muscle activity of L3 was significantly increased, so that the left and right unbalance of the trunk was reduced and the spine was stabilized. In this study, the muscle activity ratio of GM increased significantly in the descending and ascending phase of the trunk correction squat. Hip joint muscles are very helpful in maintaining the stabilization of the trunk. This is because the muscles origin or insertion on the pelvis plays a role in controlling the balance of the body, which regulates the movement of the pelvis along the axis of the hip joint^[9]. Mahaudens et al. (2005) reported that a scoliosis affects the pelvic dysfunction and pain during daily gait and gait due to GM imbalance^[10]. In this study, it was suggested that the left and right GM muscle activity ratio of the vertebral flexion patients was significantly increased during the trunk correction squat, so that the left and right imbalance of the pelvis would be reduced to help decrease the pelvic dysfunction.

In this study, the dynamic balance was significantly increased in descending, holding, and ascending phase during the lateral shift correction squat compared to the general squat. According to a study, on the balance ability of scoliosis show a much greater trunk sway area, as well as more sway, surging, and sway radius. Muscle imbalances affect reflexes, postural sway due to muscle weakness, flexibility and decreased co-ordination in the ankle and knee. Compared lateral shift correction

squat, during the general squat, the shaking of the trunk during the dynamic balance test will be increased due to the muscle tension due to the unbalance of the left and right muscles and the deformation of the center of gravity due to skeletal misalignment. During the general squat movement, skeletal misalignment would be caused by the imbalance of the left and right muscles, and the dynamic balance would be degraded due to the deformation of the center of gravity. On the other hand, it seems to be possible to improve the dynamic balance ability of all the squat phase by keeping the equilibrium without side shift due to the muscle balance of left and right sides of the trunk and pelvic muscles during the lateral shift correction squat.

The limitations of this study are as follows. First, only the cross - sectional study was conducted in this study. The lateral shift correction squat should proceed in the long term in scoliosis. In the next study, it is necessary to study long term intervention.

Second, it is necessary to investigate the kinematical phenomenon in order to investigate the effects of direct trunk correction squat. In this study, however, only the left and right muscle activity ratio and balance ability were confirmed. Future studies will require a kinematical study to determine the correct curvature enhancement.

Conclusions

In this study, we compared the muscle balance and dynamic balance of the trunk and hip extensor muscles during lateral shift correction squat. Compared to the general squat, the ratio of muscular activity of left and right elector spinae and gluteus maximus was increased, and dynamic balance ability was significantly increased. Therefore, we recommend a lateral shift correction squat to increase the balance between the trunk and pelvis for those with scoliosis.

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Source of Funding: Self

Conflict of Interest: Nil

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Levels of Wellness, Health Literacy and Health Promoting Behavior Related Factors among Industrial Workers

So-Young Lee¹, Ju-Young Hong¹

¹Nursing Department, Kyungwoon University, Gumi, 39160, Korea

ABSTRACT

Background/Objectives: The aim of this comparative descriptive study is to identify in the characteristic and health promoting behavior of employees who work for the workplace.

Method/Statistical Analysis: The subjects were 142 industrial workers in D, K, U city. Questionnaires were used to measure wellness, levels of health literacy and health promoting behavior. The data were collected from April 15, 2018 to May 15, 2018. Regression analyses were carried out to study the relationship of wellness, health literacy and health promoting behavior with Industrial workers, data were analyzed t-test, ANOVA, Pearson Correlation Coefficient by SPSS win 21.0 program.

Findings: Among the participants in the study, 55% were in 40s and 56.3% were manufacturer worker. The mean score of Wellness was 2.86, Health literacy was 80.53, Health promoting behavior was 2.78. The ability to understand health information was 18 points in 3 areas and the average was 80.53 points when converted into 100 points. The factors that have significant relationships with wellness were age, working hours, next health literacy were educational, manufacturer worker and subjective health status. Health promoting behavior factors were age, smoking, shift work, night work, working hours, subjective health status and subjective safety status. Factors affecting the health promoting behavior were support from wellness ($\beta = .561$, $p < .001$) and night work ($\beta = .449$, $p = .002$). The explanatory power of these variables was 40.9%. The major factor influencing health promoting behavior intention was wellness and night work.

Improvements/Applications: These results suggest that wellness improvement programs should be focused on developments to improve the quality of Health promoting behavior.

Keywords: *Wellness, Health literacy, Health promoting behavior, Industrial workers, Education*

Introduction

Health is an important source supply to economic and social well-being^[1], decisive determinant factor of steady workforce participation, a lot of research shows that poor health often precedes early retirement^[2,3]. The health promotion behavior is a high level of health care process in the process of changing personal habits or circumstances^[4]. In particular, as many workers are taking a long time at the company, we need a way to induce diverse health promotion activities^[5]. Therefore,

many workers are under a lot of stress due to their various social roles and require care and need for medical services. Male workers are less aware of their own health than women workers because of the lack of practice of health management practices such as smoking cessation, stress management, and regular exercise^[6]. Especially male workers are bad socio-economic group, associated with poor health and high levels of chronic disease^[7]. Health promotion behavior refers to behavior actively responding to the environment in order to reach a high standard by lifestyle improvement, act to promote the level of well-being, self-achievement and self-realization^[8,9]. Also, it is important to investigate factors that affect workers health management improvement, these factors are physical, mental and spiritual integrity are organically integrated into health and made in a way that is optimal called Wellness^[10,11]. Because workers

Corresponding Author:

Ju-Young Hong
Professor, Nursing Department,
Kyungwoon University, Gumi Korea
Email: barn007@naver.com

wellness spend a lot of time at long-term task company, improvement in individual health and quality of life is improved, job satisfaction, reduction in absenteeism, reduction of enterprise productivity as we acquire it, worker wellness management is necessary^[12]. In other words, many workers should be able to lead a better way of life and health promotion activities. It is also necessary to have the ability to acquire, think, and understand health related information in order to make informed decision making when using various health services, and this is called health literacy^[13]. The acceptance of health information understanding ability plays a useful role in dialogue with medical personnel. As it was recognized by assets that can control health and social, environmental and health problems, it gained broad attention in the field of health promotion for individuals and society as a whole^[14].

The purpose of this study was to investigate the relationship between health information understanding ability and health information comprehension ability, and to utilize it as basic data to promote more effective health promotion behavior through development of correct health information cognition enhancement.

Materials and Method

The purpose of this study is to identify the wellness, health literacy and health promoting behaviors of industrial workers and to clarify the relationship among these variables.

1. Identify the degree of wellness, health literacy, and health promotion behavior of Industrial Workers
2. Identify differences in wellness, health literacy, and health promoting behavior according to general characteristics of industrial Workers

Design: This research is descriptive and seeks to understand the recognition of and related causes of wellness, health literacy and health promoting behavior of various industrial workers.

Sample: The subjects of this study were various industrial workers in D, K, U city. The number of subjects was estimated using G * power 3.12 program. 95 and significance level .05, respectively. A total of 142 subjects were studied considering the dropout rate.

Instruments

Wellness: The wellness consisted of 18 items that were revised of Worker Wellness Measurement Tool

developed by Choi et. al.^[15]. The subjects were Physical area, Emotional area, Social area, Cognitive area, Occupational area, and consisted of 5 points from 'not at all' to 'always'. The higher the score the higher the wellness. Cronbach's $\alpha = .91$ in Choi et al. study and Cronbach's $\alpha = .92$ in this study.

Health Literacy: Health literacy is the ability to acquire, process, and understand basic health information and services that individuals need to make the right health decisions in 2009, Health People 2010. In this study, Kang Su-jin^[16] was measured by Korean Health Literacy Instrument (KHLI) to measure functional, mutual and evaluative health literacy for adults. Cronbach's alpha = .82, and Cronbach's alpha = .709 in the present study.

Health Promoting Behaviors: The health promoting behaviors consisted of 26 items that were revised and supplemented by 40 items of Health Promoting Life Style(HPLP) developed by Walker et. al.^[17]. The subjects were positive self-image, self-realization, regular exercise, diet management, interpersonal support, stress management, and consisted of 4 points from 'not at all' to 'always'. The higher the score the higher the health promotion behavior. Cronbach's $\alpha = .84$ in the minimum LA(2006) study and Cronbach's $\alpha = .881$ in this study.

Data Collection

The data collection period was from April 15, 2018 to May 15, 2018 and explained the research background, purpose, and procedure at the time of data collection and voluntarily agreed, and explained that the questionnaire response can be discontinued at any time. Also, we explained that the records that can identify the subject are kept confidential and will be discarded after the end of the research. 153 of the total 160 were collected, and 142 of them were analyzed except for those who responded unfairly or were abandoned.

Data Analysis

The collected data were analyzed using SPSS 21.0 program. We analyzed the general characteristics of the subjects, wellness, health literacy and health promoting behaviors using descriptive statistics such as frequency, percentage, and mean standard deviation. The differences of the variables according to the general characteristics of the subjects were analyzed by t-test and ANOVA. Scheffe's test was used for the post test. Regression analyses were carried out to study the relationship of wellness, health literacy and health promoting behavior.

Results and Discussion

Results of study concerning demographic characteristics of the samples, demonstrated that out of 142 participating in the study, 100% them were male. In total, 78.2% them married, 38.7% of the workers were between 40 to 49 years old. Furthermore, 43.7% of the workers were high school graduation, 64.8% were alcohol drinking and 56.3% were smoking. A total of 70.4% of the workers shift pattern working and 71.1% had night working. Also, 56.3% of the workers in manufacturer worker. Of all the workers, 45.1% of them worker 8 hours a day and 26.1% of the workers had been under total working experience more than 26 years. It was subjective health status that most of them 48.6% had experienced normal status and 59.2% of them had been subjective safety status. Furthermore, 31.7% of the workers are salary from both 40 million won and 49 million won, 94.0% of them had no health problem[Table 1].

In terms of the general characteristics of the subjects, the wellness differed from the age($F=3.154$, $p>.016$), working hours($F=11.653$, $p>.001$). Scheffe's test results were more meaning for 8 hours working

than 9-10 hours and 11hours or more. The health literacy varied according to education($F=9.080$, $p>.001$), working setting($t=-2.627$, $p=.010$), subjective health status($F=3.019$, $p=.020$). And Health promoting behaviors showed differences in age($F=3.727$, $p=.007$), smoking($t=0.394$, $p=.035$), shift work($F=-2.448$, $p=.016$), night work($t=-3.174$, $p=.002$), subjective safety status($F=4.924$, $p=.009$). Scheffe's test results were more meaning for the higher self - conscious awareness, the more significant differences are seen with health promoting behaviors[Table1].

The wellness was 2.86 out of 5, health literacy was 80.53 out of 100, and health promoting behavior was 2.78 out of 4. Health promotion behaviors showed a statistically significant correlation with wellness($r=.595$, $p<.05$), it did not correlate with health literacy[Table2].

Multiple regression indicated two predictors wellness and night work of health promoting behaviors in industrial workers[Table 3]. Health promoting behaviors showed that wellness($B=.441$, $S.E.=.054$, $t=8.233$, $p<.001$) and night work($B=.383$, $S.E.=.121$, $t=3.170$, $p=.002$) were significantly positively related. These variables explained 40.9% of the variance.

Table 1: Correlation between the Level Wellness, Health Literacy and Health Promoting Behavior (N = 142)

Characteristic	Categories	N(%)	Wellness		Health Literacy		Health Promoting Behavior	
			M ± SD	t/F (p)	M ± SD	t/F (p)	M ± SD	t/F (p)
Marital status	Unmarried	31(21.8)	2.89 ± .333	.544	.529 ± .180	-.967	2.78 ± .232	-.100
	Married	111(78.2)	2.85 ± .528	(.588)	.551 ± .153	(.335)	2.78 ± .421	(.921)
Age	20-29	13(9.2)	2.91 ± .264	3.154 (.016)	.525 ± .178	.193 (.942)	2.84 ± .146	3.727 (.007)
	30-39	24(16.9)	2.55 ± .351		.555 ± .169		2.57 ± .387	
	40-49	55(38.7)	2.92 ± .512		.551 ± .160		2.74 ± .411	
	50-59	44(31.0)	2.93 ± .555		.531 ± .153		2.91 ± .371	
	≥ 60	6(4.2)	2.98 ± .169		.564 ± .158		2.96 ± .296	
Education	High school	62(43.7)	2.85 ± .481	.447 (.641)	.480 ± .159	9.080 (.000) a, b, c<d	2.75 ± .339	.388 (.679)
	College	31(21.8)	2.80 ± .490		.544 ± .132		2.80 ± .438	
	≥ university	49(34.5)	2.91 ± .511		.624 ± .140		2.81 ± .414	
Alcohol drinking	Yes	92(64.8)	2.82 ± .447	-.413	.552 ± .147	.796	2.76 ± .352	-.966
	None	50(35.2)	2.88 ± .569	(.680)	.528 ± .179	(.428)	2.83 ± .445	(.336)
Smoking	Yes	62(43.7)	2.80 ± .426	-1.358	.546 ± .154	.156	2.70 ± .358	.394
	None	80(56.3)	2.91 ± .535	(.177)	.542 ± .164	(.876)	2.84 ± .400	(.035)
Shift work	Shifting	42(29.6)	2.75 ± .544	-1.648	.526 ± .168	-.859	2.66 ± .377	-2.448
	No shift	100(70.4)	2.91 ± .462	(.104)	.551 ± .155	(.392)	2.83 ± .382	(.016)

Conted...

Night work	Yes	41(28.9)	2.80 ± .510	-1.012	.532 ± .166	-.555	2.63 ± .349	-3.174
	None	101(71.1)	2.89 ± .484	(.313)	.549 ± .157	(.580)	2.85 ± .385	(.002)
Work setting	Manufacturer worker	80(56.3)	2.84 ± .549	-.650	.514 ± .168	-2.627	2.73 ± .411	-1.686
	Office job	62(43.7)	2.89 ± .408	(.517)	.582 ± .139	(.010)	2.84 ± .347	(.094)
Working duration (year)	1-10	41(28.9)	2.83 ± .578	.301 (.877)	.544 ± .157	.403 (.807)	2.88 ± .455	1.241 (.296)
	11-15	20(14.1)	2.97 ± .493		.525 ± .202		2.84 ± .373	
	16-20	20(14.1)	2.85 ± .473		.577 ± .152		2.73 ± .328	
	21-25	24(16.9)	2.86 ± .380		.523 ± .134		2.74 ± .303	
	≥26	37(26.1)	2.84 ± .478		.549 ± .159		2.70 ± .384	
Working hours (hr/day)	≤ 8	64(45.1)	3.05 ± .484	11.653	.537 ± .162	1.468 (.234)	2.86 ± .372	3.005 (.053)
	9-10	37(26.1)	2.81 ± .435	(.000)	.581 ± .168		2.76 ± .269	
	≥ 11	41(28.9)	2.61 ± .436	a>b, c	.521 ± .143		2.68 ± .472	
Salary (won)	≤ 3,000	47(33.1)	2.84 ± .486	1.528 (.210)	.540 ± .163	.093 (.964)	2.78 ± .391	.088 (.966)
	3,100-3,900	12(8.5)	2.70 ± .245		.560 ± .126		2.83 ± .297	
	4,000-4,900	45(31.7)	2.81 ± .511		.538 ± .170		2.77 ± .358	
	≥ 5,000	38(26.8)	2.99 ± .520		.551 ± .155		2.78 ± .448	
Subjective Health status	Very good	4(2.8)	3.16 ± .029	1.565 (.187)	.569 ± .027	3.019 (.020)	3.22 ± .257	3.960 (.005)
	Good	60(42.8)	2.92 ± .497		.500 ± .158		2.87 ± .273	
	Normal	69(48.6)	2.77 ± .485		.580 ± .160		2.68 ± .437	
	Bad	5(3.5)	2.95 ± .489		.633 ± .100		2.60 ± .310	
	Very bad	4(2.8)	3.17 ± .588		.444 ± .078		2.95 ± .557	
Health problem	Yes	48(33.8)	2.94 ± .461	1.365	.531 ± .190	-.628	2.86 ± .419	1.726
	No	94(66.2)	2.82 ± .504	(.174)	.550 ± .141	(.532)	2.74 ± .366	(.086)
Subjective safety status	Very high	9(6.3)	3.03 ± .408	2.994 (.053)	.561 ± .093	.183 (.833)	3.16 ± .301	4.924 (.009) a>b,c
	high	84(59.2)	2.92 ± .440		.537 ± .168		1.77 ± .362	
	Normal	49(34.5)	2.73 ± .564		.552 ± .154		2.74 ± .412	
	Low	-	-		-		-	
	Very low	-	-		-		-	

Table 2: Difference of Level Wellness, Health Literacy and Health Promoting Behavior according to demographic characteristics (N = 142)

	Wellness r(p)	Health Literacy r(p)	Health promoting behavior r(p)
Wellness r(p)	1		
Health Literacy r(p)	-.025(.764)	1	
Health promoting behavior r(p)	.595** (p<.05)	-.094(.264)	1

Table 3: Predictors of industrial workers Health Promoting Behaviors

Various	B	SE	β	t	p
(Constant)	1.271	.273		4.665	.000
Wellness	.441	.054	.561	8.233	.000
Health Literacy	-.194	.163	-.080	-1.189	.237
Night work	.383	.121	.449	3.170	.002
R ² =.447 Adjusted R ² =.409 F=11.834, p<.00, Durbin-Watson= 1.78					
*p< .05, **p<.01					

Conclusion

Considering the findings of the present study, and regarding of health promoting behaviors, wellness in industrial workers which impact on health promoting behaviors and quality of life these them, makes health promoting behaviors more comfortable. That is, the more increase in the level of wellness, the more adoption of health promoting behaviors in industrial workers. Therefore, given the role of wellness life style in improving health behaviors in industrial workers, it is important that healthcare providers adopt measures to improve their industrial workers positive health behavior and motivate them.

Health promoting behaviors play a key role in wellness and can enhance an individual's physical, social, and psychological satisfaction. Considering the findings of the present study, and regarding of health promoting behaviors, wellness in industrial workers which impact on health promoting behaviors and quality of life these them, makes health promoting behaviors more comfortable. That is, the more increase in the level of wellness, the more adoption of health promoting behaviors in industrial workers. Therefore, given the role of wellness life style in improving health behaviors in industrial workers, it is important that healthcare providers adopt measures to improve their industrial workers positive health behavior and motivate them. Health promoting behaviors play a key role in wellness and can enhance an individual's physical, social, and psychological satisfaction.

Namely point is that it should be approve that industrial workers with a longstanding health promotion behavior condition may adapt objectives and tasks of their job to their condition. Suggests that it is necessary to revise and supplement the tools to assess the ability of wellness to comply with the current situation of medical institutions, and to study the difference in wellness, health literacy, and health promoting behavior according to the night working.

Since this study did not focus on interventions, future studies need to focus on the exploration of the types of nursing care and health services that may be most effective in promoting healthy behaviors in industrial workers. This study suggests that it is necessary to revise and supplement the tools to assess the ability of wellness to comply with the current situation

of medical institutions, and to study the difference in wellness, health literacy, and health promoting behavior according to the night working. Since this study did not focus on interventions, future studies need to focus on the exploration of the types of nursing care and health services that may be most effective in promoting healthy behaviors in industrial workers.

Ethical Clearance: Not required

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The Relationship between the Subjective Health Status, e-Health Literacy, Health Literacy and Health Promoting Behavior in Under Graduate Nursing Students

Ju-Young, Hong¹, So-Young Lee¹

¹Nursing Department, Kyungwoon university, Gumi, 39160, Korea

ABSTRACT

Background: Many people use the internet for health information, Nursing students should be well-acquainted with e- health information and resources to better provide information for their patients.

Method: Participants were 138 undergraduate nursing students in D, K, U city. Questionnaires were used to measure levels of health literacy, e-Health literacy, and health promoting behavior. The data were collected from April 2, 2018 to May 2, 2018. Data were analyzed using t-test, ANOVA, Pearson Correlation Coefficient by SPSS for Windows 21.0 program.

Findings: e-Health literacy and subjective health condition were high and ability to understand health information was in the middle. The degree of health promoting behavior was a little low. Participants' ability to understand health information came from the following: ability to understand inter active health information, understand critical health information, understand functional health information. E-Health information comprehension ability appeared in the order of use ability, solution ability, evaluation ability. The major factor influencing health promoting behavior intention was e-Health literacy.

Improvements: These results suggest that Health literacy, e-Health literacy interventions should focus on improving the quality of health promoting behavior.

Keywords: Health literacy, e- Health literacy, Health promoting behavior, Subjective health status, Nursing students

Introduction

College life is a period of change in behaviors that can lead to good lifestyles in life and to carry out health promotion activities. Health habits of this period have an important influence on lifelong health care activities ^[1]. According to the Korea Internet & Security Agency (KISA) in 2015, health information and health activities searched by college students ranked second in Internet search followed by information acquisition area (99.6%), week search was related to disease and injury information (61.9%), lifestyle And nutrition information (50.2%) ^[2]. In the flood of many health information, the

need to search, select, understand and evaluate the right health information is increasing, and this ability is called e-Health Literacy ^[3]. In addition, not only the Internet, but also the information obtained by visiting the medical institutions themselves, is diversified, and the ability to apply and utilize such information is called the Health Literacy ^[4]. Health literacy is an important issue for the public, health care providers should also learn to use the basic skills to develop and use the electronic sources in order to implement better standards of health services ^[5, 6]. The acceptance of health information understanding ability plays a useful role in dialogue with medical personnel ^[7, 8]. In particular, nursing college students, who are future nurses, firstly recognize that their right health information understanding ability and e-health information understanding ability are related to their own health promoting behavior, and they also connect with the subjects and effective health explanatory power. The purpose of this study was to investigate the relationship between health information understanding

Corresponding Author:

So-Young Lee
Professor, Nursing Department,
Kyungwoon University, Gumi Korea
Email: 108959@naver.com

ability and e-health information comprehension ability, and to utilize it as basic data to promote more effective health promotion act as a preliminary medical person through development of correct health in formation cognition enhancement.

Materials and Method

The purpose of this study was to identify the health literacy, e-health literacy, and health promoting behaviors of nursing college students and to clarify the relationship between these variables.

1. Identify the degree of health literacy, e-health literacy, and health promoting behavior of nursing students.
2. Identify differences in health literacy, e-health literacy, and health promoting behavior according to general characteristics of nursing college students.

Design: This research is descriptive and seeks to understand the recognition of and factors influencing health literacy, e-health literacy, and health promoting behavior of nursing students.

Sample: Participants in this study included students attending Nursing College in D, K, U city. The number of subjects was estimated using G * power 3.12 program. 95 and significance level .05, respectively, the largest calculated sample size was 119 subjects. A total of 138 subjects were studied considering the dropout rate.

Instruments

Health Literacy: According to Healthy People 2010, health literacy is the ability to acquire, process, and understand basic health information and services that individuals need to make the health. In this study, Kang Su-jin^[9] was measured by Korean Health Literacy Instrument (KHLI), which measures functional, mutual, and evaluative health literacy in adult populations. Reliability was assessed using Cronbach's alpha. KHLI had a Cronbach's alpha = .82, and Cronbach's alpha = .83 in the present study.

e-health Literacy: e-Health is the ability to find, understand and evaluate health information on the Internet and apply it to health decision making^[3]. In this study, e-Health was used to measure e-health literacy. Developed by Norman & Skinner(2006), e-Health is a scale that measure technology, knowledge, and

perceived convenience using 8 items. We used modified tool by Lee et al^[8], This scale consists of 5 responses, that range from 'not at all' to 'very highly'. The greater the score, the higher the ability to comprehend e-health information. Reliability of this scale was assessed using Cronbach's alpha ($\alpha = .88$ and $\alpha = .93$)

Health Promotion Behaviors: The health promoting behaviors consisted of 26 items (26 items) that were revised^[10] and supplemented by 40 items of Health Promoting Life Style (HPLP) developed by Walker et al^[11]. Item measure positive self-image, self-realization, exercise, diet management, interpersonal support, and stress management. Responses were on a likert scale and ranged from 4 'not at all' to 'always'. The greater the score, the higher the health promotion behavior. Cronbach's $\alpha = .84$ in choistudy^[10], and Cronbach's $\alpha = .81$ in this study

Data Collection

The data collection period was from April 02, 2014 to May 02, 2018. All participants provided informed consent prior to participation in this study. Out of 160 potential participants, the final sample consisted of 138 individuals. 143 of the total 160 were collected, and 138 of them were analyzed except for those who responded unfairly or were abandoned

Data Analysis

The collected data were analyzed using SPSS version 21.0. We analyzed the general characteristics of the subjects, the ability to understand health information, the ability to understand e - health information, and health promoting behaviors using descriptive statistics such as frequency, percentage, and mean standard deviation. The differences of the variables according to the general characteristics of the subjects were analyzed by t-test, ANOVA, Pearson correlation coefficient.

Results and Discussion

A total of 138 (114, 82.6% female and 24, 17.4% male) nursing students participated in this study. Mean age of the subjects was 21 years. 56% were fourth grade students and 55% lived with family. 87% drank alcohol and 5% smoked. 63% slept six to seven hours a day. 55% ate at home and 68% had irregular eating pattern. Overall, a majority of individuals reported themselves to be in "very good" or "good" health condition. Sociodemographic characteristics of are shown in[Table 1].

Table 1: Sociodemographic characteristics of study participants (N = 138)

Characteristic	Categories	N (%)
Gender	Female	114(82.6)
	Male	24(17.4)
Residence type	Living with family	76(55.1)
	Dormitory	23(16.7)
	Self-boarding	34(24.6)
	Etc	5(3.6)
Grade	2	60(43.5)
	4	78(56.5)
Alcohol drinking	Yes	87(63.0)
	No	51(37.0)
Smoking	Yes	5(3.6)
	No	133(96.4)
Sleep time/day (hours)	4-5	28(20.3)
	6-7	87(63.0)
	8 $\geq$	23(16.7)
Circumstance of eating	Eating with family	77(55.8)
	Eating in School	15(10.9)
	Eating delivery food	41(29.7)
	Etc	5(3.6)
Eating pattern	Regular	44(31.9)
	Irregular	94(68.1)
Exercise	Yes	74(53.6)
	No	64(46.4)
BMI	18.5<	17(12.3)
	18.5-22.9	99(71.7)
	23.0-24.9	13(9.4)
	25.0>	9(6.5)
Subjective health status	Excellent	5(3.6)
	Very good	55(33.9)
	Good	47(34.1)
	Fair	29(21.0)
	Poor	2(1.4)

The Participants' health literacy was 13.4 out of 18: among its sub-areas, ability to understanding of interactive health information scored the highest with 3.34 ± 4.29 and functional health information scored the lowest with 2.68 ± 1.39 .

e-Health literacy was 3.35 out of 5, and Health promoting behavior was 2.79 out of 4. Among the e - Health literacy sub-areas, ability to use scored the highest with 3.91 ± 0.59 and ability to evaluation scored the lowest with 3.67 ± 0.72 .

The mean scores for subscales of the Health literacy, e-Health literacy, Health promoting behavior are shown in [Table 2].

Table 2: Degree of the Health literacy, e-Health literacy and Health promoting behavior (N = 138)

	Subscales	M $\pm$ SD	Range
Health literacy	Ability to Understand Functional health information.	2.68 ± 1.39	2~3
	Ability to Understand Interactive health information	3.34 ± 4.29	1~4
	Ability to understand Critical health information	2.74 ± 2.69	1~3
e-Health literacy	Ability to use	3.91 ± 0.59	2~5
	Ability to evaluation	3.67 ± 0.72	2~5
	Ability to solution	3.76 ± 0.78	1~5
Health promoting behavior	Health promoting behavior	2.79 ± 0.32	2~4

There was no significant correlation between Health literacy and e-Health literacy (Pearson correlation coefficient, $r=.01$, $p=.92$) and Health promoting behavior (Spearman correlation coefficient, $r=-.13$, $p=.12$).

There was a significant difference in terms of total e-Health literacy scores between Health promoting behavior ($r=.41$, $p<0.001$) [Table 3].

Table 3: Correlation between the Health literacy, e-Health literacy and Health promoting behavior (N = 138)

	Health Literacy r(p)	e-Health Literacy r(p)	Health promoting behavior r(p)
Health Literacy	1		
e-Health Literacy	.01 (.92)	1	
Health promoting behavior	-.13 (.12)	.41** (.00)	1

* $p<.01$, ** $p<.001$

In terms of the general characteristics of the subjects, Health literacy differed from the circumstance

of eating($F=2.812$, $p=.042$). e-Health literacy varied based on gender($F=-2.468$, $p=.015$), smoking($F=3.016$, $p=.003$), and circumstance of eating($F=1.464$, $p=.007$), and exercise ($F=-1.226$, $p=.022$). Additionally, health promotion behaviors were different based on circumstance of eating($F=4.130$, $p=.008$), eating pattern($F=4.111$, <0.001), exercise, ($F=-3.297$, $p=.001$) and subjective health status($F=7.904$, <0.001)[Table 4].

Table 4: Correlation between the Level Health Literacy, e-Health Literacy and Health Promoting Behavior (N = 138)

Characteristic	Categories	Health Literacy		e-Health Literacy		Health Promoting Behavior	
		M $\pm$ SD	t/F (p)	M $\pm$ SD	t/F (p)	M $\pm$ SD	t/F (p)
Gender	Female	0.74 $\pm$ 0.15	-.693 (.490)	3.78 $\pm$ 0.58	-2.468 (.015)	2.77 $\pm$ 0.30	-1.567 (.119)
	Male	0.77 $\pm$ 0.18		4.10 $\pm$ 0.56		2.88 $\pm$ 0.41	
Residence type	Living with family	0.72 $\pm$ 0.17	1.374 (.253)	3.72 $\pm$ 0.62	2.447 (.057)	2.81 $\pm$ 0.33	1.149 (.332)
	Dormitory	0.79 $\pm$ 0.14		3.95 $\pm$ 0.44		2.85 $\pm$ 0.37	
	Self-boarding	0.76 $\pm$ 0.12		3.94 $\pm$ 0.53		2.71 $\pm$ 0.25	
	Etc	0.77 $\pm$ 0.10		4.25 $\pm$ 0.72		2.70 $\pm$ 0.33	
Grade	2	0.72 $\pm$ 0.15	-1.480 (.141)	3.91 $\pm$ 0.62	1.375 (.171)	2.77 $\pm$ 0.36	-.869 (.386)
	4	0.76 $\pm$ 0.16		3.77 $\pm$ 0.56		2.82 $\pm$ 0.29	
Alcohol drinking	Yes	0.75 $\pm$ 0.16	0.513 (.609)	3.88 $\pm$ 0.61	1.300 (.196)	2.82 $\pm$ 0.33	1.234 (.219)
	No	0.74 $\pm$ 0.15		3.75 $\pm$ 0.54		2.75 $\pm$ 0.30	
Smoking	Yes ^a	0.87 $\pm$ 0.12	1.813 (.072)	4.63 $\pm$ 0.54	3.016 (.003)	2.88 $\pm$ 0.59	0.635 (.527)
	No ^b	0.74 $\pm$ 0.16		3.80 $\pm$ 0.57		2.79 $\pm$ 0.31	
Sleep time/day (hours)	4-5	0.77 $\pm$ 0.13	0.406 (.667)	3.64 $\pm$ 0.70	2.170 (.118)	2.81 $\pm$ 0.37	1.067 (.347)
	6-7	0.74 $\pm$ 0.15		3.90 $\pm$ 0.53		2.81 $\pm$ 0.31	
	8 $\geq$	0.73 $\pm$ 0.20		3.79 $\pm$ 0.63		2.70 $\pm$ 0.29	
Circumstance of eating	Eating at home ^a	0.73 $\pm$ 0.16	2.812 (.042) b>c>a>d	3.71 $\pm$ 0.63	1.464 (.007) b>d>c>a	2.83 $\pm$ 0.29	4.130 (.008) b>d>a>c
	Eating in School ^b	0.84 $\pm$ 0.09		4.05 $\pm$ 0.52		2.97 $\pm$ 0.37	
	Eating delivery food ^c	0.75 $\pm$ 0.16		3.75 $\pm$ 0.53		2.66 $\pm$ 0.26	
	Etc ^d	0.74 $\pm$ 0.21		4.20 $\pm$ 0.45		2.84 $\pm$ 0.65	
Eating pattern	Regular	0.72 $\pm$ 0.20	-.871 (.387)	3.83 $\pm$ 0.56	-.074 (.941)	2.95 $\pm$ 0.31	4.111 (.000)
	Irregular	0.75 $\pm$ 0.13		3.84 $\pm$ 0.60		2.72 $\pm$ 0.30	
Exercise	Yes	0.75 $\pm$ 0.17	-.234 (.816)	3.89 $\pm$ 0.55	-1.226 (.022)	2.87 $\pm$ 0.33	-3.297 (.001)
	No	0.74 $\pm$ 0.14		3.77 $\pm$ 0.62		2.69 $\pm$ 0.28	
BMI	18.5<	0.67 $\pm$ 0.20	1.586 (.196)	3.85 $\pm$ 0.53	0.411 (.745)	2.78 $\pm$ 0.22	.646 (.587)
	18.5-22.9	0.75 $\pm$ 0.15		3.85 $\pm$ 0.59		2.80 $\pm$ 0.32	
	23.0-24.9	0.78 $\pm$ 0.12		3.86 $\pm$ 0.73		2.79 $\pm$ 0.42	
	25.0>	0.80 $\pm$ 0.13		3.62 $\pm$ 0.46		2.65 $\pm$ 0.32	
Subjective health status	Very healthy ^a	0.75 $\pm$ 0.18	0.436 (.782)	3.68 $\pm$ 0.68	1.209 (.310)	3.19 $\pm$ 0.79	7.904 (.000) b>c>a>d>e
	Good ^b	0.74 $\pm$ 0.16		3.42 $\pm$ 0.46		2.90 $\pm$ 0.27	
	Moderate ^c	0.73 $\pm$ 0.16		3.31 $\pm$ 0.56		2.69 $\pm$ 0.27	
	Not good ^d	0.77 $\pm$ 0.14		3.24 $\pm$ 0.48		2.69 $\pm$ 0.33	
	Illness ^e	0.83 $\pm$ 0.15		3.19 $\pm$ 0.79		2.83 $\pm$ 0.29	

Conclusion

The results of this study provide evidence that the acquisition of health information by nursing college students, who are future nursing educators, increases their e-health literacy. e-Health literacy is correlated with health promoting behaviors, and nursing college students as future health leaders need to understand health information acquisition in various ways and to have critical thinking ability about correct health knowledge. In addition, it is important that the education method that can convey the method and understanding ability of health information through various education methods is important, and this study has significance as the basic data of practical nursing education program. This study suggests that it is necessary to revise and supplement the tools to assess the ability of health information to comply with the current situation of medical institutions, and to study the difference in Health literacy, e-Health literacy, and health promoting behavior according to the circumstance of eating.

It is found that the acquisition of health information of nursing college students who are future nursing educators mainly occurs through e-health literacy and they are more comfortable with it. Therefore, it is necessary for nursing students as future health leaders to have an understanding of health information acquisition in various channels and critical thinking ability about correct health knowledge. In addition, it seems that education methods that can convey the method and understanding ability of health information through various education methods are important. It suggests the necessity of applying education and program to obtain health information by the right internet search to nursing students in the future.

Ethical Clearance: Not required

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Big Data Analysis: Medical Accident

Jung-ho Bae¹, Eunae Burm²

¹Dept. Childhood Education, ²Dept. Nursing, Baeksoek Culture University, 58, Munam-ro, Dongnam-gu, Cheonan-si, Chungcheongnam-do, 31065, Korea

ABSTRACT

Background/Objectives: Medical accidents have been happening in major large hospitals and real-time search queries for portal sites are increasing. We purpose to provide basic data on medical dispute resolution and medical accident prevention.

Method/Statistical Analysis: We based data collected through educational and academic information sources(RISS) and *aver search as big data, and analyzed the keywords and the network analyzed by the 'Medical accident' keyword. The frequency, ranking, and connection of the keywords were analyzed through the process of processing the collected unstructured text into the data suitable for research and analysis.

Findings: As a result, in case of the academic research related to the medical accidents, the study on the medical dispute is most active. In the analysis of the network, the medical accidents lead to the medical disputes and are mostly resolved by law in a manner that judge criminal responsibility and other responsibilities(punishment and compensation).Analysis of search words from news, blogs and Internet cafes, and the most frequently mentioned keyword related to medical accidents was criminal responsibility. In the analysis of the network it will be as follows: the handling of medical accidents involving criminal liability and other liabilities shall result in punitive damages resulting from legal proceedings or monetary damages resulting from civil agreements.

Improvements/Applications: We suggest that the human, institutional, and physical environment should be improved to avoid medical accidents, conflicts and litigation.

Keywords: Medical accident, Big data, Medical error, medical dispute, prevention

Introduction

According to the Korea Medical Dispute Mediation & Arbitration Agency (2018), a total of 36,099 medical dispute counseling and 1,398 mediation applications were received in 2013. And now the figure is about 57,349, which is about double. As can be seen from these results, the aspect of conflict on medical accidents is getting serious^[1].

'Medical accident' means a case of 'damage caused to a person's life, body and property due to a medical practice', and a medical accident in the narrow sense

means only a result that occurs in the course of medical practice. On the other hand, the medical accidents in a broad sense include accidents that occur in the course of patient management or facility management of hospital^[1]. Medical accidents involving patient safety during the provision of health care services are occurring much more often than are generally perceived, and in fact such accidents are reported to be preventable^[2,3]. In the United States, which boasts the world's best medical technology and services, there are at least 4,300 similar cases^[3]. There is no official statistical data on the status of medical accidents in Korea. However, due to the improvement of economic level and the realization of health guarantee for the whole nation, the utilization rate of medical services has increased and medical services have diversified and the number of claims for damages caused by medical accidents has also been increasing steadily^[4].

Recently, various efforts and basic researches have been actively conducted to prevent medical accidents

Corresponding Author:

Eunae Burm

Dept. Nursing, Baeksoek Culture University,
Republic of Korea

Email: eaburm@gmail.com

and to provide a safe medical environment to patients, especially in developed countries. In addition, the increase in the number of medical disputes is considered to be a major social phenomenon, which is caused by the complexity of other social background factors rather than merely increasing medical accidents^{[5][6]}. Unlike in the past, where the person involved in the accident asked for responsibility and punished accordingly in the event of a medical accident, the approach that focuses on the patient safety is focusing on finding out the problems of the medical delivery system itself that allows the occurrence of repeated accidents and preventing medical errors from occurring in advance by defining the cause of the medical error as an incomplete systematic problem^{[2][7]}.

The general procedure for dealing with a medical accident is to judge the responsibility of a hospital or a medical staff involved in the medical accident, and to provide compensation and relief to the victim according to the relevant law^{[8][9][10]}. However, it is more important to prevent the occurrence of medical accidents than to compensate the victims according to the laws and precedents, taking into account the causes and responsibilities of medical accidents, which are recognized as the most important point in medical accidents. Nevertheless, most studies are concentrated only on the corresponding procedures and damage compensation on the assumption of occurrence of the medical accident rather than focusing on the prevention of medical accidents. The purpose of this study is to

provide basic data for the prevention of medical accidents by understanding the perception of medical professionals and the general public about the medical field in order to prevent the occurrence of the medical accidents.

Materials and Method

Data Investigate: The study was intended to collect a wide range of data from various perspectives in order to understand the perception of experts and the general public about medical accidents. The big data of the database used by experts and the general public was studied. In order to investigate the perception of experts on medical accidents, related academic research data were collected from the homepage of the Korea Education and Research Information Service (KERIS) by inserting the keyword of the medical accident. Academic information was collected from books, theses, journals, and other academic materials from the Research information service system(RISS) which is used by the majority of researchers. Secondly, I collected blogs, cafes, web documents, and news materials from the portal site “*AVER” using the key word of “medical accident” to figure out the public awareness and understanding on the medical accident. Finally, I gathered questions and answers about medical accident shared in ‘Jisik-In’ to understand the social knowledge of medical accident, that is, the sharing of actual knowledge information[Table 1].

Table 1: Result of Data Investigate

	Thesis and Article	Internet café, Blog, web documentary, Jisik-In	News
Period	2018.05.01~05.15.	2018.05.01~05.30.	2018.05.15~05.30.
Type	Title, Author, Abstract, Keyword, Published date, Publisher	Title, URL, Contents, Writer, Published date, Publisher etc.	Title, Contents, Writer, Published date, Publisher
Total	298 out of 7,335 (104 books, 33 Thesis, 161 Article)	8,332 out of 262,024 (115 café, 43 Blog, 135 Web documentary, 7,989 Jisik-In(Q: 3,395, A: 4,594))	188 out of 132,268

Data Analysis

The frequency, ranking, and connection of the keywords were analyzed through the process of processing the collected unstructured text into the data suitable for research and analysis. First of all, a word frequency analysis table was presented through the keyword analysis and visualization analysis was performed on the data. Second, the relationship between major keywords was analyzed through the keyword network analysis.

Results and Discussion

The number of analysis data related to Research information service system (RISS) is shown in [Figure 1].

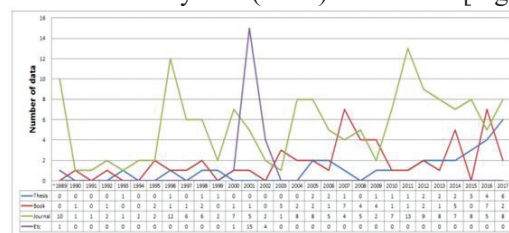


Figure 1: Research information service system (RISS)

The academic research on the medical accident that was searched from the research information service system (RISS) was conducted in 1978, and the academic research was an important research topic for the researchers. The special issue was that the book publication has risen dramatically in 2007 and 2016. The interest in medical accidents seems to have increased since the medical law was revised in 2007. And the reason for the increase in academic research in 2011 can be interpreted as the fact that the medical dispute law eventually passed the National Assembly in 23 years. The beginning is related to the dramatic increase in demand for medical care in 1989 by expanding medical insurance coverage for all citizens. In December 1995, a blood transfusion mistake occurred in Seoul National University Hospital due to an unconfirmed blood type, and dozens of medical mistakes and medical accidents were found in the prosecution investigation. A total of 22 people, including doctors and nurses, were placed in the case. As a result of such an incident, it is interpreted that

a lot of academic research related to the case conducted in 1996. And, reflecting this fact, the court published the law reports on medical accident in 2001. In 2016 and 2017, as the medical accidents related to celebrities were widely reported through the media, not only the interest of the general public, but also the interest of the researchers has greatly increased.

Academic Research Analysis

Analysis on the Frequency of Keywords (Medical Accidents): In academic research, the most frequently mentioned keyword associated with ‘medical accidents’ was ‘medical dispute’, which appeared 46 times in total. The next most frequently occurring words were ‘relief’, which appeared 32 times in total. In addition, words such as disputes, medical care, law, dedication, research, compensation, responsibility, methods and procedures for this have appeared frequently. The [Table 2] shows the frequency of major words among the words related to the ‘medical accidents’

Table 2: Frequency of Major Words among the Words Related to the Medical Accidents

Ranking	Word	Frequency	Ranking	Word	Frequency	Ranking	Word	Frequency
1	Medical accidents	270	11	Method	15	21	Type	12
2	Medical dispute	46	12	Compensation	15	22	Investigation	12
3	Relief	32	13	Accountability	15	23	Judicial precedent	12
4	Criminal responsibility	25	14	Anesthesia accident	14	24	Awareness	11
5	dispute	23	15	Prevention	14	25	Institution	11
6	Medical	23	16	Dentist	13	26	Anesthesia	10
7	Law	22	17	Occurrence	13	27	Insurance	8
8	Adjustment	22	18	Case	13	28	Irresistible force	8
9	Research	21	19	Patient	13	29	Litigation	8
10	Analysis	20	20	Countermeasure	12	30	Proceeding	8

The [Figure 2] describes the results of the keyword analysis which are visualized in the order of frequently shown words in order to identify the weight of the words mentioned with the medical accidents. According to the above findings, in case of the academic research related to the medical accidents, the study on the medical dispute is most active. In addition, it can be interpreted that there are a lot of studies on the compensation and counter measures for damages such as laws and counseling system for damage relief and mediation.



Figure 2: Keywords Visualization of Medical Accidents in Academic Research (Word cloud)

Network Analysis (Medical Accidents): Understanding the context in which the word ‘medical accidents’ is used in academic research can increase the understanding of researchers’ interest and awareness of the medical accidents. For this purpose, the network analysis was conducted to analyze the aspect of the connectivity of the words through the relationship between ‘medical accidents’ and other key words. The words that are intensively connected with the word ‘medical accident’ are criminal, civil, liability, appraisal, counter-measure, negligence, loss and damages. The ‘medical dispute’ is intensively linked to cause, issue, type, case, judicial precedent, law, counter-measure, and so on. The word ‘damages’ is intensively linked with words, ‘medical accidents’ and ‘medical dispute’. The medical accidents generally call civil and criminal liability for the negligence. And the medical dispute that judges the subject of such liability can be interpreted as being divided into types based on cause, issue, type and law.

The ‘medical accidents’ lead to the ‘medical disputes’ and are mostly resolved by law in a manner that

judge criminal responsibility and other responsibilities. And the punishment and compensation for the assigned liability shall be linked to legal punishment or damages. However, it has been difficult to find intensive connection to prevention, mediation, and counseling, which are the most important factors for medical accidents and medical disputes. In other words, there is a lack of recognition and research on the most basic factors such as preventive and post mediation procedures of medical accidents and medical disputes. It seems that more efforts are needed to identify and prevent the cause of medical accidents.

Analysis of Search Words from News, Blogs and Internet Cafes.

Status of the Search Words: The number of analysis data related to the search word is shown in [figure 3]. ‘Jisik-In’ is a knowledge sharing service among internet users by using collective intelligence in *AVER, and it can be regarded as a kind of knowledge information communication field in which any one can provide answers to the general questions and receive compensation after providing answers.

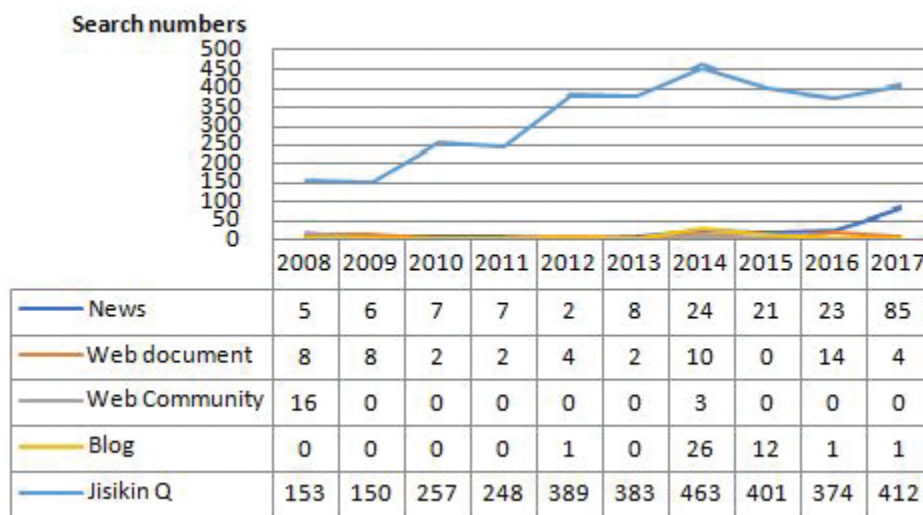


Figure 3: Number of Analysis Data Related to the Search Word

The total number of data of the last 10 years collected after inserting the word ‘medical accidents’ as a key word was 1,640,012 and a total of 3532 cases were finally analyzed among them. What is unusual is that search volumes have increased dramatically in 2010, 2012, and 2014. Those years are also the year when major medical accidents involving celebrities or medical care and health occurred. The explosive growth of news releases in 2016 and 2017 reflects public interest in medical accidents and celebrity’s death due to medical

accidents, and there was a lot of news coverage related to medical accidents at that time. The reason why the amount of search in ‘Jisik-In’ is more than the search volume of web documents, cafes and blogs is that the initial consultation about the medical accidents is mainly done in the Internet search site and there is a high level of public interest in medical accidents as well.

Keyword Frequency Analysis (Medical Accidents): The most frequently mentioned keyword related to ‘medical

measures to disputes caused by the medical accidents. In addition, there was a connection with words such as prevention, mediation and prevention that were difficult to find in the search word data. This can be interpreted as the experts are aware of the necessity of the prevention of medical accidents and arbitration strategy necessary in case of disputes. It also suggests that the interest and understanding of experts and general public about medical accidents should be integrated. On the other hand, when looking at the search word results, the words such as civil and criminal liability, law, dispute, judicial precedent, responsibility, indemnification, law and so on are intensively linked to the word medical accidents. It can be seen that there are active discussions on civil and criminal proceedings and accusations against medical accidents, and damages compensation. Looking at the appearance of emotional words unique to the search word, words such as 'resentment' and 'absurd' frequently appear. These words express the feeling of victims in a compressed way. The victims of medical accidents have to be absolutely subject to the authority of the doctor as a passive being within the medical service system. A victim undergoing medical accidents will only be baffled and perplexed by a series of circumstances that have occurred regardless of his will.

In the search word analysis, a counter-measure for medical accidents is represented by three stages of procedures as follows. The first step is to ask questions about whether the victim is an accident, and then the attorney, who is the stakeholder involved in the accident, generally defines the accident as medical accidents. Then, the final step, the response procedure, will lead to litigation and legal procedures by means of damages and compensation. In other words, information pollution which is the same as the environment is serious, and victims suffering from medical accidents are over-exposed to the knowledge and information on counter-measure procedures related to the medical accidents rather than arbitration or mediation procedures. It means that the current information environment can cause repeated wasteful vicious circle of litigation.

Out of the total number of counseling cases on medical devices, the number of cases involving plastic surgery was the sixth in the ranking, but search word showed a high frequency and connectivity. Considering that the word 'surgical' and 'surgical procedure' were the most commonly linked words, the number of counsels regarding surgical procedures and surgery related to

medical accidents and medical disputes caused by the plastic surgery is different from the search word interest have. In the case of medical accidents and disputes about plastic surgery, it seems that people take counter measures individually using knowledge and information on the Internet before they receive mediation or counsel. In other words, the vast majority of active exchange of knowledge and information figured out through the search word pattern can be regarded as related to the plastic surgery and since people are more likely to take counter measures to medical accidents based on the information and knowledge they receive on the web, regulations on knowledge information on the web regarding plastic sourcing are highly required. To summarize, experts have been primarily concerned with the current status of medical accidents, progression after the incident, and legal procedures related to them. The search word analysis results show that people tend to exchange knowledge and information about actual medical accidents and disputes, and plastic surgery.

Conclusion

The pre-accident phase is the best time to prevent medical accidents from occurring. However, looking at the key words in the academic materials, it is difficult to find words and networks related to prevention of medical accidents other than the word 'prevention'. While studies or research may be an important means of preventing accidents, most studies or research are about the judicial precedents, accident status, post-accident handling and so on related to the medical accidents. In the academic network analysis figure, it can be seen that words that show intensive connection with studies or research are words such as judicial precedents and laws, etc. On the other hand, 'prevention' is closely related to the word 'study' or 'research', but the strength or frequency of connections seems weak. There are some studies that are trying to approach the problem at the preventive point of view about the medical accidents. Authorities and experts are required to carry out more diverse and extensive researches and cause investigations to prevent medical accidents to improve and build physical and human systems for the prevention of the medical accidents and it is also necessary to ensure that a variety of practical measures and prevention education are connected.

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Applying the Havruta Learning Method to Nursing Education

Jeung-Ah Gu¹, Ae-Sook Choi¹, Hyun-Gyung Kim¹

¹Professor, Dept. of Nursing, Baekseok Culture University, Korea

ABSTRACT

Background/Objectives: This study aims to nurture competitive nurses by applying the havruta learning method to nursing science classes and verifying the learning method's effects on the competencies of learners.

Method/Statistical Analysis: This study was conducted on 146 nursing students at Baekseok Culture University taking Community Nursing III and Nursing Management. Havruta-style paired discussion was applied during the 15-week curriculum and students submitted activity journals. This study was designed as a descriptive research study consisting of self-directed learning competency, discussion competency, individual and collective creativity and a satisfaction survey. Self-directed learning competency was measured through 45 questionnaire items across three criteria.

Findings: The results of this study show that among the 3 sub-criteria of self-directed learning, "learning practice" had the highest average score at 3.6 out of 5. The questionnaire item that scored the highest point(4.08) was "I complete tasks or work to see through to the end." The average score of discussion competency was 3.35 out of 5. Communication skill competency consisting of adaptation, argument, and non-verbal communication had the highest average score at 3.54, while prediction competency had the lowest average score at 3.18. The average total score of discussion competency was 35.38, which indicates "middle" discussion competency. In terms of individual creativity, the questionnaire item regarding "intrinsic task motivation" scored the highest at 3.91, and the average score of collective creativity was 3.56. Regarding satisfaction with the havruta learning method, the item "I would strongly recommend the havruta learning method to my juniors," scored the highest at 4.09.

Improvements/Applications: The new havruta learning method, focused on havruta-style paired discussion, needs to be applied to nursing classes of all school years with continuity so as to prove the effects of the learning method.

Keywords: *Havruta-style paired discussion, self-directed learning competency, discussion ability competency, individual creativity, collective creativity*

Introduction

Currently, universities are attempting to innovatively improve their curriculums by focusing on such topics as outcome-based education and a user-oriented education paradigm and responding to the fourth industrial revolution. In particular, the education accreditation system, including nursing science accreditation, is utilized as a major mechanism in the

innovation of higher education as the system is reflected in the evaluation index of government-funded support projects, led by the Ministry of Education^[1]. In the 21st century characterized by informatization, exponentially increasing knowledge, diversification and the need for lifelong education, learners are demanded to develop various competencies to effectively communicate using various communication media, such as the Internet and other information technologies, and to successfully adapt to fast-changing environments. Therefore, the education method in which all learners study in a uniform and passive manner is inappropriate. One of the most essential competencies learners need to develop is the ability to study in an autonomous and self-directed manner, while taking responsibility for their own learning procedures.

Corresponding Author:

Ae-Sook Choi
Professor, Department of Nursing,
Baekseok Culture University, Korea
Email: aschoi@bscu.ac.kr

Self-directed learning is based on the idea that education should help learners develop qualifications to respond more wisely and actively to the changing society^[2]. It is time for learners to change from passive learners to active and self-directed learners due to fast changes in the environments of society and deteriorating internal and external economic structures. Nursing college students will face changes in the environments when they become nurses. Low birthrate is a large concern in Korea, the aging population makes the medical environment more complex and increases customer demand for medical services, and the medical market seeks to develop competent nursing talent as hospital organizations pursue innovation and achievement.

Learners need to develop the competency to respond to the needs of customers, while exposed to various customers and various practical business environments. As members of society have more diverse faiths and arguments in an increasingly complex structure of society, conflicts and problems occur due to differences in opinions among different groups or individuals, and some previous studies have found that discussion is an effective way to reach a common agreement^[3,4]. Discussion is a way to derive a conclusion when people have different arguments about a given issue, and thus discussion enables people to explore rational methods while they understand and persuade opponents. Discussion competency includes not only communicative competency but also various other competencies seen in discussion activities. According to the analysis of a previous study on discussion competency and strategies, having a successful discussion requires expression competency, material analysis competency, argumentation competency, listening competency and adjustment/negotiation competency, and these competencies are components of discussion competency. This study shows how havruta-style discussion improves such discussion competency^[3].

College students will play major roles in the future of society and therefore, they need to develop the competency to solve problems through original ideas and creative thinking by creating new ideas and generating creative things, more than any other age groups. This means that universities need to prepare an educational environment for them to develop creative problem-solving abilities. It has been confirmed that creative classes and creative problem-solving classes are effective in improving the creativity and problem-solving abilities of college students^[5].

Creativity is one of the goals in education to prepare students for the future, and it is stressed as a key competency that learners should develop. Nurses are also required to develop problem-solving abilities through creative thinking, and creativity is considered an important job competency for nurses.

The above-mentioned self-directed learning competency, discussion competency and individual and collective creativity are key competencies that should be developed through university education.

This study intends to nurture nurses by applying the havruta learning method—a learning method that strengthens interaction between learners through questions and discussions—to the nursing science classes Community Nursing and Nursing Management and verifying the effects of the learning method on self-directed learning competency, discussion competency and individual and collective creativity, all of which are qualities nurses are required to develop. The havruta learning method will encourage nursing students to actively participation in class, help them develop broad thinking and gain competence as nurses in the future

Materials and Method

The study was conducted on 146 students at Baekseok Culture University taking Community Nursing and Nursing Management in the second semester of the third year. This study used a one-group, post-test research design, with the dependent variables consisting of the havruta learning method's effects on self-directed learning competency, discussion competency and individual and collective creativity and the level of satisfaction with the learning method among students.

Research Tools

Self-Directed Learning Competency: In this study, self-directed learning competency was measured through three sub-criteria: planning of learning, learning practice and learning assessment. For measurement, this study used the self-directed learning competency index, developed by Lee Seok-Jae et al.^[6]. Each questionnaire item was scored as either 5 (very often), 4 (often), 3 (usually), 2 (seldom) or 1 (very seldom) on a five-point Likert scale. In terms of Cronbach's alpha coefficient of reliability for these sub-criteria, the Cronbach's alpha coefficient averaged 0.87. Planning of learning was found to have a coefficient of 0.85; learning practice 0.87; and learning assessment 0.85.

Discussion Competency: The research tool used to measure discussion competency was developed by Park Se-hwan^[7] and was later revised and complemented by Jeong Seong-hong^[8]. “Communication skill competency” had four questionnaire items—two in adaptation, one in argument and one in non-verbal communication. “Critical thinking competency” had three items—one in problem definition competency, one in analysis competency and one in judgment competency. “Expectation competency” had two items, and “listening competency” had two items. Thus, “communication skill competency” had a total of 11 items. Each questionnaire item of discussion competency was scored as either 5(very much), 4(yes), 3(not sure), 2(no) or 1(hardly) on a five-point Likert scale, and the mean and standard deviation of each item were calculated. Individuals or groups with opposing views or opinions about a task have a discussion with knowledge that can affect others and that they put their knowledge forward in order to justify their beliefs, attitude, and values. Components of discussion competency include communication skill competency, critical thinking competency and listening competency. The highest possible total score of the discussion competency test was 55. Students with a total score of 30 or lower were categorized as the “low” discussion competency group; students with a score ranging from 31 to 40 as the “middle” discussion competency group; and students with a score of 41 or higher as the “high” discussion competency group.

Individual and Collective Creativity: Individual and collective creativity consisted of a total of 17 questionnaire items. Individual creativity consisted of three sub-criteria of expertise, creativity-related work and intrinsic task motivation, based on the componential theory of creativity suggested by Amabile^[9]. Individual creativity was measured through a total of 9 items. To evaluate individual creativity, a self-report method was used regarding creative actions and achievements^[10,11,12]. “Expertise” means knowledge, skills or talent in the field, and in this study, expertise was measured through

two items: “I think I have considerable talent in what I currently do,” and “I think I have a lot of specialized knowledge and experience in what I currently do.”

“Creativity-related work” means cognitive abilities and personality traits in relation to creative thinking. It was measured through three items, including, “I think I am good at coming up with original and novel ideas,” and, “I make new ideas by combining existing ideas.”

“Intrinsic task motivation” means basic attitude toward tasks, and this was measured through four items, including, “I am motivated by curiosity,” and, “I believe it is important for people to enjoy their work.”

“Collective creativity” means a group’s creative activities and its perception of the results. This was measured through eight items, including, “I think that my team (group) can solve problems considered difficult by other teams (groups) quite well”, “My team (group) can present a new and effective solution when a problem occurs,” and, “My team (group) derives many new ideas that have not been tried before.”

Each item was scored as either 5(very much), 4(yes), 3(not sure), (no) or 1(hardly) on a five-point Likert scale.

Satisfaction with the Havruta Learning Method: The content of five items, represented on a five-point Likert scale, were checked to examine students’ satisfaction with the havruta learning method.

Results and Discussion

The results of the analysis on self-directed learning competency show that among the sub-criteria, the “learning practice” area scored the highest average at 3.66 out of 5. Among the sub-factors, basic self-management competency scored the highest average at 3.79. The item with the highest score (4.08) was, “I complete tasks or work to see through to the end” [Table 1].

Table 1: Self-directed Learning Competency

Questionnaire item Sub-factor	Average	Competency factor	Average
Learning need Diagnosis	3.56	Planning for learning	3.56
Goal setting	3.58		
Examination of learning resources	3.54		
Basic self-management competency	3.79	Learning practice	3.66
Learning strategy selection	3.67		
Continuity of learning practice	3.51		
Effort attribution about results	3.55	Learning assessment	3.55
Self-introspection	3.54		

The results of the analysis on discussion competency show that the nursing students averaged 3.35 out of 5. Communication skill competency, consisting of adaptation, argument and non-verbal communication, scored the highest average at 3.54 among the sub-criteria. Prediction competency scored the lowest average at 3.18. The total average score was 35.38[Table 2].

Table 2: Discussion competency

Classification	Questionnaire Item Content	Discussion Competency	
		Average	Total
Communication skill competency	Adaptation, argument, non-verbal communication	3.54	14.15
Critical thinking competency	Problem definition competency, analysis competency, judgment competency	3.38	10.14
Prediction competency	Prediction competency	3.18	5.91
Listening competency	Listening competency	3.28	5.18
Total		3.35	35.38

In terms of individual creativity, the “intrinsic task motivation” area scored the highest average at 3.91. The average score of collective creativity was 3.56 [Table 3].

Table 3: Individual and collective creativity

Classification	Questionnaire item content	Average
	Expertise	3.41
Individual creativity	Creativity-related work	3.48
	Intrinsic task motivation	3.91
Collective creativity		3.56

The overall level of satisfaction with the havruta learning method is shown in Table 4. The item with the highest average score(4.09 out of 5) was, “I would strongly recommend the havruta learning method to my juniors. The level of satisfaction with individual and collective creativity was found to be relatively low [Table 4].

Table 4: Satisfaction with the havruta learning method

Classification	Questionnaire Item Content	Average
1	The hivruta learning method improved my discussion competency.	4.02
2	The hivruta learning method improved my self-directed learning competency.	4.01
3	The hivruta learning method improved my creativity.	3.92
4	The hivruta learning method improved my team’s (group’s) creativity.	3.95
5	I would strongly recommend the havruta learning method to my juniors.	4.09

Conclusion

Under the theme “new challenge for a better future”, this teaching method research group verified the effects of the havruta learning method by applying it to nursing science classes attended by all students in the third year. It was found that there was an absolute need for various teaching methods in which individual learners are taken into account. The havruta learning method was applied

to nursing science classes in the first semester to derive the concept relating to the learning method’s effects. The derived concept was applied to nursing science classes in the second semester to verify the learning method’s effects regarding more specific content. This way, this study derived positive results regarding the application of the havruta learning method. A few suggestions can be made based on the results and implications of this study.

First, this study applied the havruta learning method, focused on paired discussion, to nursing science classes and verified its effects although the research period was short. During the research period, nursing students explored materials necessary to solve realistic problems at a time when most classes in the Nursing Department are operated in a traditional lecture style, focused on theory and cases. As a result, statistically significant results were found in the areas of self-directed learning competency, discussion competency and individual and collective creativity, and students' level of satisfaction with the havruta learning method was high. However, further research needs to be conducted by applying the havruta learning method in all college years at the same time or with continuity during students' college years.

Second, it is considered somewhat inadequate to check statistically significant changes in self-directed learning competency, discussion competency and individual and collective creativity that appear in a short period of time. Although the students had higher scores in this study than in other studies conducted on college students, it seems somewhat inadequate to generalize the results of this study. Consequently, further research is required to continuously verify the effects by extending the research period when self-directed learning competency, discussion competency and individual and collective creativity are applied in classes for one year or longer.

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A Meta-Analysis of the Effects of Intervention on the Prevention of Medication Administration Errors in Nurses

Hyeonju Lee¹

¹Nursing Department, Tongmyong University, 428, Sinseon-ro, Nam-gu, Busan, Republic of Korea, KS012

ABSTRACT

Background/Objectives: Medication errors are one of the most common medical incidents occurring in hospitals and are the major health events. This study aims to perform a meta-analysis of the effects of intervention on the avoidance errors in nurses and to provide basic data for evidence-based nursing practice.

Method/Statistical Analysis: CINAHL, PubMed, EMBASE, Ovid, the Cochrane Library and relevant articles published in January 1975 and in February 2018 were searched. Randomized controlled trial and non-randomized controlled trials were included. Risk of Bias and Risk of Bias Assessment tool for Non-randomized Studies were used to evaluate quality of the selected studies. The random effects model was used considering various characteristics of the selected studies to calculate average effect size.

Findings: A total of 3538 studies were retrieved from five electronic databases, thirty studies of which were included in this study: five were randomized controlled trials and eight were non-randomized controlled trials. Interventions were medical devices and education intervention. Medical devices intervention was useful to directly reduce nurse medication administration errors (OR=0.64, 95% CI: 0.45 to 0.93, p=.020), and simulation education was effective in improving nurse medication knowledge (SMD=1.06, 95% CI: 0.07 to 2.05, p=.036).

Improvements/Applications: The results of this study can be widely used as the bias for the selection of useful moderations to increase safety of patients at nursing sites.

Keywords: Medication administration errors, Systematic review, Meta-analysis, Nurses, Medical devices, Simulation.

Introduction

A medication error is a type of error that occurs most frequently among medical errors caused by medical personnel ^[1], and it is one of major adverse events. There are about 400,000 annual injuries related to medication ^[2], and it was reported that 6.7% of all inpatients are led to injury or death from medication errors ^[3]. In the United States, 1.5 million patients suffered from medication accidents every year, among which 7,000 patients were reported to die ^[4]. The European Union also reported that about 8~12% of patients experience a medical accident

that includes an adverse drug event in hospitals ^[5], and the National Health Service of the United Kingdom spends 100~250 million pounds on medical accidents including medication errors ^[6]. In addition, it was reported that about 7% of inpatients experienced at least one adverse medical accident during their hospitalization period ^[7].

Medication is an important part of nursing service and one of the most dangerous parts of nursing practice. Therefore, medication is the most frequently performed task of nurses, which consumes about 40% of overall nursing activity time ^[8]. Safe administration of medicines needs to be preceded by proper prescription of doctors and accurate preparation of pharmacists, but nurses play the final role of administering medicines to patients. They are required to have accurate knowledge, administer medicines according to 5-RIGHT, monitor the effects and side effects, and educate patients about medicines. Krähebühl-Melcher ^[9] reported that 53% of medication

Corresponding Author:

Hyeonju Lee
Assistant Professor, Nursing Department,
Tongmyong University, Korea
Email: lhj209@tu.ac.kr

errors occur during administration by nurses, more often compared to prescription and preparation of medicines. When a medication error occurs, patients experience body injury, life threat, extension of hospitalization period and tremendous increase of medical expenses due to a waste of resources ^[10]. Nurses lose job satisfaction, which results in lowered work productivity ^[11]. As a result, reduced work productivity of nurses has an adverse effect on quality of nursing service received by patients ^[12].

The causes of medication errors were largely divided into personal disposition and organizational environment. Such personal disposition and organizational factors were found to affect medication of nurses ^[13]. Also, it was reported that 76% of medication errors were preventable and 56% of them were caused by human errors ^[14]. Based on these studies that correlated human medication errors with human factors, it would be necessary to examine personal factors, organizational factors and environmental factors associated with nurses who perform medication and develop an intervention method that can identify interactions among different factors to prevent medication errors.

Much time and effort are needed to develop a medication error intervention method appropriate for nursing sites. However, to make improvement on medication errors that are constantly occurring, it is necessary to combine the effects found in previous studies and compare size of the effects of different interventions, examining information about an efficient intervention based on size of the effects according to variables. Accordingly, this study aims to determine study environment, variables, intervention effects and size of effects for the study of intervention methods to prevent medication errors through meta-analysis by presenting comprehensive, reliable and consistent results. Such empirical data will present the grounds for future studies on medication error prevention programs and interventions.

Method

Inclusion Criteria and Study Selection: This study selected data according to the PICO-SD (Participants, Intervention, Comparison, Outcomes, Study Design), a systematic literature reporting guideline proposed by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) Group. Participants are

nurses in hospital where they administer medication to the patients. Interventions are implemented in order to prevent the nurse's medication errors. The comparison group is not intervened for the prevention of medication errors. Outcomes are the research that shows the error rate and knowledge score of medication administration. The study design was limited to randomized controlled trial or non-randomized controlled clinical trial.

Data Search: In this study, we conducted an online search using an academic search database and a handwriting search through reference documents for the papers published until February 2018. Five databases were reviewed: CINAHL, PubMed, EMBASE, Ovid, the Cochrane Library. Major keywords were derived from subject that constitute the core question as medication/drug; organization/administration, pharmaceutical preparations, error/incident/near miss/adverse event/sentinel event; nurses.

Data Extraction: The data selection process was independently performed by two reviewers (HL and research assistant). The studies excluded from the outcomes as follow: non-experimental studies such as survey and qualitative research, studies that cannot figure out the effect of preventative intervention, studies performed in the outpatient setting, abstract and case study without its original text.

Assessing the Quality of the Selected Studies: Among the final selected studies, randomized controlled trials were evaluated using the RoB (The Cochrane's Risk of Bias) tool developed by Cochrane Bias Method Group, the non-randomized controlled trials were evaluated using the RoBANS (Risk of Bias Assessment tool for Non-randomized Studies) tool developed by National Evidence-based Healthcare Collaboration Agency. The risk of bias for each study, and for each criterion, was classified as being low, high or unclear.

Data Analysis

The general characteristics of the selected studies, such as research information, research methods, subjects, interventions, and research results, were analyzed and coded. Effect sizes and homogeneity tests of the study were calculated by the use of Comprehensive Meta-Analysis 3.0 Version. Random effect model was used in consideration of heterogeneity between studies, odd ratio and standardized mean difference were used to calculate the effect size ^[15].

Results and Discussion

Result

Data Selection: A total of 3538 studies were searched and 2368 of them were eliminated by duplication. 87 studies of the remaining 1170 were selected in compliance with the selection criteria by reviewing the title and abstract. 75 studies were excluded from the 85 studies because of the exclusion criteria. Thus, the final 13 studies were applied to the meta-analysis [Figure 1].

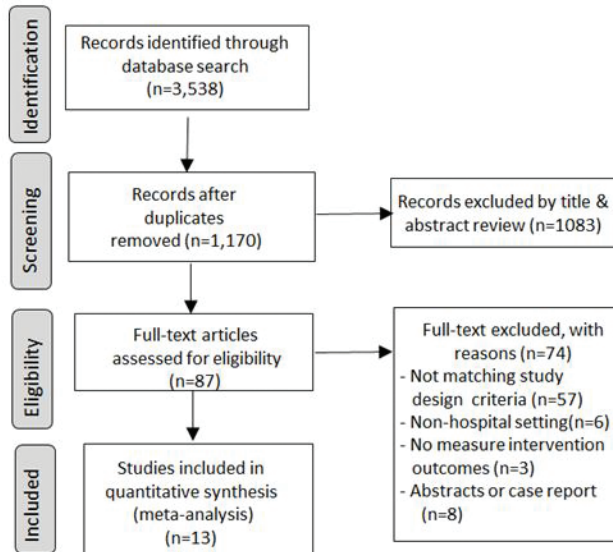


Figure 1: Flowchart of study selection

Characteristics of Studies: Five of reviewed 13 studies were classified as RCT studies and another eight as NRCT studies. The major features of the thirteen studies are summarized in Table 1. Looking at the yearly distribution of the studies, two intervention studies were conducted until 2000, seven from 2001 to 2010, and four after 2010 [Table 1].

Assessing Risk of Bias in Included Studies: Characteristics of the bias risk assessment used in this

study are as presented in Figures^[2,3] for RCT and NRCT. Based on the risk of bias assessment on RCTs, 65% of studies showed low risk of bias in the domain of random sequence generation and allocation concealment. About 35% of studies were described as random sequence generation but were unclear because they did not describe the specific method. Sham intervention was carried out in 65% of studies for blinding of participants and personnel, and about 65% of studies showed low risk of bias in blinding of outcome assessment. All studies showed low bias in the domain of incomplete outcome data and selective reporting. Other biases were determined by intervention manual and expertise of intervention providers, and 59% of studies showed low risk of bias [Figure 2].

All studies showed low risk of bias NRCT selective of participants. Whereas about 57% of studies were confirmed with confounding variables, other 43% of studies were evaluated to be unclear. Although all studies used a standardized tool for measurement of intervention, only 29% of studies performed repeated measurement and risk of bias was high. Most studies were found to have low bias for detection bias, attrition bias and reporting bias [Figure 3].

Type of Intervention Implemented: Among the various interventions applied to prevent medication administration errors were divided into two types: medical device interventions and educational interventions. Medical device interventions are automated medications dispensing system^[16,17], computerized prescribing^[18], bar-code-assisted medication administration^[19], Educational interventions are dedicated medication nurses^[20] or pharmacist-led training^[21], traditional instructor-led education^[22], education using electronic devices^[23-26], and simulation-based learning^[27,28].

Table 1: General characteristics of included studies

No.	Author (year)	Country	Design	Setting		Intervention description	Main outcome measures
				Intervention group	Control group		
1.	Barker et al. (1984)	USA	NRCT	General surgery unit	General surgery unit	Automated bedside dispensing machine	Medication error rate
2.	Cavell and Hughes (1997)	UK	NRCT	General medical unit	General medical unit	Computerized prescribing system	Medication error rate
3.	Chapuis et al. (2010)	France	RCT	MICU	MICU	Automated bedside dispensing machine	Medication error rate

Conted...

4.	Deyoung et al. (2009)	USA	NRCT	MICU	MICU	Bar-code-assisted medication administration	Medication error rate
5.	Ford et al. (2010)	USA	NRCT	CCU	MICU	Simulation-based learning educational sessions	Medication error rate Medication knowledge
6.	Greengold et al. (2003)	USA	RCT	Medical unit, Surgical unit	Medical unit, Surgical unit	Dedicated nurses with medication safety education	Medication error rate
7.	Kim (2014)	Korea	NRCT	6 mixed ICU	4 mixed ICU	Smartphone application for medication confirmation	Medication knowledge, Medication safety activities, Certainty of knowledge
8.	Lu et al. (2013)	Taiwan	RCT	11 mixed ward	10 mixed ward	60-min Educational PowerPoint lecture	Medication knowledge
9.	Nguyen et al. (2014)	Vietnam	NRCT	ICU	PSU	Pharmacist-led training of nurses	Medication error rate
10.	Schneider et al. (2006)	USA	RCT	Medical unit Medical-surgical unit	Medical unit Medical-surgical unit	Interactive CD-ROM program on safe medication practice	Medication error rate
11.	Simonsen et al. (2014)	Norway	RCT	-	-	Interactive internet-based e-learning course	Medication knowledge, Certainty, Risk of error
12.	Sung et al. (2008)	Korea	NRCT	Medical unit Surgical unit	Medical unit Surgical unit	Blended learning program with e-learning	Medication knowledge, Self-efficacy, Medication administration ability
13.	Tsai et al. (2008)	Taiwan	NRCT	Large medical center	Large medical center	Virtual reality computer simulation	Medication knowledge

NRCT: non-randomized controlled trial, **RCT:** randomized controlled trial, **MICU:** medical intensive care unit, **CCU:** coronary critical care unit. **PSU:** post-surgery unit

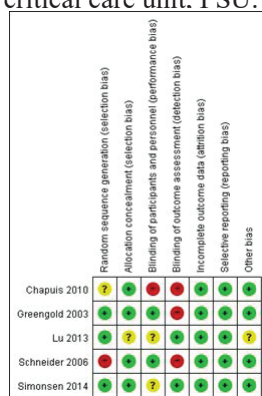


Figure 2: RoB summary

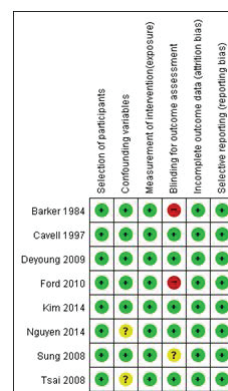


Figure 3: RoBANS summary

Effects of Interventions: As 13 studies that presented the effects of medication error interventions were found to be heterogeneous ($p<.001$; $I^2=95\%$), subgroup analysis was performed to explore heterogeneity. Heterogeneity exploration was classified into outcome variables, namely the medication administration error rate and medication knowledge.

Effect size (odd ratio) of the medication error intervention carried out to reduce the medication administration error rate was 0.66 (95% CI: 0.47 to 0.93), but heterogeneity was high ($p<.001$, $I^2=95\%$). To verify heterogeneity, effect size was confirmed separately for different intervention types including the medical device intervention and education intervention.

Whereas the medical device intervention was effective (OR=0.64, 95% CI: 0.45 to 0.93, $p=.020$), the education intervention was ineffective (OR=0.79, 95% CI: 0.31 to 2.02, $p=.618$) [Figure 4].

Effect size (standardized mean difference) of the medication error intervention carried out to improve medication knowledge was 1.57 (95% CI: 1.29 to 1.85), but heterogeneity was high ($p<.001$, $I^2=95\%$). To verify heterogeneity, effect size was confirmed separately for different characteristics of the education intervention including e-learning, lecture and simulation. Simulation was effective (SMD=1.06, 95% CI: 0.07 to 2.05, $p=.036$) and e-learning was ineffective (SMD=0.33, 95% CI: -0.82 to 1.49, $p=.573$) [Figure 5].

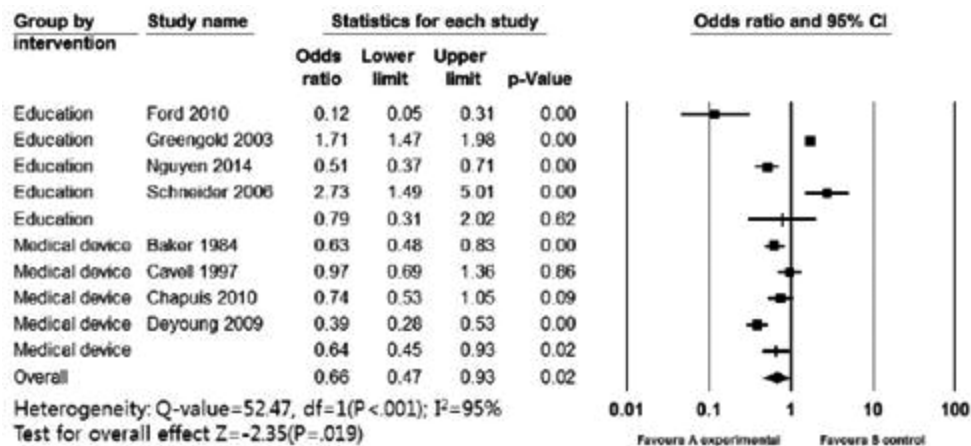


Figure 4: Effect of medication administration rate on intervention type of forest plot

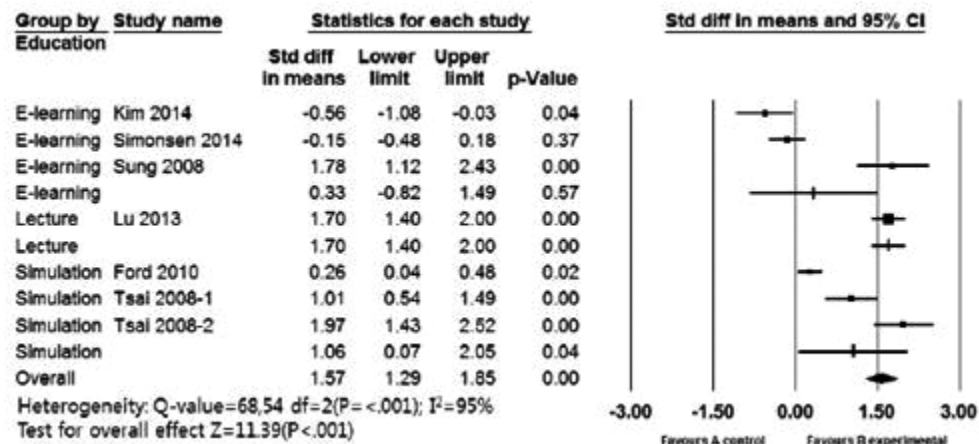


Figure 5: Effect of medication knowledge on education type of forest plot

As for the medication administration error rate, the medical device intervention (OR: 0.66, 95% CI: 0.47 to 0.93) was the only intervention type that showed statistically significant effect size. According to a preceding study, medication errors occur from

the interaction of working environment and human beings [13]. The MedMARx medication error report program of the United States Pharmacopeia reported that medication errors rarely occur from a single factor and are mostly related to compound systematic factors of the

organization [29]. When a computerized physician order entry and decision support system was implemented in neonatal wards to improve medication dosage errors, medication errors were reduced by 34% [30]. As such, introduction of medical devices or systems in the medication process is a useful intervention that can reduce medication errors.

Based on the analysis of medication knowledge, simulation (SMD: 1.06, 95% CI= 0.07 to 2.05) was the only education method that showed statistically significant effect size. Practical education based on simulation offers a learning environment that is more realistic and interactive than lecture education, and it is recommended as an education method appropriate for cultivating the decision-making ability, communication ability and work performance [31, 32]. In addition, it is evaluated as an effective education method that can foster practical and clinical knowledge in nurses that facilitate their adaptation to nursing practice through acquisition of core competencies in a safe educational environment that does not inflict harm on patients. Simulation develops integrative abilities to accommodate for different situations instead of simply acquiring knowledge and skills.

Strengths and Limitations: Considering strong heterogeneity among studies, the outcome variables were divided into the medication administration error rate calculated as an odd ratio and medication knowledge calculated as a standardized mean difference. This secured homogeneity among the outcome variables, setting the direction of intervention effects to agree with the direction of effect size.

Also, whereas previous studies simply reported the effects of medication error interventions, this study verified that medical device interventions are more useful than education interventions in reducing the medication error rate. Among education interventions, simulation was found to be more effective than e-learning and lecture. These results can be used as the grounds for the development of medication error prevention programs by verifying characteristics of interventions through meta-analysis.

On the other hand, this study has a limitation in determining whether the intervention effects between the intervention group and control group are purely based on interventions because there were more NRCT used for meta-analysis than RCT.

Conclusion

Medical device interventions were useful methods of directly reducing the medication administration error rate of nurses during the medication administration process. To improve medication knowledge of nurses, simulation was an effective education method of practicing situations similar to the reality. The results of this study can be widely applied to select useful interventions that can increase quality of patient safety in the nursing scene.

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Physical Activity Types Favored by Students with Developmental Disabilities: A Converging Study based on Q Methodology

Hye-Min Kim

Post-doctoral Researcher, BK21 plus, Pusan National University, Korea

ABSTRACT

Background/Objectives: The purpose of this consumerism-theory-based study was to explore the types of physical activities favored by students with developmental disabilities using Q methodology.

Method/Statistical Analysis: This study used based on a small sample, of less than 30 participants. A total of 27 students with developmental disabilities who were aged between 13 and 18 years, attended special classes at regular schools, and lived in Y city participated in the study. The subjects were classified into 25 physical activity cards developed for this study, and their preference types were analyzed through QUANL pc program.

Findings: The results are as follows. First, students with developmental disabilities preferred four types of physical activities. Second, the characteristics of these four types were as follows: peer-centered (first type), family-centered (second type), music-centered (third type), and competition-centered (fourth type).

Improvements/Applications: Moreover, these results indicate that students with developmental disabilities are interested in various types of physical activities, and favor a variety of activities types depending on their background characteristics.

Keywords: *Q Methodology, A Converging Study based, Physical Activity, Developmental Disabilities, Types Favored*

Introduction

Increasing attention has been recently paid to self-determination as a measure of educational performance for people with disabilities in education practice. Self-determination is needed to express one's will and intentions by oneself without external intervention, and involves the ability to solve problems arising in daily life as an autonomous agent¹. Self-determination is valuable for people with disabilities to be able to make their own decisions, and can therefore increase their opportunities to pursue a satisfactory life². In addition, many consumerism-based studies that put emphasis on

humanistic values have been conducted in the field of adapted physical activity in Korea since 2000³. This phenomenon can be attributed to new policies based on a "tailor-made" welfare paradigm, which have come into focus due to social changes where growing attention is paid to human rights and self-realization. Such a social shift has changed the environment for people with disabilities to engage in physical activities, which has had an influence on the field of adapted physical activity in Korea. Students with disabilities, in particular, have difficulties in making reasonable decisions by themselves, as their self-determination ability is much lower compared to their non-disabled peers. Therefore, educational programs are often offered to children with disabilities who are deprived of their right to self-determination by parents or teachers who do not recognize their self-determination ability⁴. Furthermore, physical activity classes provided at schools focus excessively on education and rehabilitation, which makes students

Corresponding Author:

Hye-Min Kim

Post-doctoral Researcher,

BK21 plus, Pusan National University, Korea

Email: khm0726@hotmail.com

lose interest in the classes. This type of classes also prevents instructors from recognizing and understanding the diverse subjective viewpoints of their students⁵. Kim, Kim, & Lee¹ advocated self-directed learning programs that can encourage more active participation of the students by catering to their preferences, and Park⁶ emphasized that self-directed physical activity programs can achieve their educational goals while allowing children to have fun. In this regard, this study employed Q methodology, a research method to investigate individuals' subjectivity, with the aim to provide opportunities for students with disabilities, whose self-determination ability is lower than that of non-disabled students, to make their own choices and decisions. Q methodology is a process in which respondents compare and rank stimuli by themselves to establish a model and express their subjectivity⁵. That is, in Q methodology studies, hypotheses are set up from the perspective of the participants rather than the researchers. This method is used widely to explore a variety of subjectivities in the fields of psychology, sociology, education, and health science⁵. In the field of adapted physical education, Q methodology was used in an exploratory research on types of daily physical activities preferred by people with intellectual disabilities⁷ and an exploratory subjectivity study on physical activities among children with developmental disabilities³. These studies offer meaningful research material for assessing the academic value of Q-methodology-based convergence research in the field of adapted physical education. This kind of research is significant in that it highlights the academic importance of the self-determination research that is being emphasized in current education practice, it provides a theoretical foundation for future research, and it indicates the need to conduct further studies on relevant programs. The purpose of this consumerism-theory-based study was to explore the types of physical activities favored by students with developmental disabilities using Q methodology. Research questions were as follows. Firstly, what are the types of physical activities preferred by students with developmental disabilities? Secondly, what are the characteristics of each type of physical activity preferred by the students with developmental disabilities?

Materials and Method

Research Participants (P Sample): When employing Q methodology, a large sample size may result in selection bias, which hinders the identification of

differences between individual participants. The adequate sample size for Q methodology is thus around 50, which is sufficient to generate and compare factors⁵. Based on this principle, this study used a sample of less than 30 participants. A total of 27 students with developmental disabilities who were aged between 13 and 18 years, attended special classes at regular schools, and lived in Y city participated in the study. Firstly, among students diagnosed with development disabilities (but not with multiple disabilities such as visual, hearing, or physical disabilities), we selected those recommended by their homeroom teachers. Secondly, among these recommended students, we selected those with intellectual disabilities whose IQ was between 35 and 75 as measured with the Korean version of the Wechsler Intelligence Scale for Children – Fourth Edition, those with autism whose Childhood Autism Rating Scale result was between 30 and 36, and those with attention deficit and hyperactivity disorder (ADHD) whose result on the Korean version of the ADHD Diagnostic System was between 90 and 110. Thirdly, among the selected students, we selected those with a level of reading ability equivalent to that of first to third graders, able to communicate with researchers and rank picture cards appropriately, and whose parents provided written consent to participate in the research. Detailed characteristics of the participants are shown in <Table 1>

Table 1: Characteristics of research participants

Division	Male	Female	Total
Intellectual disabilities	10	7	17
Autism Spectrum Disorder	3	3	6
ADHD	2	2	4
13years old	1	3	4
14years old	3	1	4
15years old	3	2	5
16years old	3	1	4
17years old	2	2	4
18years old	4	2	6
Total	16	11	27

Research Process: This research followed the process suggested by Kim⁵, which consists of four stages: Q sample development, P sample (research participants) selection, Q sort, and analysis of the Q sort.

Research tools

Q sample Development: Brown⁸ suggested that there was no absolutely ideal size for the sample of items. Therefore, taking into account that the participants were students with developmental disabilities, 25 physical activities were selected as the Q sample in order to minimize the participants' burden of sorting and to raise the confidence level of their responses. Initially, physical activities were selected for Q sort by referring to physical

education textbooks used in special needs schools and prior literature on physical activities^{3, 6}. Subsequently, five individuals including teachers with experience in teaching students with disabilities, and postdoctoral researchers and professors in the field of adapted physical activities reduced the number of physical activities down to 25 through discussion. Selected activities were expressed in pictures easily understood by the participants, and these were printed on 10.5 cm × 14.5 cm cards, which are easy to use. The Q sample picture cards are presented in <Figure 1>.



Figure 1: Q sample picture cards

Q Sort: The Q sort method used by Combes, Hardy, and Buchan⁹ with people with moderate intellectual disabilities was employed in this study. According to this method, the participants placed the Q sample, made up of 25 cards, on the sort table as shown in <Figure 2>. Enough time was given for the participants to choose physical activities during the sorting process, and interviews were conducted with the participants with regard to the sorting process, which were documented as individual interview records.

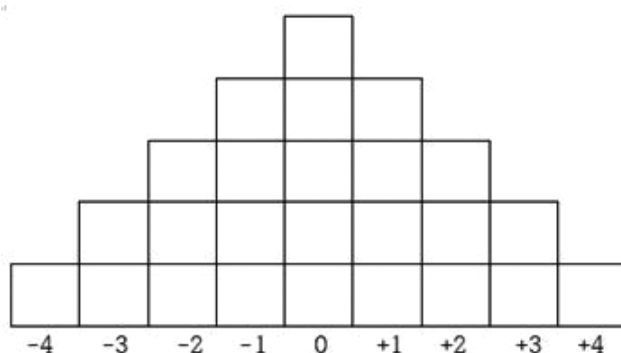


Figure 2: Q sort table and scores

Data Analysis

The collected data were coded using the QUANL PC program, developed for Q methodological analysis. A Q factor analysis was conducted on the 25 coded items by employing principal component factor analysis using the P sample as a basis. Factors that had eigenvalues greater than 1 and could capture the uniqueness of an activity type were extracted. This study sought to increase the validity of activity types by obtaining descriptions from respondents whose factor weight was high for that activity type.

Statistical Analysis

Mention the statistical details, the number of samples used, statistical tools/software used/SD/level of significance, repeatability etc.

Results and Discussion

In Q methodology studies, respondents with a high factor weight for a factor representing a corresponding

type. Considering that our study participants were students with developmental disabilities, the statements of those with relatively clearer verbal expression were interpreted in an effort to conduct a more valid analysis.

Development of Q-types: Physical activities preferred by the students with developmental disabilities were identified and are shown in <Table 2>. Only the factors with eigenvalues greater than 1 were extracted and categorized as four activity types, which explained 48% of the total variance. The first type explained 23.01% of the total variance, the second type 12.41%, the third type 6.99%, and the fourth type 5.2%. The students with developmental disabilities favored the first type of physical activities the most. The correlations between the activity types are shown in <Table 3>, and indicate the likeness between the types. The coefficients for the correlation of the first activity type with the second, third, and fourth types were .103, -.071, and .502, respectively. Those for the correlation of the second type with the third and fourth types were .349 and .095, respectively. Finally, the correlation coefficient between the third and fourth types was .051. In addition, factor weights and demographic characteristics of the participating students with developmental disabilities are presented in <Table 4>. The participant with the highest factor weight in each

activity type is the person favoring the corresponding activity type the most among the other participants.

Table 2: Eigenvalues and explained variance by physical activity type

Division	Type1	Type2	Type3	Type4
Eigen values	6.2120	3.3500	1.8873	1.4028
Opercentages of total variance %	.2301	.1241	.0699	.0520
Cumulative%	.2301	.3541	.4240	.4760

A professor in adapted physical education, a teacher with experience in teaching students with developmental disabilities, and three postdoctoral researchers in adapted physical education and special education reviewed the characteristics of the four types and named each type accordingly.

Table 3: Correlations between types

Division	Type 1	Type 2	Type 3	Type 4
Type 1	1.000	-	-	-
Type 2	.103	1.000	-	-
Type 3	-.071	.349	1.000	-
Type 4	.502	.095	.051	1.000

Table 4: Factor weights and demographic characteristics of P samples

Type	Sample number	Factor weight	Gender	Age	Type of disability	School Type	Physical activity (PE classes) Experience
1Type (8people)	s01	1.0171	Male	14	Intellectual Disability Level 3	Ordinary schools	○
	s05	.7059	Female	13			○
	s10	1.1371	Male	18			○
	s11	.5698	Male	16			○
	s12	1.2947	Male	16	ADHD		○
	s17	.8235	Male	14	Autism Spectrum Disorder Level 3		○
	s20	.7696	Male	15	ADHD		○
	s22	.9390	Female	17			○
2Type (7people)	s6	.7087	Female	13	Intellectual Disability Level 3	Ordinary schools	○
	s8	1.3134	Male	18			○
	s9	.8109	Male	18			○
	s15	1.6052	Male	16			○
	s19	.7077	Female	14	Intellectual Disability Level2		○
	s26	.4344	Male	13	Autism Spectrum Disorder Level 2		○
	s27	.2987	Female	18	Intellectual Disability Level2		○

Conted...

3Type (6people)	s2	.4226	Female	13	ADHD	Ordinary schools	○
	s3	.3985	Female	16	Autism Spectrum Disorder Level 2		○
	s4	.8491	Female	18	Intellectual Disability Level 3		○
	s13	1.2077	Female	15	Autism Spectrum Disorder Level 2		○
	s23	.4029	Female	15	Intellectual Disability Level 2		×
	s24	.7249	Female	17			○
4Type (6people)	s7	1.3898	Male	18	Intellectual Disability Level 2	Ordinary schools	○
	s14	.8547	Male	17	Intellectual Disability Level 2		○
	s16	.8262	Female	15	Autism Spectrum Disorder Level 3		○
	s18	.7585	Male	14			○
	s21	.7564	Male	15	Intellectual Disability Level2		○
	s25	.9230	Male	17	ADHD		○

Characteristics of Physical Activity Types

First Type: Peer-centered Activities: The first type of activities preferred by the participants involved activities through which the students could play together with their peers. The most favored activities were badminton and soccer, as shown in <Table 5>.

“Playing badminton relieves stress. Badminton is for two players, meaning four people can play, too. But when you run, you run alone. I like to do something with my friends.” (Participant S01)

“It’s fun. I can have a conversation with my friends while playing, and I like that I sweat a lot when playing.” (Participant S10)

Table 5: Type 1 Standard score by item

Q card	Standard score
21. Badminton	1.68
19. Football	1.60
8. Dance	-1.54
2. Yoga	-1.78
Sports with scores higher or lower than the standard score 1.5	

This result reflects the fact that the participants have fun and develop their interest in physical activities through interaction with their peers, and their confidence and self-recognition in terms of physical activities increased when engaging in this type of physical activities. In addition, it was discovered during the

interviews that providing the appropriate opportunities and environment to the students with developmental disabilities to engage in playing with friends in gyms and schoolyards encouraged their voluntary participation in these playful activities. This finding is congruent with that of the study by Han¹⁰, indicating that peer acceptance levels and social skills of male students with developmental disabilities improved through comprehensive playing programs.

Second Type: Family-centered Activities: The second type of activities favored by the students involved activities in which their family members could participate. The most favored activities were cycling and running, as shown in <Table 6>.

“My daddy promised that he would go riding with me. I like being with my daddy. I don’t like playing with friends because they like playing games at video game cafes more.” (S26)

“I like to ride a bike because it clears my mind. I have my bike at home. When I get stressed because of reading and writing, daddy asks me to ride together.” (S06)

This result indicates that the participants relieved their mental stress related to their peers and classes by engaging in physical activities with their family, and efficient communication could be established between family members through such activities. In addition, it was found during the interviews that riding a bike was a medium through which emotional ties with parents were built, as most participants learned how to ride a

bike from their parents. This finding is in line with the result of a study conducted by Kim, Kim, Park & Lee⁷, indicating that global and local motor skills of children with intellectual disabilities improved through community dance programs in which children and their parents could participate together.

Table 6: Type 2 Standard score by item

Q card	Standard score
9. Bicycle	2.15
10. Running	1.78
16. Goal ball	-1.50
Sports with scores higher or lower than the standard score 1.5	

Third Type: Music-centered Activities: The third most favored activity type involved activities where the students could move their bodies to their favorite music. As shown in <Table 7>, the most preferred activities was dancing.

“I like songs. I also like to dance. I can lose weight when I dance, and dancing also makes me feel better. Usually I dance with my friends at lunch time. I love K-Pops music.” (S04)

“I like to dance because I can listen to music. But I’m actually not a good dancer. I found the choreography awesome so I danced along, but it was too hard for me.” (S13)

Table 7: Type 3 Standard score by item

Q card	Standard score
8. Dance	2.07
12. Mountain climbing	-1.51
18. Taekwondo	-1.80
Sports with scores higher or lower than the standard score 1.5	

This result indicates that the participants had a stronger motivation and became more eager to participate in physical activities if they could listen to music they liked. In particular, all six participants who favored this activity type were female. With or without disabilities, dancing is something that all Korean-pop-loving girls enjoy. They teach choreographies to each other, through which communication is established. In addition, as confirmed during the interviews, participants’ confidence level in physical activities was boosted as they mastered

more complex dance movements, which in turn could increase voluntary participation. This result is congruent with that of Jung¹¹ that passive actions of children with developmental disabilities turned into more voluntary and cooperative interaction through musical activities that could increase socialness.

Fourth Type: Competition-centered Activities: This type of activities was preferred by those who enjoyed competing and winning. As shown in <Table 8>, the most favored activities were T-ball and basketball.

“It’s so much fun to watch the game between Lotte and SK. A defender caught the ball so they could win in the end.” (S14)

“You can jump and pass the ball to put the ball in the basket. It’s fun to dribble and do pickup games with friends.” (S21)

This result highlights participants’ desire and hope to win when they played in competitions and club activities. T-ball, basketball, and soccer, in particular, are not played as formal games. Rather, they are played in a recreation-like situation such as after-school sports activities, where students with and without disabilities can play together. In the interviews, it was found that students with disabilities could gain a sense of achievement and confidence, which could encourage voluntary participation. This is in line with the result of a study conducted by Kim¹², which investigated the educational significance and characteristics of teaching competition activities in physical education classes.

Table 8: Type 4 Standard score by item

Q card	Standard score
17. Tee-ball	1.81
20. basketball	1.59
18. Taekwondo	-1.52
11. Inline Skate	-1.57
2. Yoga	-2.12
Sports with scores higher or lower than the standard score 1.5	

Conclusion

Based on the above discussion, the following conclusions can be drawn in this study regarding the types of physical activities favored by students with developmental disabilities. First, students with

developmental disabilities preferred four types of physical activities. Second, the characteristics of these four types were as follows: peer-centered (first type), family-centered (second type), music-centered (third type), and competition-centered (fourth type). Moreover, these results indicate that students with developmental disabilities are interested in various types of physical activities, and favor a variety of activities types depending on their background characteristics.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Context Mining based Mental Health Model for Lifecare Platform

Ji-Won Baek¹, Hoill Jung², Kyungyong Chung³

¹Department of Computer Science, Kyonggi University, 154-42, Gwanggyosan-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16227, South Korea; ²Department of Computer Software, Daelim University College, 29, Imgok-ro, Dongan-gu, Anyang-si Gyeonggi-do, 13916, South Korea; ³Division of Computer Science and Engineering, Kyonggi University, 154-42, Gwanggyosan-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16227, South Korea

ABSTRACT

With the emergence of the 4th industrial revolution, IT convergence engineering based artificial intelligence and intelligent system has constantly been researched in today's society. In particular, healthcare service based on IT-BT convergence helps to improve quality of people's life and provide user-oriented healthcare contents actively. Currently, the healthcare industry has gradually changed its healthcare paradigm from conventional healthcare to mental diseases care and tries to solve the social problem with depression, one of mental disorders. This study proposes the context mining based mental health model for the lifecare platform. This study makes use of users' profiles about depression and health weather index provided by Korea Meteorological Administration to classify and define semantic ontology based context information, and to develop the context mining model for depression index service. The proposed context mining based mental health model uses personalized context information so that it is possible to provide personalized depression index service, rather than unified healthcare service. Also, the proposed one uses user-based information for modeling so that it can provide guidelines for developing data model of depression. In addition, it is possible to provide accurate and specified service for users and efficient depression index service through customized service. The result of the proposed method shows that the context mining model not only promotes the theory and practical ability but also consolidates their understanding of web engineering models and concepts.

Keywords: *Depression, Context Mining, Healthcare, Depression Index, Mental Health*

Introduction

With the start of the 4th industrial revolution, IT convergence technology has developed and today's society has become informatization. As a result, people's quality of life has been improved. The top issue in the 4th industrial revolution outstandingly arises in the healthcare area for healthy life [1-4]. In the social change, the number of chronic disease patients is on the rise, and the medical service area changes from disease treatment

to personalized preventive healthcare promotion [5-6]. As mobile devices have been popular, medical life has been changed. With the development of mobile phones and tablet PCs based mobile environment, medical service applications have also been more developed. In the circumstance, consumers' demands of self-healthcare have been on the rise. In addition, with the wide distribution of internet and informatization, useful contents and services of healthcare are provided to users through their mobile devices and PCs. Such services have expanded from physical healthcare to mental healthcare. Depression, a typical one of mental diseases, is a disorder explained in the continuous line of the two extremes of emotional status and mental disorder status in everyday life [7]. Although this symptom occurs sometimes or disappears immediately, it causes an extremely stressful feeling. A repeated feeling of depression dominates one's emotion. If such a feeling

Corresponding Author:

Kyungyong Chung
Professor,
Division of Computer Science and Engineering
Kyonggi University, Korea
Email: dragonhci@gmail.com

reaches an extreme level, it leads to losing one's life. Accordingly, depression requires continuous treatment for care and prevention.

Depression is found in various age groups from adolescence to senescence. As for depression, music therapy^[8], laughter therapy^[9], arts therapy^[10], and other therapies have continuously been researched. These studies resulted in the development of IT-BT convergence based healthcare service solution in association with the development of various IT devices^[3-4]. Unlike other diseases, depression is hard to be quantified. Depending on users, there are many different types of cases. For this reason, it is difficult to efficiently provide depression care service. In order for effective depression care, mental health technology based IT convergence is needed. These days, commercialization of wireless wearable sensors, remote medical diagnosis, and health monitoring have been researched. In mobile devices or wearable devices, such health service as sensing based heart rate measure and respiratory measure is provided. However, in such healthcare service, only health measures found through physical information monitoring are displayed on screen. The service is not personalized. For this reason, simply general treatment service is offered and it is hard to manage the service^[11-13].

Therefore, this study proposes context mining based mental health model for the lifecare platform. With the uses of users' context data and mining technique, the context mining model is developed, and thereby the drawn inference rules are applied to depression index service. In addition, the real-time health weather index of Korean Meteorological Administration and Living Health Index Service are applied to make possible personalized service. The composition of this study is as follows. In Section 2, we describe the healthcare models for web-engineering framework, In Section 3, we propose a context mining based mental health model for the lifecare platform. In section 4, provides a conclusion and future work.

Depression Index for Mental Healthcare: Depression as one of mental disorders is the case where more than four of psychomotor changes, including declining enthusiasm, thinking of death, desire for death, lowering thinking and concentration abilities, lethargy, a sense of guilt, fatigue, a loss of appetite, a loss of weight, sleep disorder, and a loss of sexual desire, continue to occur for more than two weeks^[14]. Typical symptoms

of depression are a sense of depression, declining vitality, fatigue, a loss of interest, a fall in attention, a sense of guilt, a lowering sense of self-esteem a sense of worthlessness, negative view, suicidal idea and action, a loss of appetite, and sleep disorder. According to Honkanen, living satisfaction had negative correlation with depression not only in clinical depression group but in general population group; with lower living satisfaction, a sense of depression was predicted to increase^[14]. In Korean self-administrative evaluation, main symptoms of depression were classified in terms of physical, emotional, and physical aspects, and depression scale was prepared.

The scale is comprised of six dimensions: negative mind-set of the future, lack of self-esteem and self-confidence, anxiety and impatience, a sense of depression, and physical symptoms, and lack of enthusiasm. BDI (Beck Depression Scale) as a tool of measuring a level of seriousness of depression is widely used in the world^[15]. Zung (Self-rating Depression Scale; SDS) evaluates depression on the basis of frequency of depression symptoms. In other words, depending on how often depression symptoms occur, a level of depression is evaluated. In this evaluation method, if a severe symptom occurs sometimes, not often, a low score can be given. Hamilton Rating Scale for Depression (HRSD) as an observer's rating scale, vis most widely used to evaluate depression symptoms. This is used for an evaluator to present one of sentences showing severity of a symptom after semi-structured interview. Center for Epidemiologic Studies Depression Scale (CES-D, Korean version) is used as the primary screening tool of depression^[16]. In this method, t level of severity is measured on the basis of the time when a symptom appears. Therefore, this scale is much used in epidemiologic studies, especially comparative analysis on prevalence of depression depending on nationality, age, and sex.

Context Mining based Mental Health Model for Lifecare Platform

Pattern Analysis using Context Mining: In order to provide proper and personalized depression index service to users, it is necessary to analyze each user's environment and apply it efficiently. Accordingly, the context information which can influence a user's mental healthcare is classified and defined, and then inference rules are created through context mining. For intelligent

depression index service, a user's context information mining is performed in a functionally excellent ontology model. To find association of a user's context information, context mining analysis is conducted. For depression index service, inference rules are created. This method improves a conventional ontology model which generates service-intensive inference rules [5,17,18]. Context mining information is defined in seven groups- individual, medical sciences, service, position, device, action, and environment data-and context data are classified. The proposed context mining based mental health model uses static and dynamic context data. Based on context information, a variety of each user's information such as surroundings and tendencies is collected and analyzed. And then a personalized context mining model is developed. It includes environment data or medical data which can influence depression and is classified [3-5, 19].

Context mining creates knowledge base with the use of semantic ontology based inference engine. Context mining is applied to the context information collected by an IoT device with the use of FP-Tree algorithm. A semantic ontology based model generates a user's internal, external and service context mining relation and inference rules of knowledge base. Figure 1 illustrates the process of context mining pattern analysis based on semantic ontology. The purpose of such generation is to improve simple inference results when inference rules are created by inference engine in a semantic ontology context model. Therefore, to solve the problem, context mining is applied so as to the association of each layer context information. In the proposed context mining based mental health model, FP-Tree algorithm is applied to the context information of internal, external, and service layers in order for mining.

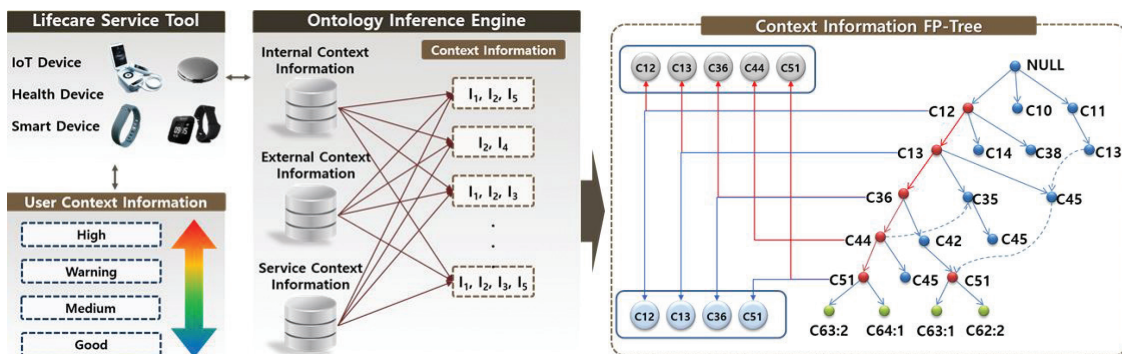


Figure 1: Process of context mining pattern analysis based on semantic ontology

Context Mining Model for Lifecare Platform:

Depression index service is a user-oriented personalized index service to which context mining model is applied for a lifecare platform. On the basis of a user's context mining information, health weather index and living weather index of Korea Meteorological Administration, personalized depression index service is offered [20]. To provide depression index service, a context mining model based on personal context information is needed. The context mining model is expressed in top-down tree structure so that it is efficient at classifying, predicting, and analyzing data [21]. Therefore, with the model, it is possible to analyze the result easily, and its big data can be used in a general computing environment with stability. A context mining model is good at easily drawing rules in machine learning, artificial intelligence, ambient intelligence, information retrieval, and is much used in the areas for prediction [22]. Figure 2 presents the context mining model for lifecare platform.

In order to provide a mental health service, context mining information and significant data for depression factors are judged and then a rule based context mining model is created in the lifecare platform. In order to generate a rule based context mining model, context mining tree technique and mining technique are applied [23]. This study makes use of the improved ID3 algorithm 'C5.0' and Apriori algorithm to create a context mining model. Apriori algorithm is applied to a context mining model, and its association rule is mined with the use of context mining information and depression factor data. Support and confidence are based on the significance level 0.05, and an optimal context mining model is generated. With the use of health weather index and living weather index of Korea Meteorological Administration [24], a context mining model is additionally applied for real-time personalized service depending on a user's position and environment [25]. The inference based result can be served through a depression index in lifecare platform [26].

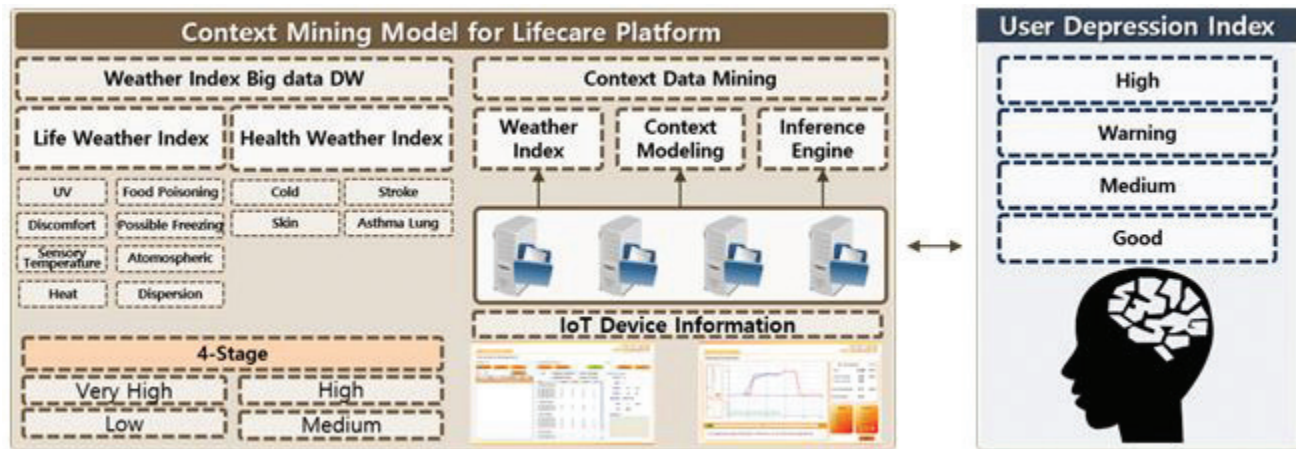


Figure 2: Context mining model for lifecare platform

Table 1: Inference rules of context mining for knowledge management

Service	Inference rules
Context Data Analysis	$(?Depression\_Level((?Threshold.index) \cap (?Customer(Locations,Seoul)) \cap$ $(?Weather\_Index(Location,Seoul,Careful)) \cap \rightarrow (?GIS ?Seoul)$ $(?Depression\_Level((?Threshold.index) \cap (?Customer(Locations,Suwon)) \cap$ $(?Weather\_Index(Location,Suwon,Careful)) \cap \rightarrow (?GIS ?Suwon)$ $(?Customer hasRain ?Rain) \cap (Environment hasTime ?Morning),$ $(?Customer has ?DeepSleep) \cap ((?Environment hasTime ?Minute.30) \cap$ $(?Environment ?hasTime ?Morning)) \cap ((?Environment hasTime ?Minute.30) \cap (?Environment$ $?hasTime ?Night)) \rightarrow (?ActionGuidelineInformation ?MeasureAdvice), \dots$
Depression Management	If(user's BMI exceeds 26 $\cap$ Stress Index exceeds 3) $\cap$ Context(Depression Lv1) Then ServiceContext (Depression Status, Health Weather Index, Mental Index, SDNN, Event, TRUE), If(user's BMI exceeds 20 $\cap$ Stress Index exceeds 4) $\cap$ Context(Depression Lv2) Then ServiceContext (Depression Status, Health Weather Index, Mental Index, SDNN, Event, TRUE), If(user's BMI exceeds 24 $\cap$ Stress Index exceeds 5) $\cap$ Context(Depression Lv3) Then ServiceContext (Depression Status, Health Weather Index, Mental Index, SDNN, Event, TRUE), ...
Management Coach	If((User Status(hasBlue, TRUE)) $\cap$ (IntempStatus(hasIndoor)=Low Temperature) $\cap$ (timeStatus(hasTime)=night)) $\cap$ Then LowLevelContext (DepressService, NONE), $\rightarrow$ $(?ActionGuidelineInformation ?MorningRainAlam) \cap$ $(?ActionRecommand hasActionRecommand ?Action1\_MentalHhealth),$ $(?Customer hasStress ?Stress) \cap (Environment hasTime ?Morning) \cap$ $(?Environment\_Weather hasTemp ?Temp >29) \rightarrow (?ActionGuidelineInformation$ $?MorningStressAlam) \cap$ $(?ActionRecommand hasActionRecommand ?Action2\_Stress),$ $(?Customer hasStress ?Stress) \cap (Environment hasTime ?Evening) \cap$ $(?Environment\_Weather hasTemp ?Temp >32) \rightarrow (?ActionGuidelineInformation$ $?EveningStressAlam) \cap$ $(?ActionRecommand hasActionRecommand ?Action4\_Stress), \dots$

To apply the result of context mining analysis to depression index, inference rules are needed. The inference rules of context mining are classified into monitoring & position of a user's context mining information, into a region, and into personal context information. Then, the context mining information in need is drawn. After that, the inference rules of external context mining information

and of internal context mining information are created, and thereby service inference rules are created. With the use of the ontology based semantic inference engine Jena 4.0, a user's health conditions are judged in the rule base and the inference rules for depression index service are generated [3, 5-6, 11]. Table 1 shows the inference rules of context mining for knowledge management.

Conclusions

With the development of IT convergence and information, today's society rapidly changes. The IT convergence is also applied to the area of healthcare area. Therefore, research on healthcare has been conducted actively. As the paradigm of healthcare research expands and changes from physical health to mental health, efficient and systematic healthcare is recognized to be the most important in the healthcare area. Conventional healthcare service fails to understand a user's situation or environmental factors. As a result, it is difficult to achieve care and service for mental diseases. In addition, although general treatment and temporary service can be provided according to medical guidelines, it is hard to find any mental disease care service in terms of disease prevention. Therefore, this study proposed context mining based mental health model for the lifecare platform in order to improve the conventional healthcare service. The proposed model used a user's context information which can be obtained in everyday life. In addition, this study developed the inference rules of context mining model which met the medical standards of healthcare and applied the service information and features of depression. Context mining was used to design a user's context information based on semantic ontology, and the rules of inference were created in a context mining model. The inference rules were applied for the context mining model for depression index service. In addition, with the use of health weather index and living weather index provided in real time by Korea Meteorological Administration, a context mining model was developed to make personalized service depending on a user's position and environment. In the future, a mobile program for depression index service will be implemented. Furthermore, based on the proposed method, the contents related to mental disease prevention and depression improvement will be additionally applied for service. This work will be very helpful for engineering research of context mining based mental health model. The proposed context mining based mental health model uses the personalized information modeling so that it can provide guidelines for developing web-engineering models of the healthcare. To clarify the developing model for a web-based health platform, the research is core knowledge for a health platform in machine learning, artificial intelligence, data mining, and health information system. This health platform makes use of the improved ID3 algorithm 'C5.0' and

Apriori algorithm to suggest a context mining model. Apriori algorithm is applied to a context mining model, and its association rule is mined with the use of a health information system and data mining for web-engineering framework factors.

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Association between Teacher Efficacy and Job Burnout According to Job Stress Variables of Middle School Teachers

Ji-Woo Han

Department of Nursing, Kyungdong University, Korea, laurabest@kduniv.ac.kr

Abstract

Objectives: This study is narrative research to identify the level of job stress, teach efficiency, and job burnout among middle school teachers in Gangwon-do province and to investigate the effects of job stress on teacher efficacy and job burnout.

Method: In total, samples were gained from 59 subjects who teach at middle schools in Y town in Gangwon-do province. Data was collected from April 2 to April 23, 2018.

Findings: Results showed that their job stress was significantly higher for shorter years of teaching experiences, homeroom teachers, single, and numerous classes. Although their job stress did not affect teacher efficacy, it served as a variable that gives 31.4% impacts on job burnout.

Improvements: Working environment needs to be improved through this study and follow-up research is needed to identify methods of decreasing result variables of job burnout when emotional variables such as job stress are mediated as teacher efficacy.

Keywords: Teacher Efficacy, Job Burnout, Job Stress, Middle School Teachers, Gangwon-do

Introduction

As 20.1% of Korean teachers who responded “I’m regretful to become teachers” among 105,000 middle school teachers, this record is 9.5% higher than the average of OCED members and 36.6% said “they would not become teacher again if they must choose this job” and it was higher than the OCED mean(22.4%). Causes such as difficulty of instructing students due to rapidly changing educational background, selfish attitudes of parents’ lack of teaching understanding, social criticism on teachers, teaching subjects, and difficulty of performing official tasks were raised¹. In addition, stress can cause burnout. It literally refers to lack of emotional and mental energy due to excessive contract with people and feeling fatigue and also encompasses losing

interests in tasks and further losing vigor, confidence, and interests². One study reported that teachers are fatigued by excessive interactions with students, parents, and colleagues in terms of their job characteristics.^{3,4,5,6,7}

Job stress can affect teacher efficacy in terms of external and internal factors. The external factors affecting teacher efficacy include organizational characteristics, dynamic interactions among members, participation in decision-making, and relations with parents.⁸ Internal factors include the level of academic education of teachers, teaching experience, and job satisfaction. Likewise, Teacher efficacy is closely associated with job stress. Based on earlier studies including a study that teacher efficacy increases as more communications with colleague teachers and frequent numbers of participating in decision-making⁹ and another study on the negative association between job stress and teacher efficacy of elementary school teachers and kindergarten teachers^{10,11}, it can be said that teacher efficacy gets higher as job stress is reduced.

Accordingly, based on the above results from past research, job stress can cause job burnout and this can affect teacher efficacy. This study therefore aims to

Corresponding Author:

Ji-Woo Han

Professor, Department of Nurse

Kyungdong University, Korea

Phone:+82-010-8304-7106

Email: laurabest@kduniv.ac.kr

explore methods of preventing burnout and alleviation, and further provide basic data for establishing policy to boost educational efficiency by giving positive impacts on teacher efficacy.

Objective

This study intends to investigate the association between teacher efficacy and job burnout according to job stress of middle school teachers. Specific objectives are set as follows.

First, it aims to identify the correlation among job stress, teacher efficacy, and job burnout of subjects.

Second, it aims to identify the effects of job stress on teacher efficacy.

Third, it aims to identify the effects of job stress on job burnout.

Subject and Method

Subjects in this study are middle school teachers at Y town in Gangwon-do province. We collected 60 samples from them who consented to participate in this study after giving detailed accounts on this objective, the guarantee of anonymity, and the right of study participants. Data was collected from April 2 to April 23, 2018. In total, 59 questionnaires except for one were used for final analysis. Using G-Power 3.1.9.2 to see the fulfillment of the number of subject samples, test power was set to 0.95, the level of significant was set to 0.05, and the size of effect was set to 0.20. The number of minimum samples was met as the number of maximum samples were 27 needed for ANOVA, correlation, and regression analysis.

Instruments

Job Stress: A translated version by Ahn¹² from Teacher Stress scale invented by Fimian¹³ was used for assessing job stress of teachers. The index consists of 29 questions including eight questions on time management, six questions on task-related concerns, five questions on professional concerns, six questions on discipline and motivation, and four questions on professional intervention. Each question is composed of five-point

Likert scale ranging between 1 point “never” and 5 point “very.” As score is higher, it means that stress is higher. From Ju¹⁴, reliability was Cronbach’s $\alpha=.92$, while Cronbach’s $\alpha=.85$ was found in this study.

Teacher Efficacy: Teacher efficacy scale was developed by Gibson and Dembo¹⁵, abbreviated by Tschannen¹⁶, translated by Lim¹⁷ into Korean, and used by Ju¹⁴. This scale consists of 21 questions ranging between 1 point “never” and 5 point “very.” As score is higher, teacher efficacy gets higher. Ju¹⁴ showed that reliability was Cronbach’s $\alpha=.84$. This study showed Cronbach’s $\alpha=.96$.

Job Burnout: Job burnout scale was adopted from MBI(Maslach Burnout Inventory) developed by Maslach & Jackson¹⁸ and used by Ha¹⁹. It is composed of 22 questions ranging between 1 point “never” and 5 point “very”. As score is higher, job burnout is higher. Reliability turned out Cronbach’s $\alpha=.91$ as shown in Ha¹⁹. This study showed Cronbach’s $\alpha=.82$.

Analysis Method: Data from this study was analyzed by using SPSS statistical program T-test and ANOVA were used to see the general characteristics, job stress, teacher efficacy, and job burnout of subjects and Scheffé post-test was also conducted. The correlation among job stress, teacher efficacy, and job burnout was identified by using Pearson’s correlation coefficients. In addition, regression analysis was carried out to identify the effects of job stress on teacher efficacy and job burnout.

Results

The difference among Job Stress, Teacher Efficacy, and Job Burnout according to General Characteristics: Job stress according to general characteristics showed statistically significant difference in teaching experience ($F=10.79$, $p=.000$), position ($t=-2.09$, $p=.040$), homeroom teacher ($t=-2.84$, $p=.006$), single or married ($t=-2.84$, $p=.006$), and total number of classes ($F=15.27$, $p=.000$). Post-analysis on teaching experiences demonstrated that teachers who have little experience showed significantly higher job stress than those who have many teaching experiences. Job burnout according to general characteristics of subjects showed significant difference in position ($t=-2.09$, $p=.040$), while had no significant difference in teacher efficacy [Table 1].

Table 1: Differences among job stress, teacher efficacy, and job burnout according to general characteristics (N = 59)

Characteristics	Category	Job stress		Teacher efficacy		Job burnout	
		M ± SD	scheffé	M ± SD	scheffé	M ± SD	scheffé
Gender	Male	3.20 ± .47		2.91 ± 1.00		3.20 ± .38	
	Female	2.99 ± .69		2.78 ± 1.04		3.25 ± .68	
	t or F	1.12		.45		-.27	
	p	.265		.648		.783	
Teaching experience	Less than 10 years ^a	3.65 ± .74	a>b>c>d	2.96 ± .98		3.23 ± .72	
	11- 20 years ^b	3.05 ± .40		2.39 ± .48		3.41 ± .45	
	21- 30 years ^c	2.81 ± .41		2.79 ± 1.21		3.29 ± .69	
	More than 31 years ^d	2.65 ± .40		3.11 ± 1.15		2.99 ± .32	
	t or F	10.79***		1.12		1.06	
	p	.000		.348		.371	
Position	Deputy teacher	2.84 ± .57		2.94 ± 1.12		3.00 ± .52	
	Ordinary teacher	3.16 ± .65		2.76 ± .99		3.35 ± .61	
	t or F	-1.787		.624		-2.09*	
	p	.079		.535		.040	
Homeroom teacher	Yes	3.19 ± .65		2.77 ± 1.00		3.31 ± .60	
	No	2.79 ± .54		2.91 ± 1.10		3.10 ± .58	
	t or F	2.36*		-.48		1.28	
	p	.021		.627		.204	
Single or married	Married	2.89 ± .54		2.91 ± 1.00		3.22 ± .55	
	Single	3.36 ± .70		2.65 ± 1.07		3.27 ± .70	
	t or F	-2.84**		.92		-.26	
	p	.006		.357		.795	
Total number of classes	Less than 3 classes ^a	2.82 ± .37	d>c>b>a	2.69 ± 1.09		3.37 ± .54	
	4-6 classes ^b	2.74 ± .47		3.02 ± 1.16		3.06 ± .60	
	7-10 classes ^c	3.10 ± .27		2.79 ± 1.04		3.08 ± .52	
	More than 11 classes ^d	3.80 ± .64		2.75 ± .77		3.35 ± .70	
	t or F	15.27***		.35		1.18	
	p	.000		.788		.324	

*p<.05 **p<.01 ***p<.001

Correlation among Job Stress, Teacher Efficacy, and Job Burnout of Subjects: Job stress of subjects showed a statistically significant and positive correlation with job burnout ($r=.348, p<.01$), while it was not correlated with teacher efficacy. In other words, the higher job stress is, the lower job burnout is. Teacher efficacy showed a statistically significant and positive correlation with job burnout ($r=-.617, p<.01$) [Table 2].

Table 2: Correlation among job stress, teacher efficacy, and job burnout of subjects (N = 59)

		Factors of job stress						G	H
		A	B	C	D	E	F		
Factors of job stress	A	1							
	B	.310*	1						
	C	.136	.143	1					
	D	.051	.180	.238	1				
	E	.120	-.025	.182	.271*	1			
	F	.748**	.646**	.413**	.535**	.378**	1		
G		.018	-.011	-.043	-.257*	-.307*	-.150	1	
H		.092	.003	.201	.491**	.473**	.348**	-.617**	1
*p<.05, **p<.01, ***p<.001		A. Time management, B. Task-related concerns, C. Professional concerns, D. Discipline and motivation, E. Professional intervention, F. Total job stress, G. Teacher efficacy, H. Job burnout							

Effect of Job Stress on Teacher Efficacy: As shown in Table 3, to test the effects of job stress on teacher efficacy, multiple regression analysis and multicollinearity test revealed that multicollinearity was not found, but significance probability was more than 0.5. This indicates that the regression line was inappropriate for the model. In other words, job stress of subjects did not significantly affect teacher efficacy.

Table 3: Effects of job stress on teacher efficacy

Predictors		B	β	t	Tolerance	VIF
Variables of job stress	Time management	.044	.057	.41	.880	1.137
	Task-related concerns	-.006	-.007	-.04	.859	1.165
	Professional concerns	.082	.046	.340	.909	1.100
	Discipline and motivation	-.194	-.196	-1.42	.861	1.162
	Professional intervention	-.265	-.269	-1.98	.889	1.125
R ²		.132				
Adj. R ²		.050				
F		1.61				
p		.172				
*p<.05, **p<.01, ***p<.001						

Effect of Job Stress of Subjects on Job Burnout: To test the effects of job stress of subjects on job burnout, multiple regression analysis and multicollinearity test found that as shown in Table 4, discipline and motivation (t=3.38, p<.01) and professional intervention (t=3.02, p<.01) as subfactors of job stress were positively associated. In other words, as discipline, motivation and professional interventions of subjects increase, so does job burnout. The regression model showed a higher correlation as R=.611 between job stress and job burnout. For 37.4% of total variations, job stress had a positive impacts on job stress (F=6.32, p<.001).

Table 4: Effects of job stress of subjects on job burnout (N = 59)

Predictors		B	β	t	Tolerance	VIF
Factors of job stress	Time management	.022	.049	.42	.880	1.137
	Task-related concerns	-.042	.060	-.69	.859	1.165
	Professional concerns	.050	.121	.41	.909	1.100
	Discipline and motivation	.230	.068	3.38**	.861	1.162
	Professional intervention	.202	.067	3.02**	.889	1.125
R ²		.374				
Adj. R ²		.314				
F		6.32***				
p		.000				
*p<.05, **p<.01, ***p<.001						

Discussion

This study aimed to identify the level of job stress, teach efficiency, and job burnout among middle school teachers in Gangwon-do province and to investigate the effects of job stress on teacher efficacy and job burnout. To perform this, a survey was conducted among 59

middle school teachers. The mean difference of variables was compared through t-test and the effects of job stress on teacher efficacy and job burnout was statistically processed by using regression analysis. Based on results from this study, discussion and conclusion associated with earlier studies are presented as follows.

Mean scores of their job stress turned out 3.06 point and job burnout showed 3.24 point, which were comparatively higher than mean score and this showed that job stress and job burnout account for major portions. Teacher efficacy recorded 2.82 point in average, which showed similar results. Job stress showed significant differences in teaching experience, position, homeroom teacher, single or married, and the number of classes. As teaching experience is low, job stress increased. This is consistent with results presented by Choi²⁰ that teachers who have little experience assume important tasks and feel stressful. Moreover, ordinary teachers who assume low positions show higher job burnout, which is consistent with results from Park's²¹ study that higher teaching experiences correspond with increasing job satisfaction.

No effect of job stress of middle school teachers on teacher efficacy was found and Lim¹⁷ supported that the effects of teacher efficacy on job stress is irrelevant. Job burnout was influenced by discipline and motivation as well as professional intervention as subfactors of job stress, which is consistently explained by results found in Lim¹⁷.

Conclusion

Observing discussions in association with earlier studies and society, the disposition of parents or local demanders who force teachers to work perfectly can give negative impacts on their job stress. When positive measure is prepared to reduce their job stress and boost job satisfaction, it needs to focus on cutting performance-oriented evaluation and solving private problems.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Effect of Stress and Self-esteem on QoL in General College Students

Mi Hyun Joo¹

¹Professor, College of Medical Science, Jeonju University, Jeollabuk-do, KOREA

ABSTRACT

Background/Objectives: College students are in the transition period between adolescence and adulthood and need to lay the ground for emotional or financial independence. This study aimed to analyze the effects of general college students' stress and self-esteem on their quality of life (QoL).

Method/Statistical Analysis: This study was performed in a total of 200 students at S University in S City. With the exception of the questionnaires not returned or wrongly or not fully completed during the process of data collection (n=25), 175 questionnaires were finally analyzed. Before the survey, the participants in this study were given an explanation about the purport of the research and those consenting to participate in this study were asked to make a written consent and complete questionnaires, which were then returned. The collected data were analyzed using descriptive statistics and t-test, one-way ANOVA, Pearson's correlation coefficient, and multiple linear regression.

Findings: This study obtained the following results: first, the total score was 46.5 ± 18.4 for the socio-psychosocial well-being index (PWI), 30.2 ± 4.5 for self-esteem, and 91.0 ± 13.1 for QoL; second, QoL differed statistically significantly by the frequency of having breakfast per week ($F=3.3$, $p=.02$), and PWI ($F=4.7$, $p=.003$) and QoL ($F=4.8$, $p=.003$) differed statistically significantly by activity of daily; third, significant negative correlation was found between PWI and QoL ($r=-.7$, $p<0.001$); fourth, stress ($\beta=-.7$, $p<0.001$) was the factor that had the strongest negative effects on QoL.

Improvements/Applications: Stress was the factor that had the strongest effects on QoL in college students. It is therefore necessary to develop health promotion programs that can help general college students relieve stress with the objective of improving their QoL.

Keywords: College student, Stress, Self-esteem, QoL, Health

Introduction

College students need to prepare for adulthood. However, they actually suffer from more stress than during adolescence to adapt themselves to an unfamiliar environment, while they may have expectation of and excitement at a new campus life ^[1, 2]. Indeed, the 2017 Youth Statistical Survey supervised by the Ministry of Gender Equality and Family showed that 50.3% of the respondents aged 20-24 were experiencing stress in all areas of their life ^[3].

Corresponding Author:

Mi Hyun Joo

Professor, College of Medical Science,
Jeonju University

Email: joomihyun@jj.ac.kr

In the body, if a prolonged state of stress reactions overwhelms the capability of each system to cope with them, it can cause physically and psychologically abnormal signs, such as loss of appetite, muscle tension, fatigue, insomnia, emotional turmoil, and depression, which can then lead to several types of disease: gastrointestinal disorders, cardiovascular disease, respiratory disease, and mental illness ^[4]. So it is probably possible to solve university students' physical and mental problems by allowing them to identify and cope properly with the causes of stress so that they can avoid being left maladjusted due to the exposure to excessive stress.

Self-esteem means thinking of oneself as a valuable being; people with high self-esteem are likely to accept, respect, and regard themselves as valuable. Positive

self-esteem may cause people to lead a positive and worthwhile life and behave with confidence, whereas negative self-esteem may cause them to become skeptical of self-value, frequently feel anxious, become depressed, have no confidence in themselves, and do unstable and passive behavior^[5]. University students need to establish their self-value and become independent, the failure in which can lower self-esteem due to an excessive sense of inferiority or lower self-esteem and give severe mental stress; for this reason, adjustment status, the environment, stress, and personal lifestyle during this period are likely to have significant effects on the quality of life in adulthood as well^[6-8].

The quality of life (QoL) means a subjective value judgment about daily satisfaction based on satisfaction with life as well as on physical, mental, and social well-being^[9]. Research on the correlations between stress and QoL has reported that university students can experience lots of stress in all areas of campus life due to identity, interpersonal relationships, academic work, financial difficulties, and employment on entering the university and that students experiencing such severe stress can suffer mentally and physically severe maladjustment as well as problems with campus life^[10-12]. A study showed that university students' stress management, satisfaction with the in-campus environment, and health practice behavior were likely to affect their QoL^[13].

So this study aimed to examine the effects of college students' stress and self-esteem on their QoL and is expected to provide basic data that can help develop health promotion programs so that they can improve their QoL and prepare for happy and healthy adulthood.

This study aimed to examine the effects of general college students' stress and self-esteem on their QoL.

Materials and Method

Participants: The convenience sampling method was used to make a sample of 200 students at S University in S City. Before data collection, the participants in this study were given an explanation about anonymity, confidentiality, possibility of withdrawing from the survey any time, and the purport of the study in ethical consideration, and those volunteering to participate in this study were asked to make a written consent. The students were asked to personally complete questionnaires, which were then returned. With the

exception of the questionnaires not returned or wrongly or not fully completed during the process of data collection (n=25), 175 questionnaires were analyzed after the final error detection.

Research Tools

Stress: The revision of the Socio-Psychosocial well-being Index (PWI) developed by the Korean Society for Preventive Medicine on the basis of Goldberg's GHQ-60 (General Health Questionnaire) was used^[14]. PWI, which was designed to determine the level of stress in normal people, has a total of 45 items in four domains: performance of social role and the degree of self-reliance, depression, sleep disorders and anxiety, and general health and vitality. On a four-point Likert scale, scoring ≤ 22 in total for the level of socio-psychological health means positive well-being, 23-62 moderate distress, and ≥ 63 severe distress.

Self-esteem: The Korean version of the self-esteem scale developed by Rosenberg was used^[15]. It had a total of 10 items—5 positive items and 5 negative ones—on a four-point Likert scale. The total score ranged from 10 to 40, with a higher total score meaning higher self-esteem.

Quality of Life (QoL): The Korean Version of WHO Quality of Life Scale Abbreviated Version (WHOQOL-BREF) was used to measure QoL^[16]. It had a total of 26 items in the physical, psychological, social, and environmental domains (24), QoL in general (1), and general health awareness (1) on a five-point Likert scale. In this study, only the physical, psychological, social, and environmental domains (24 items) were used for analysis on the basis of literature review^[17]. The total score ranged from 24 to 120, with a higher total score meaning higher QoL, except for 3 items processed reversely.

Statistical Analysis

Frequency analysis in descriptive statistics was performed on the respondents' general characteristics; t-test and one-way ANOVA were carried out to determine the differences in stress, self-esteem, and QoL by the general characteristics; and Scheff's method was used for post-hoc analysis. Pearson's correlation coefficient was used to determine inter-variable correlation. Multiple linear regression was made on the factors for QoL. All the statistical analyses were carried out by using SPSS Window version 25.0 at the $p < 0.05$ significance level.

Characteristics of the Subjects: The respondents' general characteristics—age, school year, smoking, frequency of alcohol intake per week, frequency of having breakfast per week, and exercise—are as presented in Table 1. The mean age was 21.5 years; 102 respondents (58.3%) were male, and 73 (41.7%) female. 22 students (12.6%) were smokers, and 152 (86.9%) non-smokers; 5 students (2.9%) drank everyday, 19 (10.9%) 4-5 per week, 114 (65.1%) 2-3 per week, and 37 (21.1%) didn't drink at all. 66 respondents (37.7%) had breakfast every day, 15 (8.6%) 4-5 per week, 30 (17.1%) 2-3 per week, and 64 (36.6%) skipped breakfast. As for activity of daily living, 4 respondents (2.3%) did intense activity, 54 (30.9%) moderate activity, 80 (45.7%) light activity, and 37 (21.1%) was sedentary.

Table 1: Characteristics of the Subjects (N = 175)

Characteristic	Category	n (%)
Age(yr)		21.5 ± 1.1
Sex	Male	102(58.3)
	Female	73(41.7)
Grade	Freshman	47(26.9)
	Sophomore	45(25.7)
	Junior	40(22.9)
	Senior	43(24.6)
Smoking	Yes	22(12.6)
	No	152(86.9)
Alcohol Drinking	Everyday	5(2.9)
	4-5 times a week	19(10.9)
	2-3 times a week	114(65.1)
	Nothing	37(21.1)
Number of breakfasts per week	Everyday	66(37.7)
	4-5 times a week	15(8.6)
	2-3 times a week	30(17.1)
	Nothing	64(36.6)
Activity of daily living	Intense activity	4(2.3)
	Moderate activity	54(30.9)
	Light activity	80(45.7)
	Sedentary	37(21.1)
Values are presented as mean ± standard deviation or number (%)		

Stress, Self-esteem, Quality of Life in the Subjects: The respondents' levels of stress, self-esteem, and QoL are as presented in Table 2. In this result, the total score for the PWI was 46.5 ± 18.4, which means moderate distress.

A study on university students' [18] socio-psychological health reported that university students had low levels of PWI and moderate or severe stress; the analysis of university students' stress, depression, and social support [19] showed that the majority of respondents experienced moderate or severe stress, which was consistent with the results of this study. In four domains of PWI, they scored slightly higher for performance of social role and the degree of self-reliance (16.0 ± 7.6) and depression (12.0 ± 6.4), and lower for general health and vitality (10.9 ± 3.2) and sleep disorders and anxiety (7.7 ± 5.0). This result implies that university students with moderate distress can have lots of stress related to performance of social role and a slightly higher depression index.

The respondents in this study scored slightly high for self-esteem (30.2 ± 4.5). Reportedly, high self-esteem controls problem behaviors because it positively affects stress coping [20] and the degree of perceiving, controlling, and coping with stress can depend on keeping self-esteem high [21]. It is believed, therefore, that the participants in this study felt less stress, protected themselves from psychological distress [22], and were very likely to recover [21, 23] because they had high self-esteem.

The respondents in this study scored relatively high for QoL (91.0 ± 13.1). Another research on university students' QoL also found high QoL, which was consistent with the results of this study [24]. As for the four domains of QoL, however, they scored relatively higher for the environmental (30.4 ± 4.5) and physical domains (26.2 ± 4.7) and lower for the psychological (22.7 ± 4.0) and social domains (11.7 ± 1.8). Even university students with high QoL are expected to be dissatisfied with their life to some degree in the psychological and social domains.

Table 2: Level of PWI, Self-esteem and QOL (N = 175)

Variable		M (SD)
PWI	Total Score	46.5 (18.4)
	Performance of social role and the degree of self-reliance	16.0 (7.6)
	Depression	12.0 (6.4)
	Sleep disorders and anxiety	7.7 (5.0)
	General health and vitality	10.9 (3.2)
Self esteem	Total Score	30.2 (4.5)

Conted...

QOL	Total Score	91.0 (13.1)
	Physical domain	26.2 (4.7)
	Psychological domain	22.7 (4.0)
	Social domain	11.7 (1.8)
	Environment domain	30.4 (4.5)
Values are presented as mean (standard deviation)		
PWI, Socio-Psychosocial well-being Index; QOL, Quality of life		

The difference of Stress, Self-esteem, Quality of Life according to general characteristics: The differences in the respondents' stress, self-esteem, and QoL by their general characteristics are as presented in Table 3. QoL differed statistically significantly by the frequency of having breakfast per week ($F=3.3$, $p=.02$). In particular, the students skipping breakfast showed significantly lower QoL than those having it every day. A study on the factors for QoL in university students ^[25] found positive correlation between health behavior practice status,

including the rate of meal skipping, and QoL. This finding implies that the lower level of health behavior practice, the lower QoL, which is consistent with the results of this study.

Activity of daily living made statistically significant differences in PWI ($F=4.7$, $p=.003$) and in QoL ($F=4.8$, $p=.003$). In particular, students doing light activity and sedentary had significantly higher PWI than those doing moderate activity. Several studies [26, 27] found that physical activity of moderate or higher degree was effective in relieving stress. This finding is probably because physical activity is effective in relieving physical and mental tension and in making one less sensitive to stress [28].

Students doing moderate activity had significantly higher QoL than those doing light activity or sedentary. This study is consistent with the finding that university students with a larger amount of physical activity had higher QoL [29]. This is probably because a moderate or higher degree of physical activity can improve physical functions, mental health, social activity, etc.

Table 3: The difference of PWI, Self-esteem and QOL according to general characteristics

[illegible]

Associated Factors with Quality of Life: The correlations among stress, self-esteem, and QoL in the participants are as presented in Table 4. In this study, PWI, which shows the level of stress in normal people, was significantly negatively correlated with QoL ($r=-.7$, $p<0.001$). However, no significant correlation was found between PWI and self-esteem and between self-esteem and QoL. To investigate the effects on university students' QoL, multiple linear regression analysis was made with QoL as a dependent variable and stress and self-esteem as independent variables (Table 5). The regression model analysis found that stress ($\beta=-.7$, $p<0.001$) was the factor that had the strongest negative effects on QoL.

These results imply that stress has the strongest effects on QoL in university students and that a higher level of stress can possibly lead to lower QoL. Research on living stress and QoL in nursing students [30] and a study on the factors for QoL in university students [14] reported that the students could improve their QoL by managing stress well. It is therefore necessary to develop and operate various health promotion programs as well as to create facilities and environments that can help university students manage their stress in campus so that they can lead a happy and healthy life.

Table 4: Correlations among Outcome Variables (N = 175)

Variables	PWI	Self esteem	QOL
PWI	1		
Self esteem	0.4(0.6)	1	
QOL	-0.7(0.000)**	-0.1(0.3)	1

PWI, Socio-Psychosocial well-being Index; QOL, Quality of life ** $p<0.001$

Table 5: Predictors of QOL (N = 175)

Variables	QOL					
	B	SE	β	t(p)	R ²	F(p)
Constants	117.5	5.0		23.7	0.5	93.1**
PWI	-0.5	0.04	-0.7	-13.6**		
Self esteem	-0.1	0.16	-0.03	-0.6		

PWI, Socio-Psychosocial well-being Index; QOL, Quality of life ** $p<0.001$

Conclusion

This study aimed to analyze the effects of general college students' stress and self-esteem on their QoL and provide basic data that can help develop health promotion programs so that they can improve their QoL and prepare for happy and healthy adulthood.

The results of this study can be summarized as follows: First, the participants experienced moderate distress and showed relatively high self-esteem and QoL. Second, students skipping breakfast had significantly lower QoL than those having breakfast every day. The students doing light activity and sedentary experienced significantly more stress than those doing moderate activity; the students doing moderate activity had significantly higher QoL than those doing light activity or sedentary. Third, PWI, which shows the level of stress, was significantly negatively correlated with QoL. Fourth, stress was the factor that had the strongest negative effects on QoL.

It is therefore necessary to develop and operate various health promotion programs as well as to create facilities and environments that can help general college students manage their stress in campus so that they can lead a happy and healthy life.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Effect of Private Health Insurance on Medical Expenditure and Unmet Medical Needs: Evidence from South Korea

Hyoungshim Choi¹, Young-il Jung²

¹Assistant Professor, Department of Nursing, Hansei University, Gyeonggi-do, Republic of Korea;

²Assistant Professor, Department of Environmental Health, Korea National Open University, Seoul, Republic of Korea

ABSTRACT

South Korea is experiencing increases in private health insurance (PHI). The purpose of this study is to examine the role of PHI on medical expenditure and unmet medical needs. This longitudinal study used data from the nationally representative 2011–2014 Korea Health Panel Survey (KHPS). Propensity score matching was performed to control the endogeneity from enrolling in PHI for the sake of healthcare utilization. Fixed-effects panel data analyses were performed to control for time-invariant factors. The final matched sample of 2,390 participants was retained throughout the study period. In this study, about 83.4% of the participants were covered by PHI in 2011 (fixed benefit 70.2%, indemnity 29.8%). Results from the fixed effects analysis with matched panel data showed that the impact of PHI on personal medical expenditure and unmet medical needs was not statistically significant. However, it was found that PHI had a positive and statistically significant influence on out-of-pocket (OOP) expenditure at point of use, including that for non-covered services. Particularly, indemnity type insurance plans had a large effect on OOP expenditure. The results show that PHI increased OOP expenditure but failed to decrease unmet medical needs. Additional analyses of the contribution of PHI and exploration of policy alternatives are required.

Keywords: Private health insurance, Healthcare expenditure, Out-of-pocket expenditure, Unmet medical needs, Republic of Korea.

Introduction

South Korea has a national health insurance (NHI) system in the form of universal public health insurance¹. NHI was established as a public security system only recently; it involves a low healthcare expenditure level compared to GDP and has excellent health outcomes². However, when NHI coverage is calculated as the ratio of public resources to individual medical expenditure, the resulting rate of 55.1% is far lower than the Organisation for Economic Cooperation and Development's (OECD) average of 73.0%³. Private Health Insurance (PHI) is

used as supplementary health insurance to compensate for the limited coverage.

Recently, South Korea has been experiencing increases in PHI coverage due to insufficient public coverage rates¹. The expansion of the PHI market creates the possibility of the over-consumption of medical services, that is, the possibility of moral hazard for medical consumers who have joined both public health insurance and PHI⁴. Also, the recent rapid increase in medical expenses among OECD countries has contributed to the possibility of moral hazard caused by PHI⁵. The question is whether healthcare consumers who join PHI increase their demand for real medical expenses after contracting with PHI⁴. The effect of PHI has been debated. Many studies have reported that PHI has a positive impact on outpatient expenditure, but the effect on inpatient expenditure was not consistent^{6,7}. In recent years, there have been studies analyzing the effect of indemnity PHI on the utilization of medical services due to the rapid increase in the subscription

Corresponding Author:

Young-il Jung
Assistant Professor,
Department of Environmental Health,
Korea National Open University,
Seoul, Republic of Korea.
Email: extra012@knou.ac.kr

rate of indemnity PHI; the results differed depending on the sources and research methods^{1,8,9}. Although several studies have quantitatively demonstrated the relation between PHI and medical utilization, to quantify the causality between them, it is necessary to address the issue of the endogeneity of insurance variables⁹.

So far, there are few studies concerning the impact of PHI on healthcare equity¹⁰. PHI is expected to reduce unmet medical needs, as a supplementary role in coverage and depth, but the Korean NHI has a high incidence of unmet medical needs¹¹. Unmet medical needs is an important issue to identify and improve in terms of policy, because diseases can worsen and complications can arise if a problem is not treated in a timely manner; thus, it is also important to understand the relationship between PHI and unmet medical needs¹⁰. Some studies used propensity score matching to counter the endogeneity issues, while others applied panel data analysis to examine the longitudinal effect of PHI on healthcare utilization and expenditure^{6,7}. One small study applied both methods to analyze the effect of PHI on medical expenditure, but no study has yet investigated the impact of unmet medical needs on PHI. The purpose of the current study was to examine the role of supplementary PHI on medical expenditure and explore the impact on unmet medical needs.

Materials and Method

Materials: The data for this study are based on the 2011–2014 data from the Korea Health Panel Survey (KHPS). The KHPS has been conducted since 2008 to provide the Korean government with data about medical expenditure and appropriate healthcare utilization rates. The representative sample of households was selected using a two-step probabilistic stratified cluster method and each household member was surveyed. Items concerning demographic characteristics, health status, and healthcare utilization were covered. Respondents' medical expense histories were retrieved from actual receipts, allowing us to identify specific costs and out-of-pocket payments. Also, survey items specifically addressed enrollment in PHI plans. The analysis excluded participants under 20 years of age, as younger citizens may have limited decision-making experience regarding healthcare utilization, and those over 65, as they have restricted private insurance enrollment.

Method

Measurements: The independent variables were enrollment in PHI (non-enrollment, enrollment) and type of insurance (non-enrollment, fixed-benefit, indemnity). We classified those enrolled in both types of insurance as having indemnity-type insurance plans, under the assumption that health service utilization will be influenced more heavily by them. Dependent variables were: (1) total medical expenditure, (2) out-of-pocket expenditure, and (3) experience of unmet medical needs. Variables (1) and (2) are annualized personal medical expenditures for outpatient services, inpatient services, and emergency services; (1) includes covered NHI expenses and out-of-pocket expenditures, and (2) refers to only out-of-pocket expenditures at point of use. This measure of medical expenditure relied on information from receipts and household accounts to mitigate problems caused by recall bias (which occurred in general surveys) or by inaccurate measurement of the overall payment (which occurred in administrative data due to non-covered expenditures). Because of the skewed nature of the distribution of medical expenditure, log transformation was applied for normalization. In (3), an unmet medical need was defined as an individual feeling that they had been unable to access treatment for medical needs experienced over the past year.

Covariates included demographic variables such as sex, age, marital status, education level (middle school graduate, high school graduate, college, and above), income (quintiles), and participation in the labor force, as well as health variables such as the diagnosis of chronic disease, physical activity, and self-rated health.

Statistics Analysis: The characteristics of the sample will be different depending on enrollment in PHI. Because enrollment in PHI is based on individual choice, the tendency for those who are more likely to utilize health services to enroll may lead to the problem of endogeneity. To overcome this problem, we utilized propensity score matching (caliper matching) techniques. Propensity score matching was carried out based on individual data from the 2011 dataset, including information on demographics (age, sex, marital status, education level, income level, labor force participation) and health status (chronic disease, smoking, physical activity, and self-rated health). Matching was done with greedy matching without a replacement option, with nearest neighbor

matching within the caliper (0.01). We 1:1 matched 7,470 individuals (6,227 with PHI and 1,243 without PHI) and extracted 2,390 individuals as our matched sample (1,195 with PHI, 1,195 without PHI).

To use an analytic model that controlled for confounding factors influencing medical expenses and the experience of unmet medical needs, we conducted both fixed-effect panel data analysis and ordinary least squares (OLS) regression with pooled longitudinal data. The panel data analysis was carried out to control for time-invariant factors. The Hausman test was applied to the fixed-effects and random-effects models for error analysis. The null hypothesis was rejected at the 1% significance level, and the fixed-effects panel model was adopted. We validated the heteroscedasticity robust Hausman-Robust test for panel data serial correlation introduced in Born & Breitung¹².

We tested for correlation between the variables and multicollinearity. Correlation among variables was not significant and the variance inflation factor was below 2, confirming that multicollinearity was not a concern. Statistical analyses were conducted using Stata (ver. 15) software.

Results and Discussion

The sample size was 7,470, with 1,243 who did not have any supplementary PHI (only NHI) and 6,227 who were enrolled in PHI plans (PHI + NHI). After matching, 50.0% of the 2,390 respondents had PHI.

Demographic characteristics of the sample are as follows. Before matching, there were a higher proportion

of females among those with PHI, with 47.78% male and 52.22% female, compared to 54.79% male and 45.21% female among those without PHI. Average age was 43.7 in the PHI group and 42.6 in the non-PHI group. Among those with PHI and those without PHI, 75.96% and 51.01% were married, respectively. The proportion of those with college degrees was 36.73% in the PHI group and 28.72% in the non-PHI group. Distribution of income quartiles was higher in the PHI group (3.7 ± 1.2) than in the non-PHI group (3.0 ± 1.3). We found that 68.32% of the PHI group were still in the labor force, compared to 60.02% of the non-PHI group.

As for health-related characteristics, a higher proportion of the PHI group (50.92%) had a diagnosis of a chronic disease compared to the non-PHI group (44.49%). Among those with PHI, 81.99% participated in physical activity compared to 77.56% among those without PHI. Finally, 48.97% of those with PHI rated their health as “good” compared to 45.09% of those without PHI. After matching, there were no significant differences in demographic or health-related factors between the PHI and non-PHI group [Table 1].

We observed the effect of enrollment in supplementary PHI on personal medical expenditure. After matching, enrollment in PHI was found to increase medical expenditure in the pooled OLS model, but the effect was not significant in the fixed-effects panel model. Unlike the pooled OLS model, the panel data analysis, which controls for unobserved factors, found that total individual medical expenditure did not increase due to enrollment itself. The results were similar before and after matching.

Table 1: Basic Characteristics of Participants

		Before matching (n=7,470)			After matching (n=2,390)		
		Without PHI (n=1,243)	With PHI (n=6,227)	p-value	Without PHI (n=1,195)	With PHI (n=1,195)	p-value
		%	%		%	%	
Gender	Male	54.79	47.78	<.001	52.72	52.97	0.902
	Female	45.21	52.22		47.28	47.03	
Age	mean $\pm$ SD	42.6 $\pm$ 14.0	43.7 $\pm$ 11.8	0.005	44.5 $\pm$ 14.0	44.3 $\pm$ 13.7	0.724
Marriage	No	48.99	24.04	<.001	43.6	47.03	0.092
	Yes	51.01	75.96		56.4	52.97	
Education	Middle school	24.30	18.18	<.001	27.28	27.45	
	High school	46.98	45.09		44.18	45.86	
	University	28.72	36.73		28.54	26.69	

Conted...

Income	mean ± SD	3.0 ± 1.3	3.7 ± 1.2	0.220	3.0 ± 1.3	2.9 ± 1.2	0.220
	1st quintile	13.77	4.15		13.05	11.63	
	2nd quintile	24.96	15.17		25.1	28.7	
	3rd quintile	26.49	22.53		27.45	25.86	
	4th quintile	17.95	27.59		17.99	22.26	
	5th quintile	16.83	30.58		16.4	11.55	
Employment status	Economically active	60.02	68.32	<.001	63.51	61.76	0.375
	Inactive/unemployed	39.98	31.68		36.49	38.24	
Chronic disease	Yes	44.49	50.92	<.001	48.03	48.28	0.902
	No	55.51	49.08		51.97	51.72	
Smoking status	None-smoker	60.05	62.84	0.024	60.17	60.08	0.908
	Ex-smoker	12.82	13.77		13.31	12.8	
	Current smoker	27.12	23.39		26.53	27.11	
Physical activity	No	22.44	18.01	<.001	21.92	21.51	0.804
	Yes	77.56	81.99		78.08	78.49	
Self-rated health	Good	45.09	48.97	<.001	44.72	46.93	0.303
	Fair	41.94	41.94		42.08	41.9	
	Bad	12.97	9.09		13.21	11.17	
Total medical expenditure	Log	7.8 ± 5.9	9.7 ± 5.0	<.001	8.3 ± 5.8	9.0 ± 5.4	0.002
Out-of-pocket expenditures	Log	3.0 ± 5.1	4.1 ± 5.6	<.001	3.3 ± 5.2	3.9 ± 5.2	0.005
Unmet medical needs	No	86.89	83.82	0.013	87.21	81.86	0.001
	Yes	13.11	16.18		12.79	18.14	
PHI: private health insurance							

As Table 2 shows, aside from PHI enrollment, those who were older, married, or had a chronic disease or a lack of physical activity had increased medical expenditure. In addition, no significant relationship was found between the type of PHI (non-enrollment, fixed-benefit, indemnity) and individual medical expenditure, with similar trends in statistical significance before and after matching, as shown in Table 2.

Next, we analyzed the effect of supplementary PHI on OOP expenses. After matching, the effect of enrollment in PHI on OOP expenditure was found to be statistically significant in the pooled OLS model. Enrollment in PHI had a significant impact on OOP expenditure in the panel data analysis as well, but the regression coefficient was smaller in the panel data analysis model than in the OLS model, as shown in Table 3.

Table 2: Effect of Private Health Insurance on Total Medical Care Expenditure

		Pooled OLS model		Fixed effect panel model		Pooled OLS model		Fixed effect panel model	
		β	p-value	β	p-value	β	p-value	β	p-value
PHI (ref. without PHI)	With PHI	0.979***	<.001	0.059	0.752				
PHI types (ref. without PHI)	Fixed-benefit type					0.728***	<.001	0.189	0.325
	Indemnity type					1.242***	<.001	0.214	0.277
Gender (ref. Female)	Male	1.437***	<.001	(omitted)		1.413***	<.001	(omitted)	

Conted...

Age		0.040***	<.001	0.135***	<.001	0.042***	<.001	0.132***	<.001
Marriage (ref. No)	Yes	1.309***	<.001	1.643***	<.001	1.314***	<.001	1.638***	<.001
Education (ref. Middle school)	High school	-0.347***	<.001	0.94	0.551	-0.367***	<.001	0.944	0.55
	University	-0.305**	0.001	1.23	0.439	-0.322***	0.001	1.229	0.439
Income (ref. 1st quintile)	2nd quintile	0.138	0.3	0.042	0.784	0.123	0.355	0.039	0.796
	3rd quintile	0.376**	0.004	0.233	0.152	0.352**	0.007	0.231	0.155
	4th quintile	0.485***	<.001	0.098	0.574	0.447***	0.001	0.096	0.581
	5th quintile	0.729***	<.001	0.237	0.209	0.689***	<.001	0.235	0.214
Employment status (ref. Economically active)	Inactive/unemployed	0.276***	<.001	-0.16	0.137	0.293***	<.001	-0.16	0.137
Chronic disease (ref. Yes)	No	-2.958***	<.001	-0.533***	<.001	-2.950***	<.001	-0.532***	<.001
Self-rated health (ref. Good)	Fair	0.469***	<.001	0.111	0.076	0.482***	<.001	0.111	0.077
	Bad	1.383***	<.001	0.217	0.054	1.387***	<.001	0.216	0.055
Physical activity (ref. No)	Yes	-0.078	0.32	-0.265**	0.001	-0.075	0.337	-0.265**	0.001
Constant		6.492***	<.001	1.972	0.234	6.470***	<.001	2.005	0.23
	sigma_u			3.8106926				3.8018073	
	sigma_e			3.276563				3.2765463	
	rho			0.57493915				0.57380027	
	Hausman test			448.95	<.001			454.51	<.001

PHI: private health insurance; * p<.05; ** p<.01; *** p<.001

The effects on OOP expenditure varied by type of PHI. The following are results from the matched fixed-effects panel model. Compared to those without supplementary PHI plans, OOP expenditure increased by 58.6% (Coefficient=0.586, p-value=0.033) for those enrolled in fixed-benefit type insurance plans, and by 108.2% (Coefficient=1.082, p-value<.001) for those enrolled in indemnity-type insurance plans. Both types contributed to an increase in OOP, but the degree of contribution was greater for indemnity-type insurance plans. Covariates associated with increased OOP expenditure in the matched panel data analysis were older age, marriage, chronic disease, and poor self-rated health [Table 3].

Finally, we analyzed the impact of PHI on the experience of unmet medical needs. One of the important benefits that we expect from PHI is improved access to healthcare services when one needs them. The

cases where healthcare was necessary but not utilized were considered to represent unmet medical needs. In the matched fixed-effects panel model, no significant relationship was found between enrollment in PHI and unmet medical needs. Table 4 illustrates that the type of health insurance also did not have any impact on unmet medical needs, and the same results were found in pooled OLS regression results and non-matching analysis [Table 4].

In this study, 83.4% of the participants were covered by PHI in 2011. In the preceding study, the PHI coverage rate was 60% on an individual basis in 2008¹³. The above analysis found that PHI had a positive and statistically significant influence on OOP expenditure, and this finding implies that there is a moral hazard for PHI subscribers in medical utilization. Indemnity-type insurance plans, in particular, had a large effect on OOP expenditure. This result is consistent with previous studies in which PHI

adoption was associated with higher healthcare utilization, and specifically, with an indemnity plan ^{9, 13}. In Korea, there is a large deviation in PHI coverage depending on income, the presence of disease, and age ¹⁴. In this situation, the increase of medical demand due to the moral hazard of PHI subscribers may have a negative impact on

NHI finances ⁴. The present study also showed that older age, marriage, chronic illness, and poor subjective health status increase OOP expenditure. These results correlate with previous findings suggesting that the higher the age of a patient with chronic disease, the higher the OOP expenditure, outpatient visits, and inpatient days ⁴.

Table 3: Effect of Private Health Insurance on Out-Of-Pocket Expenditure

		Pooled OLS model		Fixed effect panel model		Pooled OLS model		Fixed effect panel model	
		β	p-value	β	p-value	β	p-value	β	p-value
PHI (ref. without PHI)	With PHI	1.056***	<.001	0.658*	0.014				
PHI types (ref. without PHI)	Fixed-benefit type					0.732***	<.001	0.586*	0.033
	Indemnity type					1.525***	<.001	1.082***	<.001
Gender (ref. Female)	Male	1.592***	<.001	(omitted)		1.552***	<.001	(omitted)	
Age		0.048***	<.001	0.399***	<.001	0.051***	<.001	0.382***	<.001
Marriage (ref. No)	Yes	0.644***	<.001	1.068*	0.012	0.632***	<.001	1.037*	0.014
Education (ref. Middle school)	High school	-0.443***	<.001	1.641	0.468	-0.480***	<.001	1.618	0.474
	University	-0.655***	<.001	2.126	0.35	-0.687***	<.001	2.092	0.358
Income (ref. 1st quintile)	2nd quintile	0.412*	0.018	0.18	0.407	0.383*	0.027	0.173	0.424
	3rd quintile	0.842***	<.001	0.346	0.138	0.799***	<.001	0.336	0.149
	4th quintile	1.152***	<.001	0.227	0.364	1.087***	<.001	0.213	0.393
	5th quintile	1.466***	<.001	0.386	0.154	1.396***	<.001	0.37	0.172
Employment status (ref. Economically active)	Inactive/unemployed	0.507***	<.001	-0.156	0.309	0.535***	<.001	-0.157	0.306
Chronic disease (ref. Yes)	No	-2.439***	<.001	-0.548**	0.006	-2.427***	<.001	-0.545**	0.006
Self-rated health (ref. Good)	Fair	0.559***	<.001	0.163	0.07	0.578***	<.001	0.164	0.068
	Bad	2.213***	<.001	0.403*	0.012	2.225***	<.001	0.402*	0.012
Physical activity (ref. No)	Yes	-0.049	0.629	-0.193	0.099	-0.046	0.652	-0.189	0.107
Constant		1.310***	<.001	-15.576***	<.001	1.234***	<.001	-14.850***	<.001
	sigma_u			5.539799				5.3845681	
	sigma_e			4.6934805				4.6921483	
	rho			0.58214075				0.5683919	
	Hausman test			386.34	<.001			376.06	<.001

PHI: private health insurance; * p<.05; ** p<.01; *** p<.001

On the other hand, this study provides little evidence of a positive association between PHI and unmet medical needs. In a system such as Korea's, where universal health coverage is provided by the public sector, PHI's supplementary nature does not contribute greatly to the reduction of unmet medical needs. This result is consistent with previous studies which reported that there is no

significant correlation between PHI and unmet medical needs ¹⁵ but is not consistent with an earlier study which suggested that those who have PHI are less likely to experience unmet healthcare needs, particularly for those who have financial barriers ^{11, 16}. However, the results of the present study seem to be more credible because we used propensity score matching to reduce the endogeneity issues,

and a panel data analysis to examine the longitudinal effect of PHI on healthcare utilization and expenditure. The results show that supplementary PHI increased OOP expenditure but failed to decrease unmet medical needs, which implies that rather than providing coverage for essential services, PHI increases healthcare utilization rates at the point of use. Additional analyses of the contribution of supplementary PHI and exploration of policy alternatives are required to address Korea's rapid increase in medical expenditure. Some of the study limitations are as follows. First, due to the matching procedures, the sample size has been reduced by around half to match the number of those without PHI. Also, there may be errors due to missing medical

expenditure values or input errors. However, the matching procedure was essential to control for endogeneity between enrollment in PHI and healthcare utilization. Medical expenditure information was collected from objective data sources, such as receipts, which reduces the risk of recall bias and implies more reliability than survey response-based data. Also, despite the variety of PHI plans and products with a wide spectrum of coverage based on contracting types, we simplified PHI plans into three types: non-enrollment, fixed-benefit, and indemnity. Careful analysis of the results is required because we grouped both fixed-benefit and indemnity types of insurance together as, simply, indemnity-type insurance.

Table 4: Effect of PHI on Unmet Medical Needs

		Pooled OLS model		Fixed effect panel model		Pooled OLS model		Fixed effect panel model	
		OR	CI	OR	CI	OR	CI	OR	CI
PHI (ref. without PHI)	With PHI	1.054	[0.952,1.166]	1.083	[0.759,1.546]				
PHI types (ref. without PHI)	Fixed-benefit type					1.074	[0.969,1.190]	1.194	[0.831,1.716]
	Indemnity type					1.069	[0.956,1.194]	1.04	[0.715,1.512]
Gender (ref. Female)	Male	1.198***	[1.105,1.299]	1	[1,1]	1.197***	[1.104,1.299]	1	[1,1]
Age		0.997	[0.993,1.002]	0.885***	[0.845,0.927]	0.997	[0.993,1.002]	0.888***	[0.847,0.931]
Marriage (ref. No)	Yes	0.95	[0.860,1.049]	0.578	[0.320,1.042]	0.949	[0.860,1.048]	0.584	[0.324,1.054]
Education (ref. Middle school)	High school	0.884*	[0.791,0.987]	(omitted)		0.884*	[0.792,0.987]	(omitted)	
	University	0.868*	[0.765,0.985]	(omitted)		0.868*	[0.765,0.985]	(omitted)	
Income (ref. 1st quintile)	2nd quintile	0.789**	[0.673,0.926]	0.887	[0.680,1.158]	0.787**	[0.671,0.924]	0.885	[0.679,1.156]
	3rd quintile	0.731***	[0.625,0.856]	0.913	[0.686,1.216]	0.729***	[0.623,0.854]	0.912	[0.685,1.214]
	4th quintile	0.636***	[0.542,0.746]	0.822	[0.604,1.119]	0.633***	[0.539,0.743]	0.824	[0.605,1.121]
	5th quintile	0.560***	[0.476,0.659]	0.783	[0.557,1.099]	0.557***	[0.474,0.656]	0.784	[0.558,1.101]
Employment status (ref. Economically active)	Inactive/unemployed	0.698***	[0.638,0.764]	0.989	[0.801,1.221]	0.698***	[0.638,0.764]	0.99	[0.801,1.222]
Chronic disease (ref. Yes)	No	1.039	[0.951,1.137]	0.922	[0.707,1.203]	1.04	[0.951,1.138]	0.922	[0.707,1.202]
Self-rated health (ref. Good)	Fair	1.924***	[1.766,2.097]	1.745***	[1.539,1.977]	1.925***	[1.767,2.098]	1.746***	[1.540,1.978]
	Bad	3.416***	[3.031,3.849]	2.403***	[1.986,2.907]	3.417***	[3.032,3.850]	2.403***	[1.986,2.908]
Physical activity (ref. No)	Yes	1.132*	[1.018,1.258]	1.222*	[1.046,1.427]	1.132*	[1.018,1.258]	1.223*	[1.047,1.429]
	Hausman test			15.51	0.0166			15.51	0.0166

PHI: private health insurance; * p<.05; ** p<.01; *** p<.001

Conclusion

This study is an empirical analysis of the effects of PHI (enrollment and type) on medical expenditure and the experience of unmet medical needs after adjusting for health status confounders and time-variant factors. The effects of PHI on total medical expenditure and unmet

medical needs are not significant after controlling for endogeneity issues. However, it was found that PHI had a significant effect on the increase of OOP payment at point of use, including payments for non-NHI covered services.

The result reflects that the moral hazard under PHI exists partially, and at the same time, PHI does

not contribute to improving access to necessary care. Therefore, we need to closely monitor the impact of PHI on healthcare expenditure and try to find a way to meet unmet medical needs through reforming NHI with PHI.

Based on the results of this study, it is necessary to look closely at the interactions between PHI subscriptions and medical utilization, and to continuously monitor how the effect of PHI on unmet medical needs and medical utilization changes in such situations. In addition, it is necessary to merge the information about the subscribers held by PHI insurance companies with the information accumulated by NHI, to clearly demonstrate the relationship between PHI coverage and medical expenditure.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Effects of Cognitive Stimulation Task on Cognitive State and Activity Participation in Elderly People with Mild Cognitive Impairment (MCI)

Hwan-Hee Kim¹

¹Professor, Dept. Occupational Therapy, Semyung University, Republic of Korea

ABSTRACT

Background/Objectives: To investigate the effect of cognitive stimulation task for community living elderly people with MCI on cognitive function and activity participation.

Method/Statistical Analysis: Subjects were 15 community-dwelling elderly persons. The cognitive behavior therapy included the warming up, cognitive stimulation program, cognitive activity program, and cooling down. MMSE-DS to evaluate the cognitive state, and K-ACS to evaluate the activity participation level were conducted with all subjects before and after the intervention in the same method. All statistical analysis method were performed using SPSS version 21.

Findings: Among all participants, men were 4(26.67%) and women were 11(73.33%). significant difference of cognitive state was found between the pre and the post-test. A number of studies have shown that cognitive stimulation program can help maintain opposite to cognitive decline. K-ACS was significant differences between leisure ($p=0.034$) and social activities($p=0.028$). The mean instrumental activities score increased, but this was not significant. This is similar to the result of a study that meaningful activities through the intervention are an important factor on the life of elders.

Improvements/Applications: This research provide useful information for designing efficient interventions and identifying their good influence for progress of community involvement. Future research should examine the effects of community activities on the social impact of the elderly.

Keywords: Activity participation, Cognitive stimulation program, Cognitive state, Elderly person, MCI

Introduction

Dementia due to aging around the world has become one of the major diseases affecting public health and has become a social problem. The prevalence of dementia is expected to double by in 2020 and triple in 2050¹. Mild cognitive impairment (MCI) is a transitional phenomenon between naturally aging and neurocognitive disorder². The concept of MCI has come to the knowledge in the United States, where large-scale research projects have been studied. There is an ultimate view that provides

treatment, and thus reduces the risk of developing senile dementia³. MCI symptoms refers to a condition other than dementia, such as cognitive dysfunction or disability, decreased community activities, or difficulty in performing regular life living activities⁴. In the case of a typical MCI, cognitive decline or memory impairment does not impair the daily life of the elderly, but maintains a function lower than expectations for the individual's age and educational level⁵⁻⁷. However, impaired cognitive ability can have a negative impact on social, functional, and vocational activities.

Cognitive behavior therapy (CBT) was considered the most preferred researched psychological therapy methods, and more than 300 studies on CBT have been published until now. CBT is being applied to a variety of disorders and problems⁸. The main goal of CBT is to train cognitive and behavioral abilities efficiently to cope

Corresponding Author:

Hwan-Hee Kim
Professor, Division of Occupational Therapy,
Semyung University, Korea
Email: heeya6672@duam.net

with mental stress and abnormal situations⁹. Cognitive treatment programs consist of cognitive stimulation task, orientation, memory, and concentration training. The universal cognitive stimulation task refers to a program that is applied to group therapy and designed to improve cognitive function and social communication function. Cognitive program involves individually composed sessions centered on specific activities that use brain and body together (e.g. calculation through market play)^{10,11}.

Participation is included in the context of life or in a variety of activities, and is described in the International Classification of Functioning, Disability and Health (ICF)¹². Participation is made up of one of three elements of function in the ICF. Successive activity participation has been shown to positively affect physical, mental, social health and well-being and quality of life. However, when participation is limited, social interaction is reduced and work life, community activities, mobility, and communication decline¹³. Therefore, participation level is very important for the life of the elderly.

Previous research on group therapy has shown that various nonpharmacological treatments improved the cognitive function of elderly people with MCI. However, there is a shortage of research on the effects of cognitive functioning on individual participation. Thus, the goal of this research was to examine the effect of cognitive stimulation task for community living order people with MCI on cognitive function and activity participation.

Materials and Method

Subjects: The study was for 4 months, on from March 2017 to June 2017 at the J City Community Health Center in Republic of Korea. Subjects were 15 community-dwelling elderly over than 70 years old. Inclusion criteria for subject required willingness to the study, walk independently, no diagnosed with dementia, ability to communicate about basic action and understand the program's object. All participants understand and signed the informed agreement to join in the experiment in according to the ethical principles. This study methods were acknowledged by the Semyung University Ethics Committee. Among all participants, men were 5(33.3%) and women were 10(66.7%). Average age was 77.93 ± 3.97 years old and average of educational years was 6.53 ± 3.58 .

Procedures: All researchers completed the regular curriculums of certified institutions and participated in

the program. This study used a pre and post-test design of a one group. The cognitive behavior therapy included the following activities: warming up for 10 minutes, cognitive stimulation program for 30 minutes, cognitive activity program for 40 minutes, and cooling down for 10 minutes. The subjects also had a rest time for about 10 min in the middle of the program depending on their conditions [Table 1]. The cognitive stimulation activity involved numbers, shapes, depths, memories, and cognitive activities that could stimulate the subjects' brains. For the cognitive activity program, the subjects used their hands to make things or participated in a simple sports game. An experienced occupational therapist performed the cognitive behavior therapy on all participants for 1 hour and a half sessions per week, for 15 weeks.

Table 1: Cognitive Behavior Therapy

Time	Contents
10Minute	Greeting, Gymnastics for Dementia Prevention
30 Minute	Cognitive Stimulation Program
40 Minute	Cognitive Activity Program
10 Minute	Joint Movement, Notices

Outcome Measures: All assessments were performed by the staff of occupational therapy and trained student of the occupational therapy. The assessment battery included the Korean version of the Mini-Mental State Examination for Dementia Screening (MMSE-DS), which is a brief cognitive status screening test. This scale is a total of 19 items, ranging from 1 to 5 depending on the item. The range of the score is from 0 to 30, and the higher the score, the better the cognitive state. To interpret the results with MMSE-DS scores, you need to know your gender, age, and academic background. Based on these three criteria, the cognitive decline is judged based on the score interpretation table¹⁴.

Baum and Edwards developed the Activity Card Sort(ACS) to evaluate the activity participation level of the elders aged 65 or more who were hospitalized or living in the community¹⁵. Based on the photographs, the Korean Activity Card Sort (K-ACS) was revised by Lee et al., and collected information on social, instrumental and leisure activities according to the living environment¹⁶. The K-ACS consists of establishment versions, recovery and community living versions. In this study, community living version was used for assessment. The community

life version shows 67 pictures of activities, and the subjects should be classified into four levels (instrumental activity of daily living, low-intensity physical activity, high-intensity physical activity, and social activity). The scoring method is to calculate the possession rate of participating activities = current activity level/past activity level $\times$ 100, where the current activity level for each of the instrumental activities, social activities, and leisure activities = 'activities that they do now in the same level as before' + 'activities that they do less than before' + 'new activities that they began after 60' and the past activity level = 'activities that the participant did in the past'. The test-retest of the reliability of the K-ACS recorded .87 for community older people¹⁷.

Statistical Analysis: All statistical analysis was done using Win SPSS (version 21 ; SPSS Inc, Chicago, IL, USA). We analyzed gender with frequency analysis, age and years of education with descriptive statistics. Cognitive status and levels of participation in activity were compared by Wilcoxon signed-rank tests before and after the intervention. The $p < 0.05$ was considered to be statistically significant.

Results and Discussion

Subjects: In total, 15 subjects completed this study. Among all participants, men were 4(26.67%) and women were 11(73.33%). Average age was 77.93 ± 3.97 years old and average of educational years was 6.53 ± 3.58 [Table 2].

Table 2: Characteristics of Participants

		Subject (%)
Sex	Male	4(26.67%)
	Female	11(73.33%)
Age (M $\pm$ SD)		77.93 ± 3.97
Education in Years (M $\pm$ SD)		6.53 ± 3.58
Living Arrangement	Alone	10(66.67)
	Couple	4(26.67)
	Children	1(6.66)
Maid	Full Time	0(0.00)
	Part Time	9(60.00)
	Without Maid	6(40.00)

47.5 million people are living with neurocognitive disorder worldwide and the prevalence is expected to double every 20years¹⁷. Healthy elderly people are also at swelled risk of developing neurocognitive impairment

(20%–50% over a period of 2–3years), and the fact that the drug is not the best treatment in the case of symptoms emphasizes the importance of nonpharmacologic early intervention^{18, 19}.

Cognitive State and Activity Participation: Table 3 shows the changes in cognitive state, and activity participation after the intervention. The MMSE-DS was used for the evaluation of cognitive state. A statistically difference was showed between the pre and the post-test($p=0.011$). Many previous studies have reported that cognitive stimulation activity helps prevent cognitive decline in the elderly. These programs provide positive effects of keeping or enhancing cognitive function and may stave off or slow the advance to neurocognitive impairment^{20, 21}. In a study that used CBT as intervention, the MMSE score of the experimental group significantly increased, which agreed with the result of this study²².

Table 3: Comparison of Activity Participation by Area in Pre and Post-test

Variable		Pre-test	Post-test	p
		Mean $\pm$ SD	Mean $\pm$ SD	
MMSE-DS		22.00 ± 1.51	23.87 ± 1.35	0.011*
K-ACS	IADL	68.21 ± 3.12	69.76 ± 2.31	0.383
	Leisure	70.32 ± 4.11	80.98 ± 2.12	0.034*
	Social Activities	65.04 ± 4.82	78.18 ± 6.34	0.028*

* $p < 0.05$. MMSE-DS: Mini-Mental State Examination for Dementia Screening, K-ACS: Korean Activity Card Sort, IADL: Instrumental activities.

The K-ACS examines the activity participation level. According to the results, there were significant differences between leisure ($p=0.034$) and social activities($p=0.028$). The mean instrumental activities score increased, from 68.21 ± 3.12 to 69.76 ± 2.31 , but this was not significant ($p=0.383$). This is similar to the result of a study that meaningful activities through the intervention are an important factor on the life of elders. However, the instrumental activities score showed no statistically significant differences. This result seems to be due to lack of the area related to daily life in the intervention program. Most of the instrumental activities are dependent on the guardians, and the elders with mild cognitive impairment could not do them by themselves. Furthermore, it is difficult to directly train instrumental activities during CBT. Baek et al. assessed the ACS for three subjects after

individual home occupational therapy, all three of them showed improvements in the ability of living, two of them showed improvements in leisure activities, and only one of them showed improvement in social activities²³. This is different from the result of this study because the study design, intervention method, and the number subjects are different. Many previous studies acknowledged the importance of activities in the quality of life of the elders and researched the patterns, levels, and frequencies of the activities because “the fact that people are involved in activities means that they are alive.” In particular, ACS is used in many countries as an assessment tool for the performance level of activities of the elders. The ACS is often used as an assessment tool for the degree of involvement of the subject in rehabilitation areas. However, there were no previous studies that provided CBT as treatment for subjects with MCI or neurocognitive impairment and assessed their ACS.

This study has several possible limitations. First, the number of subjects was small size to generalize the results to a larger population of participants. Second, the K-ACS has a simple advantage that it is a self-measuring tool, but it has the disadvantage that it can not accurately determine or measure the actual participation. Because this study was conducted with group therapy activities, there are limitations in providing individualized intervention to individual subjects. In the future, personal care services provided to patients with mild cognitive impairment should help individuals participate in activities rather than housework.

Conclusion

Participation in activities is an ideal ways of sustaining physical and mental functioning and feeling happiness in life. However, limiting activity is a matter of a realistic elderly person who negatively affects individuals by their personal and social impacts. Therefore, in this study, we analyzed the difference of activity by providing intervention to MCI whose activity decreased. Using the results of this study as basic data, it is necessary to promote social participation of the senior citizens living in the community so that the senior citizens are not bored and alienated at home. These results will be linked to the job creation and community care of the elderly that the Korean government is currently pursuing.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Grid Recognition among Radiological Technologists in South Korea

Min-Cheol Kim¹, Cheong-Hwan Lim², Sung-Hun Jung³

¹Research Scholar, ²Professor, Dept. of Health Care, Hanseo University; ³Research Scholar, Dept. of Radiology, Seosan Jung-Ang Hospital

ABSTRACT

This research was to examine how radiological technologists use and perceive grids. The study entailed a survey of 201 radiological technologists working in Korean medical institutions (general and specialty hospitals and a clinic). Its aim was to improve their use of grids and to provide basic data about grids. A survey was conducted of 201 radiological technologists working in Korean medical institutions regarding the relationships between grid ratio and dose and between grid ratio and video quality as well as differences in video quality and in dose between mobile and fixed grids. There were also five questions on respondents' sociodemographic characteristics. There were significant differences in recognition of adequate grid ratios and of the relationship between grid ratio and dose among radiological technologists working in different types of medical institutions ($p < 0.01$). Technologists at the clinic level showed the highest recognition that their currently installed grid ratios were adequate. There were also significant differences in recognizing the differences in video image and dose between mobile and fixed grids depending on the different types of medical institutions and differing work durations ($p < 0.05$). To improve image quality and reduce patients' exposure doses, it is desirable that there be proper education on grids.

Keywords: Grid, Grid ratio, Adequacy, Recognition, Radiological technologists

Mathematics Subject Classification: 92C15, 92C55

Journal of Economic Literature (JEL) Classification : I19

Introduction

Modern medicine has made much progress. Development of diagnostic radiation devices has brought about synergy effects that enable precise diagnosis in the medical field while improving the quality of medical treatments at the same time. In particular, as part of information technology developments, signal systems were developed that receive and develop images from diagnostic radiation devices.¹ As the image receptors of the film in film-screen systems and existing analogy

systems were replaced by computed and digital radiography, image quality improved greatly.² Image quality is determined by the software processing in digital radiography systems and by grids and filters that eliminate scattered rays. In particular, grids can improve image contrast by first removing the scattered rays generated when passing through the subject.³ High grid ratios greatly reduce scattered rays, which improves images but also increases attenuation of the primary rays, which necessarily increases patients' exposure doses.⁴ Companies that sell diagnostic radiation devices often use high grid ratios to highlight the superior quality of their images. In the past, the grid ratios of diagnostic radiation devices were 8:1–12:15 but now the ratios are 14:1–16:1 and the devices have set values.^{6,7} Despite the importance of selecting and using appropriate grid ratios, there is little research on the subject. The aim of this study, by offering adequate grid ratios and highlighting

Corresponding Author:

Cheong-Hwan Lim
Professor, Dept. of Health Care,
Hanseo University, Korea
Email: lch116@hanseo.ac.kr

changes in image quality depending on grid changes and evaluation, was to reduce exposure doses in not only patients but also radiological technologists. Toward that end, this research entailed conducting a survey of radiological technologists working in various medical institutions in Korea to analyze current grid usage and recognition. The specific intent was to improve technologists' grid use and provide basic data on grids.

Research Target and Method

Research Objects: The target of this questionnaire survey was Korean radiological technologists working in general, university, or other hospitals or in clinics. The period for data collection was from August 1, 2017, to December 31, 2017, and the surveys were distributed by e-mail and paper mail. Two hundred and one technologists returned their surveys, and all surveys were used for statistical analysis. The average age of the respondents was 33.91 years old, with the majority, 47.5%, in their 30s. Just under half 49.3 were technical college graduates, and another 44.8% were university graduates. Average work experience was 8.30 years, and the majority of technicians, 57.2%, worked in general hospitals. Average age of respondents was 33.91 years old, and, among the respondents, those in their 30s took the largest proportion (47.5%). Technical colleges graduates were 49.3%, and university graduates were 44.8%. Average work years were 8.30 years. The majority of them (57.2%) were in general hospitals (Table 1).

Table 1: Characteristics of Research Subjects

Sortation		N	%
Gender	Man	150	74.6
	Woman	51	25.4
Age	20s	65	32.8
	30s	94	47.5
	40s	33	16.7
	50s	6	3.0
Academic background	Associate degree	99	49.3
	Bachelor	90	44.8
	Master	7	3.5
	Doctor	5	2.5

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A hospital career	~3 years	50	24.9
	4 ~ 7 years	60	29.9
	8 ~ 10 years	37	18.4
	11 ~ 15 years	29	14.4
	16 years over	25	12.4
The type of medical institutions	clinic	3	1.5
	general hospital	23	11.4
	university hospital	60	29.9
	hospital	115	57.2
N= Number of persons, %=Percent			

Measuring Tool: To assess the radiological technologists' grid recognition, a five item questionnaire was developed to evaluate their knowledge on appropriate grid ratios, the relationships between grid ratio and dose and between grid ratio and image, and the image and dose differences between moving and stationary grids. The face validity of the five items was obtained from a supervising professor and from doctoral students majoring in radiation. The questions were rated on 5-point Likert scales where higher scores indicated better grid knowledge. For the analyses, individual questions were used, but they were not scaled

Method of Data Analysis

To verify the validity of the questionnaire, data analysis consisted of frequency, mean difference, and crossover analyses using SPSS for Windows ver. 21.0. First, frequency analysis was carried out to identify sociodemographic and career characteristics. Second, t tests and one-way ANOVA were performed to identify the differences in grid recognition based on the participants' sociodemographic and career characteristics.

Results

Recognition of Adequate Grid Ratios: There were significant differences in recognition of adequate grid ratios in diagnostic radiation depending on the type of medical institution [$F = 4.837$, $p < 0.01$]. Because the differences between groups were not significant in ex-post analysis, average values were analyzed, and there were differences. The proportion of those who perceived that grid ratios were adequate was the highest among clinic technicians, followed by those working in general and specialty hospitals (Table 2).

Table 2: Recognition of Adequate Grid Ratios

Sortation		N	M	S.D	t/F-value	Duncan
Gender	Man	146	2.79	.483	-.370	-
	Woman	51	2.82	.478		
Age	20s	62	2.81	.568	.209	N.S
	30s	93	2.77	.445		
	40s	33	2.85	.442		
	50s	6	2.83	.408		
Academic Background	Associate Degree	98	2.81	.490	.042	N.S
	Bachelor	87	2.79	.486		
	Master	7	2.86	.378		
	Doctor	5	2.80	.447		
A Hospital Career	~3 years	47	2.85	.551	1.115	N.S
	4 ~ 7 years	60	2.70	.497		
	8 ~ 10 years	36	2.89	.398		
	11 ~ 15 years	29	2.83	.468		
	16 years over	25	2.80	.408		
The Type of Medical Institutions	Clinic	3	3.00	.000	4.837**	a
	General Hospital	23	2.96	.367		
	University Hospital	60	2.62	.524		
	Hospital	111	2.86	.457		

**p<0.01 N= Number of persons, M=Mean, SD=Standard Deviation

Recognition of the Relationship between Grid Ratio and Dose: The technologists' differences in recognizing that higher grid ratios entailed higher doses differed significantly by type of medical institution ($F = 4.073$, $p < 0.01$), (Table 3).

Table 3: Recognition of the Relationship between Grid Ratio and Dose

Sortation		N	M	S.D	t/F-value	Duncan
Gender	Man	150	2.28	.625	-.587	-
	Woman	50	2.34	.626		
Age	20s	65	2.31	.610	2.137	N.S
	30s	93	2.32	.628		
	40s	33	2.27	.626		
	50s	6	1.67	.516		
Academic Background	Associate Degree	99	2.28	.686	.454	N.S
	Bachelor	89	2.33	.560		
	Master	7	2.29	.756		
	Doctor	5	2.00	.000		
A hospital Career	~3 years	50	2.36	.631	.932	N.S
	4 ~ 7 years	59	2.32	.628		
	8 ~ 10 years	37	2.22	.672		
	11~ 15 years	29	2.38	.561		
	16 years over	25	2.12	.600		

Conted...

The Type of Medical Institutions	Clinic	3	1.67	.577	4.073**	a
	General Hospital	23	2.17	.778		ab
	University Hospital	60	2.50	.537		b
	Hospital	114	2.23	.610		ab
**p<0.01 N= Number of persons, M=Mean, SD=Standard Deviation						

Recognition of the Relationship between Grid Ratio and Image Quality: There were significant differences in recognizing that higher grid ratios resulted in higher image quality, also by type of medical institution ($F = 5.304$, $p < 0.01$), (See Table 4).

Table 4: Recognition of the Relationship between Grid Ratio and Image Quality

Sortation		N	M	S.D	t/F-value	Duncan
Gender	Man	150	2.23	.699	-1.449	-
	Woman	51	2.39	.603		
Age	20s	65	2.32	.640	.978	N.S
	30s	94	2.27	.691		
	40s	33	2.24	.751		
	50s	6	1.83	.408		
Academic Background	Associate Degree	99	2.19	.724	1.723	N.S
	Bachelor	90	2.39	.612		
	Master	7	2.14	.900		
	Doctor	5	2.00	.000		
A Hospital Career	~3 years	50	2.32	.621	1.005	N.S
	4 ~ 7 years	60	2.27	.686		
	8 ~ 10 years	37	2.19	.776		
	11 ~ 15 years	29	2.45	.572		
	16 years over	25	2.12	.726		
The Type of Medical Institutions	Clinic	3	2.67	1.155	5.304**	a
	General Hospital	23	2.04	.706		
	University Hospital	60	2.53	.596		
	Hospital	115	2.17	.666		
**p<0.01 N= Number of persons, M=Mean, SD=Standard Deviation						

Recognition of Dose Differences between Mobile and Fixed Grids: There were significant differences in the radiological technologists' recognition of the dose differences between mobile and fixed grids by type of medical institution ($F = 2.770$, $p < 0.05$), (Table 5).

Table 5: Recognition of the Dose Differences between Mobile and Fixed Grids

Sortation		N	M	S.D	t/F-value	Duncan
Gender	Man	150	2.63	.871	-.237	-
	Woman	50	2.66	.823		
Age	20s	65	2.52	.687	.835	N.S
	30s	94	2.73	.941		
	40s	33	2.58	.902		
	50s	6	2.67	1.033		

Conted...

Academic Background	Associate Degree	99	2.65	.884	1.770	N.S
	Bachelor	89	2.62	.805		
	Master	7	3.14	1.215		
	Doctor	5	2.00	0.000		
A Hospital Career	~3 years	50	2.52	.614	.788	N.S
	4 ~ 7 years	60	2.60	.764		
	8 ~ 10 years	37	2.84	1.214		
	11 ~ 15 years	28	2.61	.832		
	16 years over	25	2.68	.900		
The Type of Medical Institutions	Clinic	3	3.00	1.732	2.770*	b
	General Hospital	23	2.17	.834		a
	University Hospital	60	2.65	.709		ab
	Hospital	114	2.71	.890		ab

*p<0.05 N= Number of persons, M=Mean, SD=Standard Deviation

Recognition of the Differences in Image Quality between Mobile and Fixed Grids: There were significant differences in the technologists' recognition of the differences in image quality between mobile and fixed grids by duration of work experience ($F = 3.020$, $p < 0.05$) and by type of medical institution ($F = 3.761$, $p < 0.05$), (Table 6).

Table 6: Recognition of the Differences in Image Quality between Mobile and Fixed Grids

Sortation		N	M	S.D.	t/F-value	Duncan
Gender	Man	150	2.59	.876	.047	-
	Woman	50	2.58	.810		
Age	20s	65	2.52	.664	.541	N.S
	30s	94	2.64	.926		
	40s	33	2.48	1.004		
	50s	6	2.83	.983		
Academic Background	Associate Begree	99	2.55	.884	1.419	N.S
	Bachelor	89	2.61	.778		
	Master	7	3.14	1.215		
	Doctor	5	2.20	1.095		
A Hospital Career	~3 years	50	2.58	.702	3.020*	ab
	4 ~ 7 years	60	2.37	.663		a
	8 ~ 10 years	37	2.97	1.166		b
	11 ~ 15 years	28	2.61	.737		ab
	16 years over	25	2.52	1.005		a
The Type of Medical Institutions	Clinic	3	3.67	1.528	3.761*	b
	General Hospital	23	2.17	.717		a
	University Hospital	60	2.68	.725		
	Hospital	114	2.59	.900		

*p<0.05 N= Number of persons, M=Mean, SD=Standard Deviation

Discussion and Conclusion

In radiologic imaging, grids improve image contrast primarily by removing the scattered rays generated when X-rays pass through patients during normal scanning. However, high grid ratios lead to greatly reduced scattered rays and increased attenuation of the primary rays, which results in higher patient exposure doses.⁸ Specifically, grid functions vary depending on the first ray transmittance, scattered ray transmittance, and total dose transmittance; transmittance can be broader or narrower depending on grid ratio. However, as grid ratio increases, grid function decreases, and exposure rate necessarily increases.⁵ The grid ratio is the ratio of the height of the lead foil to the distance between the lead foils.⁹ High grid ratios increase the removal rate of the scattered rays, but it also increases the absorption of the primary rays in the grid, which increases the number of shoots. Additionally, the higher the grid ratio, the greater the contrast.¹⁰ However, because the dose increases at low tube voltage, which in turn increases the exposure dose, the grid should be selected based on tube voltage.⁴ The current standard is that during high tube voltage shooting, the grid ratio should be 10:1 or 12:1, during low tube voltage shooting, the ratio should be 8:1, and when shooting the head, spine or abdomen, the ratio should be 6:1 or 8:1.⁶ Because of the high radiation exposure doses with grids, radiological science departments are currently teaching students to use non-grid devices to examine thin subjects.¹¹ However, the digital radiography equipment for clinical use does not allow non-grid examination because grids are attached, and thus, patient exposure doses are increasing. Also, despite the fact that the grids are easily attached and detached, technologists do not remove the grids during examinations because they are not aware of non-grid examinations.¹² In this study, the technologists' scores for recognizing the relationship between grid and dose averaged 2 points on a 5-point scale ($p < 0.05$), which was very low. In this study, the Korean radiological technologists averaged a score of 2 on a 5-point scale for grid recognition, which was considered somewhat low. There were significant differences in recognizing grid ratio adequacy as well as recognizing the relationships between grid ratio and dose and between grid ratio and image quality depending on the technologists' personal characteristics and type of medical institution.

Based on the findings of low grid recognition among the Korean radiological technologists in this study, it appears that better education on grids is needed in order to enhance image quality while reducing patients' radiation exposure doses.

Ethical Clearance: Not Required

Source of Funding: Self

Conflict of Interest: Nil

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Automatic Exposure Control in Chest Radiography

Sung-Sik Choi^{1,4}, Cheong-Hwan Lim², Sung-Hun Jeoung³

¹Research Scholar; ²Professor; Dept. of Health Care, Hanseo University; ³Research Scholar Dept. of Radiology, Seosan Jung-Ang Hospital; ⁴Research Scholar Dept. of Radiology, Ajou University Hospital

ABSTRACT

Recent advances in medical imaging technologies have led to the increased use of automatic exposure control (AEC) in digital X-ray equipment. This study is an attempt to measure the dose of exposure based on AEC use and to evaluate the image quality in chest radiography where AEC is used most frequently. We measured the dose of radiation using three (3) units of digital radiation generators for diagnosis in conditions that are frequently used in chest radiography (110kVp, 115kVp, 120kVp, 125kVp). We placed the dosimeter in front of a chest phantom while varying the distance of FID to 110 cm, 140 cm, and 180 cm depending on whether or not AEC was used. The CNR and SNR of the images obtained by setting the lung to signal, 5 regions of Interest (ROIs), and 5 places of media sternum to noise, were measured using the Image J Program. To determine the dose difference based on AEC use, we conducted a t-test, which revealed a significant difference. When AEC was used at FID 110 cm, a high dose of 11.98% appeared. When AEC was used at FID 140cm, a high dose of 8.64% appeared. When AEC was used at FID 180 cm, a high dose of 6.74% appeared. In the t-test for the difference in CNR and SNR based on AEC use, no significant difference was detected. As the distance of FID increased, high values of CNR and SNR were measured. The results of this study show that there is no difference between CNR and SNR regardless of the use of AEC, and the dose was high when using AEC. Therefore, chest X - ray examination should not be based on AEC only. Under appropriate radiological settings, it is possible to reduce unnecessary radiation exposure to the patient.

Keywords: Automatic exposure control, Chest radiography, Exposure doses, CNR, SNR

Mathematics Subject Classification: 92C55, 92C50.

Journal of Economic Literature (JEL) Classification : I19

Introduction

In the medical field, radiology equipment and facilities are evolving rapidly due to advances in science^{1,2}. Advances in computer technology facilitate dose determination for radiation based on factors such as the examination area of the patient, body shape, and the status of adult or child. However, in reality, it is impossible to determine the most appropriate conditions for patient examination. Several medical institutions introduced Automatic Exposure Control (AEC), first introduced by Morgan in 1942. AEC is a device that allows automatic

adjustment of the appropriate radiation dose for the concentration of the image using an ionization chamber³. Even when it is an identical examination or identical area in normal radiology, examination conditions are tailored to the patient. However, in many hospitals, it is impossible to consider the patient's body shape or condition each time the examination is performed. Therefore, AEC is used to automatically set the required test conditions, most commonly used in chest radiography⁴⁻⁸. The use of AEC has expanded the area of diagnosis by facilitating the examination of the mediastinal region that was not possible in the analog system, despite the poor reliability^{3,7}. In the case of AEC, three ionization chambers are used. If the position of the ionization chamber and the position of the patient do not coincide with each other, an error occurs in the calculation of the radiation dose, resulting in an increase in the exposure dose. To correct this situation, equipment companies

Corresponding Author:

Cheong-Hwan Lim

Professor, Hanseo University, Korea

Email: lch116@hanseo.ac.kr

install AEC inside an Image Detector (Table Detector, Stand Buck), although many medical institutions do not use this equipment³. The purpose of this study is to analyze the radiation doses based on AEC use in chest radiography in order to provide directions for improved AEC use and to provide basic data for AEC study.

Materials and Method

Measuring Instrument: We used a Global 1 Platform (R-150-800, GE Healthcare, USA), FDR AcSelerate (R-150-1000, Fuji film, Japan), and DRX-Evolution (R-150-800, Carestream, USA), digital radiation generators for diagnosis of A hospital that is located in S city of Korea (Fig1, 2, 3). As the phantom for image acquisition and dose measurement, a human-body shaped multi-purpose Chest Phantom N1 “LUNGMAN” (Kyoto Kagaku, Japan) was used (Fig4). Dose measurement was performed using Unforce Thin X RAD Dosimeter (Raysafe, Sweden), (Fig 5).



Figure 1: Global 1 Platform



Figure 2: FDR AcSelerate



Figure 3: DRX-Evolution

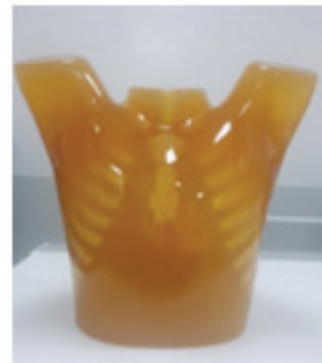


Figure 4: Chest Phantom N1



Figure 5: Unforce Thin X RAD

Experimental Method: To acquire images for dose analysis, a chest phantom was placed in front of the detector, and AEC mode was selected while varying the distance between the detector and the tube, the distance of FID to 180 cm, 140 cm, and 110 cm, under conditions commonly used in chest radiography (110kVp, 115kVp, 120kVp, 125kVp). In order to compare exposure doses based on AEC use, images were acquired under the same chest examination conditions without selecting AEC mode, and the dose was analyzed. Radiation doses were measured by placing the dosimeter in front of the chest phantom.

Image Evaluation: For image evaluation, Signal-to-Noise Ratio (SNR) and Contrast-to-Noise Ratio (CNR) of the images obtained using a chest phantom were measured by setting the lung part to signal, 5 places of ROI, and 5 places of medial sternum to noise using the Image J Program. The obtained images were evaluated with SNR and CNR based on whether or not AEC was used and the variation of FID distance (180 cm, 140 cm, and 110 cm), (Fig 6).



Figure 6: Image Evaluation Point

For measurement values of ROI, we obtained the minimum, maximum, average, and standard deviation

values respectively, and based on these values measured SNR and CNR⁹.

Results

Dose Based on AEC Use: To determine dose difference based on AEC use, an independent t-test was carried out. When AEC was used, the average dose was measured as 182.33 μ Gy at FID 110 cm, 143.67 μ Gy at 140 cm, and 128.17 μ Gy at 180 cm. In the absence of AEC, the average dose was 162.83 μ Gy at FID 110 cm, 132.25 μ Gy at 140 cm, and 120.08 μ Gy at 180 cm. The dose difference was statistically significant based on AEC use: It was 11.98% higher when using AEC at FID 110 cm ($p < 0.01$). When using AEC at FID 140cm. the dose difference based on AEC use was 8.64% higher, which was statistically significant again ($p < 0.01$). When using AEC at FID 180cm, the dose difference based on AEC use was 6.74% higher, which was a statistically significant difference ($p < 0.05$). The dose difference based on AEC use was measured higher as FID was closer (Table 1).

Table 1: Dose Based on AEC Use

Distance	AEC Use	N	M(SD)	t-value
110cm	Use	12	182.33(61.364)	3.768**
	Not Use	12	162.83(47.551)	
140cm	Use	12	143.67(56.269)	3.921**
	Not Use	12	132.25(51.879)	
180cm	Use	12	128.17(53.349)	2.386*
	Not Use	12	120.08(46.424)	
N=Number of Samples, M= Mean, SD=Standard Deviation				

CNR Based on AEC Use: To determine dose difference based on AEC use, an independent t-test was carried out as shown in table 2. CNR based on AEC use was measured as 5.59 when AEC was used at FID 110 cm, and it was measured as 5.57 when AEC was not used, and there was no statistically significant difference. CNR based on AEC use was 5.96 when AEC was used at FID 140cm. CNR was 5.95 when AEC was not used, and there was no significant statistical difference. CNR based on AEC use was 6.44 when AEC was used at FID 180cm, and it was 6.45 when AEC was not used, and there was no statistically significant difference. As FID increased, CNR value remained elevated. There was no difference in CNR value between the times when AEC was used and when AEC was not used (Table 2).

Table 2: CNR Based on AEC Use

Distance	AEC Use	N	M(SD)	t-value
110cm	Use	12	5.59(.087)	1.362
	Not Use	12	5.57(.077)	
140cm	Use	12	5.96(.167)	.581
	Not Use	12	5.95(.162)	
180cm	Use	12	6.44(.103)	.804
	Not Use	12	6.45(.117)	
N=Number of Samples M= Mean SD=Standard Deviation				

SNR Based on AEC Use: To determine dose difference based on AEC use, an independent t-test was carried out as shown in table 3. SNR based on AEC use was 7.50 when AEC was used at FID 110 cm, and it declined slightly to 7.48 when AEC was not used, without any statistically significant difference. SNR based on AEC use was 7.92 when AEC was used at FID 140cm, and it was 7.91 when AEC was not used, and no statistically significant difference was noted. SNR based on AEC use was 8.48 when AEC was used at FID 180cm, and it was 8.44 when AEC was not used, suggesting lac of ant statistically significant difference. As FID increased, the SNR value increased. No difference in SNR value was observed with or without AEC(Table 3).

Table 3: SNR Based on AEC Use

Distance	AEC Use	N	M(SD)	t-value
110cm	Use	12	7.50(.128)	1.362
	Not Use	12	7.48(.134)	
140cm	Use	12	7.92(.266)	.581
	Not Use	12	7.91(.267)	
180cm	Use	12	8.48(.172)	.804
	Not Use	12	8.44(.155)	
N=Number of Samples M= Mean SD=Standard Deviation				

Discussion and Conclusion

The International Commission on Radiological Protection states that all medical exposures should be justified just like occupational exposures. As Low As Reasonably Achievable (ALARA) exposures are recommended according to the principle of optimization. The principle of justification should remain as low as reasonably achievable based on the frequency of individual radiation exposure, and the economic and social factors determining the exposure of individuals and groups¹⁰. As medical exposures increase, the principle of optimization is further emphasized. In the case of medical radiation, the patient should be evaluated under appropriate examination conditions based on the patient's body shape and condition. In a report entitled "Reduction of patient dose in X-ray chest radiography based on AEC use," Jung et al. stated that the dose variation depended on the position of the ionization chamber that is an AEC sensor⁴. They also reported that the function of AEC, which is widely used in chest

radiography, should not be unconditionally relied on, and that the position of the sensor in ionization chamber must match the position of the examination area in order to minimize and optimize exposure. Our results of the patient dosage based on AEC use varied depending on the distance. At a distance of 110 cm, the doses were 182.33 μ Gy and 162.83 μ Gy, respectively. At a distance of 140cm, the doses were 143.67 μ Gy and 132.25 μ Gy, respectively, and at a distance of 180 cm, the doses were 128.17 μ Gy and 120.08 μ Gy, respectively. Therefore, it was possible to identify a higher dose under AEC compared with the lack of AEC. Lee et al. reported that as sensitivity increased, the dose of exposure decreased, and better image quality was obtained^{7,11}. In the present study, image evaluation based on whether or not AEC was used showed CNR was 5.59 and 5.57, respectively at a distance of 110 cm. At a distance of 140cm, CNR was 5.96 and 5.95, respectively, and at a distance of 180 cm, CNR turned out to be 6.44 and 6.45, respectively. Similarly, SNR was 7.50 and 7.48, respectively, at a distance of 110 cm. At a distance of 140cm, SNR was 7.92 and 7.91, respectively, and at 180cm, SNR scored 8.48 and 8.44, respectively. Therefore, in the cases of both CNR and SNR, similar images were obtained regardless of whether AEC was used or not. The results were similar to those reported by Lee et al. Hence, it is believed that the findings of this investigation will facilitate the determination of the use of AEC depending on patient characteristics using diagnostic radiation generators with AEC of each medical institution. It is also expected that our findings will lead to reduced exposure of patients and the radiation workers by providing quality imaging data and accurate dose information. Ultimately, our findings will contribute to the reducing the exposure dosages for the entire nation.

The study facilitated the determination of dose generation when using AEC. CNR and SNR did not show any difference in terms of image quality regardless of AEC use. We also identified that quality images can be obtained in chest X-ray examination when FID was 180 cm. Therefore, it appears that needless radiation exposure to patients can be reduced by manually setting appropriate examination conditions instead of relying exclusively on AEC.

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Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Development of a New Compression Paddle for Enhanced Image Acquisition During Mammography

Dong-Hee Hong¹, Hong-Ryang Jung², Cheong-Hwan Lim²

¹Dept. of Radiology Science, Shinhan University, 95, Hoam-ro, Uijeongbu, Gyeonggi, 11644, Republic of Korea; ²Dept. of Radiology Science, Hanseo University, 46, Hanseo 1-ro, Daegok-ri, Haemi-myeon, Seosan-si, Chungcheongnam-do, 31962, Republic of Korea

ABSTRACT

In this study, the shape and function of a mammography compression paddle was revised and investigated with regard to contrast and image quality in patients with pectus carinatum.

The center of the novel compression paddle surface had a radius of curvature of the contact area with the chest wall. The double structure of the compression paddle frame provided sufficient contact with the chest wall and reduced pain. Springs in the back allowed an open space of 30 mm. We compared the increasing rate of total area and posterior nipple line (PNL) and the image surface plot.

With the newly developed compression paddle, the averaged increasing rate of the total area in 10 patients with pectus carinatum was 9.65% and 6.96% in the craniocaudal (CC) and mediolateral-oblique (MLO) directions, respectively; the averaged increasing rate of the PNL was 9.18% and 4.55% in the CC and MLO directions, respectively; and the averaged increasing rate of the breast length side chest wall was 3.97% in the CC direction. The newly developed compression paddle appeared to contain more breast tissue without degradation in image contrast and quality.

The novel breast compression paddle was streamlined, thereby reducing friction with the chest wall. It also contained substantial breast tissue because the springs make it possible to move back and forth to match breast chest size.

The developed compression paddle will provide a wider diagnostic range for mammography.

Keywords: Mammography, Device, Compression paddle, Carinatum, Caraniocaudal (CC), Mediolateraloblique (MLO)

Mathematics Subject Classification: 51M25, 92C50

Journal of Economic Literature (JEL) Classification: I119

Introduction

It is important to treat breast cancer at an early stage before symptoms appear; therefore, the importance of mammography is rising. In the past, mammography was conducted only for the diagnosis and management

of patients with symptoms. However, it is important to monitor changes over time because breast diseases are more likely to develop into cancer. For this reason, clinicians need to conduct screening tests universally and systematically for women with and without symptoms^{1,2}.

Mammography is divided, based on its purpose, as a screening test or a diagnostic test. A screening test is a basic test conducted in the craniocaudal (CC) and mediolateral-oblique (MLO) directions³.

Pressure on the breasts in mammography improves resolution by holding the image receptor and breasts

Corresponding Author:

Hong-Ryang Jung
Professor, Dept. of Radiology Science,
Hanseo University, Korea
Email: hrjung@hanseo.ac.kr

closely together, and increases the quality of the image by reducing the thickness of the breasts. Additionally, it can make the image clear by separating the image from folded breast tissues, enhancing the contrast, and reducing the exposure dose^{4,5}.

However, the end of the image recipient and the compression paddle has straight lines. As a consequence, patients with pectus carinatum complain of pain because of friction from the compression paddle, and the image fails to include the inside and outside of the breast tissue.

Pectus carinatum is characterised by excessive protrusion of the chest wall. Hippocrates called the condition “pointed chest,” and its frequency is 0.06%⁶. However, this statistic was derived only from women who have been diagnosed with pectus carinatum. More women are expected to have pectus carinatum as it becomes frequently seen in mammography.

Breast cancer tests are conducted using sonography, magnetic resonance imaging, and computed tomography (CT). Magnetic resonance imaging has the highest sensitivity for women in their 30s, but its high cost and false-positive results prevent it from being applied to the average woman. For conditions that breast cancer testing is recommended at least once a year, CT is inappropriate as a screening test because of the large radiation exposure dose. However, sonography is inexpensive and does not have a large exposure dose; but its detectability of calcification, which is a marker of malignant breast cancer, is lower than that of mammography, which uses radiation. For a breast cancer test, it is therefore most appropriate to recommend mammography using general X-ray imaging as the screening test. The development of a new compression paddle is needed to expand the value and diagnostic area of the image.

In this study, compression paddles were developed that can be applied to women with pectus carinatum and normal people. The end of the compression paddle is round, somewhat like the chest, to depict the breast tissues as much as possible, and the frame of the compression paddle is devised to move back and forth to fit the form of an individual's chest. This study aimed to develop compression paddles with high diagnostic utility by obtaining images through applying conventional compression paddles and the newly developed compression paddles to patients with pectus carinatum form of normal. This study also aimed to evaluate the newly developed compression paddles,

after comparing the increasing rate of the total area and posterior nipple line (PNL) and image surface plots of the newly developed compression paddle with those of the conventional paddle in mammography.

Materials and Method

Materials

Mammography: Images of the breasts of women with pectus carinatum were obtained using the newly developed compression paddle. A digital X-ray mammography unit (Alpha ST; GE Healthcare, Milwaukee, Wisconsin, USA) was the equipment used. The target/filter combination of the equipment was Mo/Mo, and the computed radiography type of field of view was 18×24 cm.

Utility Evaluation: After obtaining images using the currently used compression paddles and the newly designed compression paddles through a Digital Imaging and Communications in Medicine (DICOM) file, the images were evaluated using Image J (version. 1.49h, Wayne Rasband, National Institutes of Health, USA), a digital image analysis program provided by the United States National Institutes of Health (NIH, Bethesda, MD, USA). With the Image J program, the utility of the obtained images were evaluated by measuring the whole area of the breasts and the length of the breast on the chest side and the PNL.

Method

Study Participants: The target of the study was female patients with pectus carinatum who were requesting mammography. They were recruited from five hospitals in Seoul, Korea from August 20, 2014 to September 30, 2014. The patients were in their 30s to 40s and weighed more than 50 kg. The study received approval from our Institutional Review Board. A test with the conventional compression paddle was conducted first. After obtaining the patients' written agreement to participate in the study, two images were tested, which included one image in the craniocaudal direction and the second image in the mediolateral direction, using the newly developed compression paddle.

To acquire images of female patients with pectus carinatum who visited the hospital, we conducted a test using the same amount of pressure for the craniocaudal direction and mediolateral direction. We acquired the images through a DICOM file and Joint Photographic

Experts Group (JPEG) file. We measured, compared, and evaluated the size of the whole breast area, the surface plot, and the length of the PNL using Image J software (NIH).

Statistical Analysis: To evaluate significance, based on the effective area of the pressed area through the compression paddle, SPSS statistical software (ver. 22; SPSS, Chicago, IL, USA) was used. The Wilcoxon signed-rank test, a nonparametric test, was conducted as a paired t-test to analyse the pressure effective area obtained by the developed compression paddle. P value less than 0.05 was considered to be statistical significance.

Results

Development of the new compression paddle for mammography

The plan and design of the new compression paddle for mammography: The conventional breast compression paddle is rectangular with flat sides that press the breasts in parallel with the grid sides of the chest. However, the actual model of the human body is a bit convex, which makes the inner and outer parts of the breasts out of the sight of the pressed area on an image when pressing. Therefore, we curved the part that touches the chest side of the compression paddle and applied a spring to make it move back and forth automatically by giving mobility through the protrusion side of the chest wall.

As show figure 1, to determine the size of the curve, CT images of 10 people—five people with a slim body type and five people with a large body type—were used for measurements. The size of the protrusion depends on the size of the ribcage. Two CT specialist radiological technologists and one radiologist comprised the radiological team. For measurement, the spot from the second rib to the sixth rib, which is the anatomical position of the breast, was the reference point. We drew a vertical line from the centre of the body to the end of the body surface to get the chest height of Rib 2 and Rib 6, respectively. Rib 2 had a thickness of 115–175 mm and Rib 6 had a thickness of 155–215 mm, an average difference of 40 mm. There was a 5 mm margin of error, depending on the body type. The end of the breast compression paddle was accordingly constructed with a 10 mm curvature radius and a 30 mm curvature radius. To correct for differences in the chest walls of between

individuals, 40–50 mm of mobility was secured by inserting a spring to allow the breast compression paddle to move back and forth.

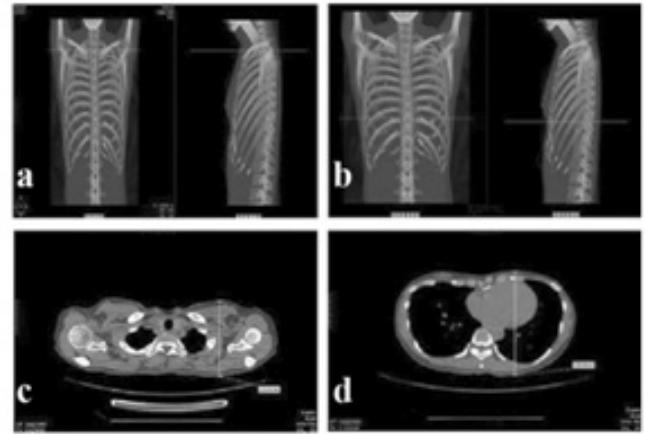


Figure 1: Measurement of the chest length at rib 2 (a and c) and rib 6 (b and d) using computed tomography

Production of the compression paddle for mammography: The length of the receptor of the mammography units was 180×240 mm, and the side size of the breast starting from the nipple of the chest phantom on chest CT was 172.3 mm. Based on this information, 40 mm was spaced out from both ends of the side that touches the chest wall side of the compression paddle, and the length of the radius of curvature was 160 mm. The thickness of the compression paddle was 30 mm, which is like that of the conventional compression paddle and meets the standard of less than 40 mm that the Ministry of Food and Drug Safety (Seoul, Korea) regulates. To prevent the breast tissue from going up on the compression paddle when pressing, it was raised vertically against the surface of the compression paddle with 55 mm of height.

The radius of curvature of the compression paddle surface on the chest wall side of the compression paddle was 10 mm and 30 mm. For the compression paddle with a size of 30 mm, too much of the breast tissue was missing. It therefore had a greater loss of breast tissue, compared to the conventional compression paddle. As a result, the radius of curvature of 30 mm was excluded and 10 mm was used instead. The conventional compression paddle frame has the simple role of supporting and fixing the compression paddle, whereas the developed compression paddle frame adds mobility to the chest side by allowing vertical movement. As show figure 2 and figure 3, this is to supplement the degree to which

the compression paddle is pushed out to correct the difference of 40 mm in the chest because of individual differences in the size of the chest. In addition, two compression paddle frames were made and placed inside

and outside; the inner frame extended from the outer frame by 30 mm, and the inner frame and outer frame were interlocked to move back and forth through a groove cut between them.

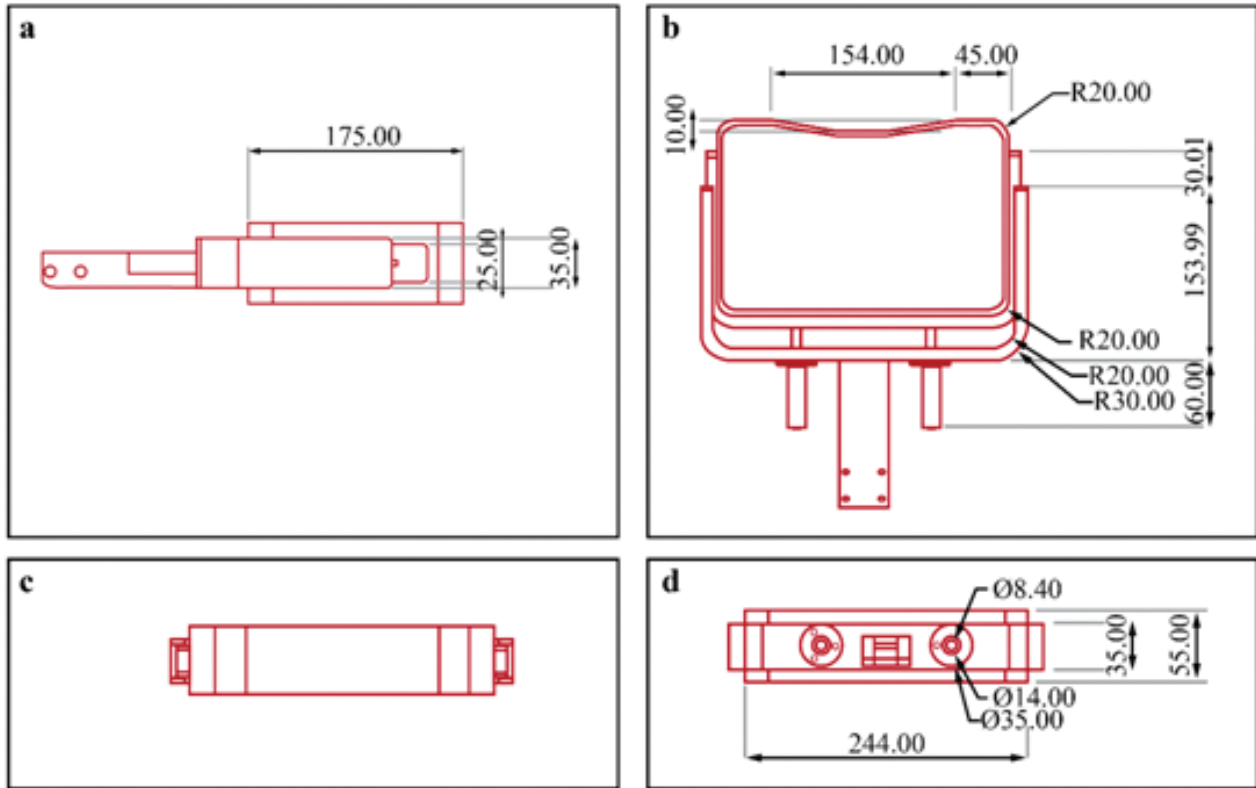


Figure 2: A planar image of the newly developed compression paddle as viewed from the front (a), laterally (b), and from below (c)

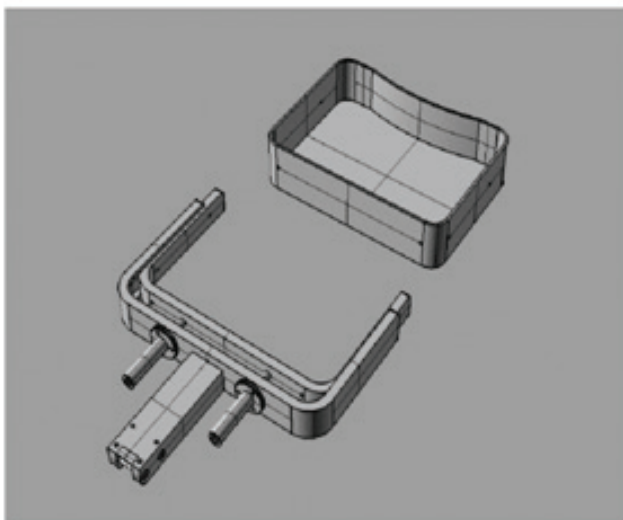


Figure 3: The planar figure of the entire newly developed compression paddle.

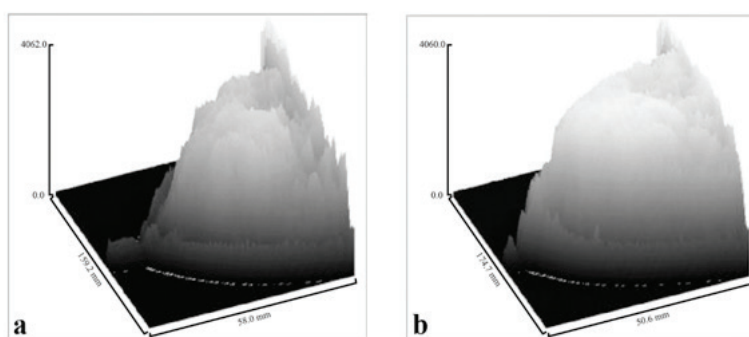
Utility evaluation of the new compression paddle for mammography

Utility evaluation of image by Image J: As show table 1, the measured values of the breast area in the images in which the developed compression paddle was applied were all higher than those obtained with the conventional compression paddle. The whole area of all 10 people increased 9.65% on average in the CC image and increased 6.96% on average in the MLO image. The PNL increased 9.18% on average in the CC image and 4.55% in the MLO image. The breast length on the chest wall side increased 3.97% in the CC image.

Table 1: The Increase Rate of the Breast Area in All Patients

Case	Measurement list					
	Item	Area (%)		PNL (%)		Breast length side chest wall (%)
		CC	MLO	CC	MLO	CC
Case 1	Increase rate	12.71	7.17	5.89	1.49	2.57
Case 2	Increase rate	1.07	10.92	6.03	23.65	10.42
Case 3	Increase rate	26.35	6.40	15.94	5.19	11.76
Case 4	Increase rate	4.15	3.30	3.90	0.65	2.98
Case 5	Increase rate	9.56	7.17	5.89	1.49	1.89
Case 6	Increase rate	29.65	9.96	28.50	3.06	4.13
Case 7	Increase rate	0.91	2.32	4.62	0.28	0.75
Case 8	Increase rate	2.46	7.75	4.69	1.96	3.55
Case 9	Increase rate	3.13	6.91	9.03	3.63	0.99
Case 10	Increase rate	6.51	7.66	7.35	4.12	0.67
Average		9.65	6.96	9.18	4.55	3.97

As show figure 4, based on the results of the comparisons of the surface plots, all images of the 10 targets had a similar form of surface outline without the degradation of the image quality and contrast.

**Figure 4: The flatness images. The conventional compression paddle (a) and the newly developed compression paddle (b)**

Evaluation of Significance: As show table 2, the Wilcoxon signed-rank test, a nonparametric test, showed a significant difference in all comparisons, and that the measured values of the images in which the newly developed compression paddle was used were higher on average than those of the conventional compression paddle ($p < 0.05$).

Table 2: Wilcoxon signed-rank test

Test statistics ^a					
	CC_new_area-	CC_new_PNL-	CC_new_wall-	MLO_new_area-	MLO_new_PNL-
	CC_ori_area	CC_ori_PNL	CC_ori_wall	MLO_ori_area	MLO_ori_PNL
Z	-2.599 ^b	-2.803 ^b	-2.191 ^b	-2.090 ^b	-2.701 ^b
Asymptotic p-value (both sides)	0.009	0.005	0.028	0.037	0.007
a Wilcoxon signed-rank test.					
b Rankings are based on the negative.					
CC, craniocaudal; MLO, mediolateral-oblique; PNL posterior nipple line.					

Discussion

Breast cancer has had the highest cancer incidence rate for women since 2001, and it is rapidly increasing because of the decreased birth rate and increased avoidance of breast feeding⁷. Mammography is a very important diagnostic method for the early diagnosis of breast cancer and has strong clinical utility as a screening test for micro calcification of breast lesions⁸. However, patients tend to avoid mammography because of the pain incurred on account of pressure applied during the test. Pressure is necessary in mammography to reduce the exposure dose and improve image quality⁹.

Measurements of adult women between 20 and 59 years old indicate that women in their 40s and 50s have a greater tendency of having droopiness and obesity horizontally in their breasts, compared to women in their 20s and 30s. One report¹⁰. Indicated that the area and volume of the bottom of breasts increases with aging. In particular, the breasts of adult women with subcutaneous fat have greater changes, compared to other parts of body as they age, and protrude in a curve on the front of the upper body¹¹. In this respect, pressing the breasts fastens drooped breasts and thins the thickened breast tissues caused by obesity, which are important in reducing the exposure dose and improving the quality of breast images.

In the human body, aging is accompanied by regression, which causes scoliosis. Functional scoliosis appears with secondary symptoms caused by external reasons, whereas structural scoliosis is caused by problems with the spine itself and has no specific reason¹². Women with scoliosis have several limitations in mammography. For example, when a protruded chest caused by a bent spine presses the breasts, it can cause friction against the surface of the compression paddle on the chest wall side and not all of the breast tissue is included in the images. It is because the model of the conventional compression paddle is rectangular to fit the size of the receptor, and the edges of the rectangle are curved. The part that touches the chest wall is a straight line parallel with the end of the receptor, which does not fit a round chest, and is eventually pushed out by the chest. This prevents the inner and outer parts of the breasts from being included in the images. This is noticeable in patients with pectus carinatum or in patients with scoliosis whose chests are protruded. The chest of patients with pectus carinatum is naturally excessively protruded and these patients are likely to have a malformation in their spine.

Pectus carinatum is more common in male individuals, although it is not difficult to find female patients with pectus carinatum who visit hospitals for mammography. This is because scoliosis caused by regression, which occurs in women in their 40s and 50s, is accompanied by pectus carinatum. If too much breast tissue is pulled and placed on the receptor to include as much breast tissue of the patients with pectus carinatum, patients will complain of severe pain because the compression paddle will press the chest together. There is a report of a method in which semipermeable pads are used to reduce the pain of pressure; however, the structural problems of the compression paddle are not fully resolved, although the pain diminishes a little¹³. When applied to patients with scoliosis, the new compression paddle developed in this study is expected to reduce the compression and reduce the image quality, thus broadening the scope of diagnosis.

Dustler¹⁴ et al. suggested a method in which images are acquired through partial pressure, excluding the chest part that prevents pressure and causes pain. This method can mitigate pain by removing pressure deterrents, but unstable factors that hinder breast cancer detectability increase because 1 cm of tissue cannot be obtained from the images. In the current study, the pain of pressure is reduced and 1 cm of tissue is visible.

There is an ongoing effort to improve the compression paddles because of pain in mammography and because the pressure is not evenly applied to all parts of the breasts. In particular, the pressure is not evenly applied to whole parts of breasts because of breast parenchymal tissues; therefore, it is recommended to correct the slope of the compression paddle to supplement^{15,16}. References show that, Kallenberg and Karssemeijer and Kallenberg^{17,18} et al. corrected the slope of the compression paddle by making the breast compression paddle movable, and on comparing it with the conventional compression paddle, they showed that images had more even concentration for the whole breast, compared to images made using the conventional compression paddle. References show that Liberman et al., Kirstein et al. and Burkholder et al. reported the difficulty of pressing the open window when locating a lesion before surgery and obtaining good quality of images^{19,20,21}. Reference shows that Blane et al. devised a new compression paddle that can apply pressure in wire localization, and succeeded in achieving substantially improved images than those with the conventional paddle²². However, he could not improve

the phenomenon in which portions of breast tissue were missing because of friction against the compression paddle caused by the structure of the human body.

Pressing the breasts in mammography is important for image quality and with regard to the exposure dose to patients²³. References show Dibble et al., Coryell and Jaeger et al. reported that pressing the breast tissues on top of the radiolucent cushion can reduce the pain of patients and enhance the quality of images^{24,25,26}. However, Hendrick and Hall reported that, although using a radiolucent cushion can increase image quality and can include as much breast tissue as possible, the exposure dose increases with increasing thickness²⁷. Using the compression paddle for the tests conducted in this study can include as much breast tissue as possible without causing the problem of the exposure dose because its thickness is the same as that of the conventional paddle.

Conducting tests using the compression paddle developed in this study can solve the problem of pain experienced when the compression paddle presses on the chest as much as the protruded chest pushes out the compression paddle. The surface of the compression paddle that touches the chest is round; therefore, it allows more of the inner and outer parts of the breasts to be placed on the receptor and more tissue is included in the images. Therefore, the newly developed compression paddle is expected to resolve the problems better than the conventional compression paddles used in clinical practice.

This was a study on a compression paddle that was used for accurate diagnosis in mammography. A compression paddle model was developed to improve the imaging of breast tissues adjacent to the chest, which are difficult to include in images obtained with the conventional compression paddles, and its utility was evaluated. The newly developed compression paddle acquired images from 10 patients with pectus carinatum and evaluated the whole area of breast tissue, the length of the PNL, the length of breast on the chest wall side, and image flatness.

Conclusion

The necessary form of the compression paddle in mammography is a structural problem and some parts of the breast tissues adjacent to the chest wall can be missing in images. However, the newly developed breast compression paddle has a streamlined shape, which reduces the friction against the chest wall and includes

the parts that could not be included previously, which allows testing of a broader area. The newly developed compression paddle has mobility with the spring equipment installed and moves back and forth to adjust to the size of the chest wall, which allows more breast tissue to be included. This study involved 10 patients with pectus carinatum. Therefore, the newly developed paddle may cause problems when applied to patients with different body types. Based on the result of this study, further research is needed to make effective use of the newly developed compression paddle.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Comparative Study of MRI Images in Accordance with Gradient Power Changes

Sung-Hun Jeoung¹, Cheong-Hwan Lim², Hyung-Ok Song³

¹Research Scholar Dept. of Radiology, Seosan Jung-Ang Jeneral Hospital; ²Professor Dept. of Health Care, Hanseo University; ³Research Scholar Dept. of Radiology, Ik San Hospital

ABSTRACT

However, many hospitals conduct examinations based on the initial setting of gradient applied to the equipment, without altering the gradient setting for the area under examination based on its characteristics. Accordingly, this study measures the signal intensity and changes in imaging according to changes in MRI gradient power appropriate for T1 and T2 examination, for possible utilization as basic data for gradient power research and studies in MRI. Bottle Phantom was positioned inside the head & neck coil, and the T1-T2Brain Sequence was used for measurement. In the case of T2, the Repetition TR was fixed at 4,500 msec, and changes were applied to the TE in five incremental steps to obtain the measurement. In addition, for T1, TR 500 msec was fixed, and changes were applied to the TE in four incremental steps in obtaining the measurement. For SNR and CNR, Image J was used and the standard deviation. Matlab was used to measure PSNR and UACI. Image evaluation in accordance with the change in gradient power at T2. In the case of SNR, normal SLT was the highest at TE 60 msec with 581.4 for Fine SLT, at TE 60 msec with 623.1, in the case of Low SAR, at TE 80 msec with 610.2 was the highest. It was evident that SNR decreased with TE increase. 4 Image evaluation at T1 in accordance with the change in gradient power SNR for normal SLT was found to be the highest at TE 40 msec with 495.5, and TE 30 msec was found to be the lowest. Fine SLT was found to be the highest at TE 30 msec with 485.6, and low SAR was found to be the highest at TE 40 msec with 503.0. In the case of PSNR, for Normal SLT, it was the largest at TE 40 msec with 24.1, without any significant difference from TE 10 to 30 msec. Determination of MRI signal intensity in accordance with changes in gradient power suggests that in the case of T2, the intensity of all the signals decreased when the TE was 80 msec and above. In addition, the intensity of all the signals varied after changing the gradient power. In the case of T1, the signal intensity appeared to be strong at TE 40 msec. In T2, the intensity of all of the signals varied with the gradient power.

Keywords: Gradient Power, Turbo Spine Echo, Repetition Time, Echo Time, Gradient field.

Mathematics Subject Classification: 92C50, 92C55

Journal of Economic Literature (JEL) Classification: I19

Introduction

Radiation is utilized as an aid to diagnose and treat illness in patients. Computed Tomography (CT), a general radiography examination utilized in medical institutions,

uses ionizing radiation^{1,2}. However, Magnetic Resonance Image (MRI) uses radio frequency, which is non-ionizing radiation based on the hydrogen nucleus inside the patient's body to produce medical images without exposure to ionizing radiation. MRI medical image is created via a number of factors including gradient field, slice selection, slice thickness, frequency encoding, phase encoding, and Fourier transformation among others³. Among these additional factors, gradient has an effect on the time of pulse sequence. Each time gradient is generated, the MRI equipment supplies power until

Corresponding Author:

Cheong-Hwan Lim
Professor, Dept. of Health Care,
Hanseo University, Seosan-si, Republic of Korea
Email: lch116@hanseo.ac.kr

the maximum amplitude is reached, and the gradient remains for a fixed amount of time and is reversed during the same time. Thus, each time gradient is generated, several msec of dead time result. Accumulation of such dead time increases the examination time for the patient triggering artifacts associated with patient's movement. Therefore, conducting the MRI by changing the gradient decreases the time and prevents movement artifacts^{4, 5}. However, many hospitals conduct examinations based on the initial setting of gradient applied to the equipment, without altering the gradient setting for the area under examination based on its characteristics. Accordingly this study measures the signal intensity and changes in imaging according to changes in MRI gradient power appropriate for T1 and T2 examination, for possible utilization as basic data for gradient power research and studies in MRI.

Measuring Instrument and Method

Measuring Instrument: We MRI images were measured utilizing Superconducting System 1.5T MRI and Head & Neck Coil (Fig 1). The Bottle (2,000cc) Phantom was used to measure the image (Fig 2). Furthermore, Image J, which was developed by the US National Institutes of Health for the purpose of research analysis, was used to measure the Signal-to-Noise Ratio (SNR) and Contrast-to-Noise Ratio (CNR) in the image obtained from the MRI. Matlab was used for the measurement of Peak Signal-to-Noise Ratio (PSNR) and Unified Average Changing Intensity (UACI).



Figure 1: Head & Neck Coil Figure 2: Bottle Phantom

Method of Research

Method of Measurement: Bottle Phantom was positioned inside the head & neck coil, and the T1-T2 Brain Sequence was used for measurement. In the case of T2, the Repetition Time (TR) was fixed at 4,500 msec, and changes were applied to the Echo Time (TE) in five incremental steps (60, 70, 80, 90, and 100 msec) to obtain the measurement. In addition, for T1, TR 500 was fixed, and changes were applied to the TE in four

incremental steps (10, 20, 30, and 40 msec) in obtaining the measurement. Each gradient power was changed to Fine SLT, low SAR, and normal SLT, to determine the changes in image intensity. The parameters used for measurement were FOV 240×240, 1NEX, 1 slice, 1mm thickness, and 256×256 matrix.

Image Evaluation: SNR, CNR, PSNR, and UACI were measured using the obtained image. For SNR and CNR, Image J was used to set up 5 signal and 5 noise areas to measure the mean, minimum, maximum, and the standard deviation (Fig 3). The following formula was used to measure SNR and Matlab was used to measure PSNR and UACI, CNR (Fig 4).

$$\text{SNR} = \frac{\text{Background Avg} - \text{Signal Avg}}{\text{Background SD}}$$

$$\text{CNR} = \frac{\text{Background SI}_{\text{Avg}} - \text{Signal}_{\text{Avg}}}{\sqrt{\text{Background SD}^2 + \text{ROI SD}^2}}$$



Figure 3: Image measurement

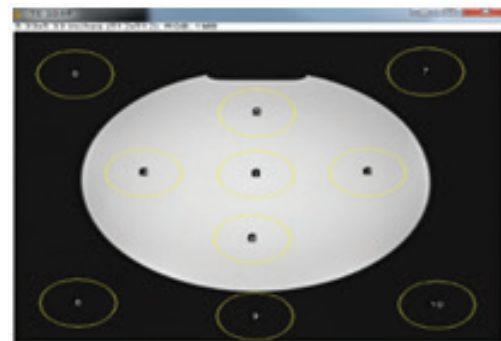


Figure 4: Signal, Noise measurement

Results

Signal and Noise measurement in accordance with changes in gradient power in T2: Normal duration of the spin-lock pulse (SLT) was the highest at TE 60 with 230.4 msec, and was the lowest at TE 80 with 227.8

msec. Noise was the lowest at TE 60 with 21.6msec, and it increased with increase in the TE value. Fine SLT was the highest at TE 60 with 224.8msec, and the signal decreased as the TE value increased. Noise was the highest at TE 60 with 23.6msec, and the noise value

decreased with increased TE value. In the case of low Specific Absorption Rate (SAR), it was the highest at TE 100 with 229.6 W/kg, and the lowest at TE 60 with 228.5 W/kg. Noise was the highest at a TE 60 of 23.4msec, and lower as the TE value increased (Table 1).

Table 1: Signal and Noise measurement in accordance with changes in gradient power

Gradient Power			TE 60	TE 70	TE 80	TE 90	TE 100
Normal SlT	Signal	Max	230.4	228.6	227.8	228.4	228.6
		Min	212.0	211.2	210.6	211.4	211.6
		Mean/S.D	222 ± 4.6	221 ± 4.4	220 ± 4.4	220 ± 4.4	221 ± 47.3
	Noise	Max	21.6	23.0	23.2	23.8	23.4
		Min	17.4	19.0	19.6	20.0	20.0
		Mean/S.D	21.0 ± 0.4	21.7 ± 0.4	22.3 ± 0.4	22.5 ± 0.4	22.5 ± 0.4
Fine SlT	Signal	Max	224.8	222.8	224.2	224.8	224.0
		Min	209.2	207.6	208.6	208.6	208.0
		Mean/S.D	217.7 ± 4.0	216.0 ± 4.0	217.0 ± 3.9	217.5 ± 4.0	216.7 ± 3.9
	Noise	Max	23.6	22.4	21.2	21.0	21.4
		Min	19.4	18.0	17.0	17.0	17.0
		Mean/S.D	22.0 ± 0.3	22.1 ± 0.4	19.7 ± 0.4	19.7 ± 0.4	19.9 ± 0.4
Low Sar	Signal	Max	228.5	229.4	229.4	228.6	229.6
		Min	210.7	212.0	212.0	210.8	211.8
		Mean/S.D	220.0 ± 4.7	221.1 ± 4.5	221.1 ± 4.4	220.1 ± 4.5	221.5 ± 4.5
	Noise	Max	23.4	23.6	22.4	21.8	22.6
		Min	20.4	20.4	19.8	19.0	20.0
		Mean/S.D	22.6 ± 0.4	22.8 ± 0.3	21.8 ± 0.3	21.0 ± 0.3	21.9 ± 0.3

Signal and Noise measurement in accordance with the change in Gradient Power in T1: For Normal SLT, the signal was the highest at TE 30 with 229.8msec, and was the lowest at TE 10 with 224.2 msec. In the case of noise, it was found to be the highest at TE 40 with 27.6msec, and was the lowest at TE 10 of 25.4 msec. In the case of Fine SLT, it was the highest at TE 20 of 214.6msec, and the lowest at TE 10 of 211.4 msec. In the case of noise, it was the lowest at TE 30 with 20.8msec, and the highest at TE 10 of 29.6 msec. In the case of Low SAR, the signal was the highest at TE 20 with 226.6 W/kg, and was the lowest at TE 30. The noise was the highest at TE 20 with 27.6msec, and was the lowest at TE 40 of 20.6 msec (Table 2).

Table 2: Signal and Noise measurement in accordance with the change in Gradient Power

Gradient Power			TE 10	TE 20	TE 30	TE 40
Normal SlT	Signal	Max	224.2	225.6	229.8	227.6
		Min	206.6	207.8	210.0	210.4
		Mean/S.D	216.3 ± 4.4	217.2 ± 4.6	220.8 ± 4.9	219.5 ± 4.2
	Noise	Max	25.4	26.2	26.8	27.6
		Min	21.0	21.8	22.2	23.2
		Mean/S.D	23.7 ± 0.4	24.5 ± 0.4	25.0 ± 0.4	25.8 ± 0.4

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Fine Slt	Signal	Max	211.4	214.6	211.3	212.9
		Min	203.2	204.4	201.8	204.2
		Mean/S.D	211.4 ± 3.3	214.6 ± 4.2	211.3 ± 4.0	212.9 ± 4.0
	Noise	Max	29.6	23.8	20.8	21.2
		Min	16.4	19.6	18.8	19.0
		Mean/S.D	21.4 ± 0.8	22.3 ± 0.4	20.1 ± 0.4	20.3 ± 0.4
Low Sar	Signal	Max	224.4	226.6	221.6	222.2
		Min	206.8	209.4	205.2	205.6
		Mean/S.D	216.2 ± 4.6	218.4 ± 4.2	214.2 ± 4.1	214.4 ± 4.0
	Noise	Max	25.2	27.6	20.8	20.6
		Min	20.8	23.2	17.6	18.2
		Mean/S.D	23.5 ± 0.4	26.0 ± 0.4	20.0 ± 0.4	19.4 ± 0.4

Image evaluation in accordance with the change in gradient power at T2: In the case of SNR, normal SLT was the highest at TE 60 with 581.4 for Fine SLT, at TE 60 with 623.1, in the case of Low SAR, at TE 80 with 610.2 was the highest. It was evident that SNR decreased with TE increase. For PSNR at normal SLT, it was found to be the highest at TE 60 of 24.09msec, and the Fine SLT was found to be the largest at TE 90 with 24.09 msec, without significant change even with the increases TE. In the case of CNR, normal SLT was the highest at TE 100 with 45.7, and the lowest at TE 60 with 43.9. The Fine SLT was the highest at TE 100 with 50.7 and the lowest at TE 60 with 43.9. In the case of UACI, the normal SLT was the highest at TE 80 with 1.98, and as the TE increased, UACI decreased. In Fine SLT, UACI was the highest at a TE 80 with 5.33 and as TE increased, UACI decreased. In the case of low SAR, it was the highest at TE 90 with 4.0 and as TE increased, UACI decreased (Table 3).

Table 3: Image evaluation in accordance with the change in gradient power at T2

	Gradient Power	TE 60	TE 70	TE 80	TE 90	TE 100
SNR	Normal Slt	581.450	542.949	552.046	507.288	505.230
	Fine Slt	623.197	505.064	500.526	517.246	479.005
	Low Sar	548.416	592.893	610.203	592.094	575.312
PSNR	Normal Slt	24.092	24.086	24.084	24.084	24.083
	Fine Slt	24.086	24.086	24.093	24.094	24.092
	Low Sar	24.085	24.084	24.086	24.088	24.085
CNR	Normal Slt	43.900	45.300	44.400	45.280	45.770
	Fine Slt	49.190	48.670	50.320	49.420	50.780
	Low Sar	42.210	44.030	44.880	43.870	44.710
UACI	Normal Slt	1.000	1.311	1.985	1.648	1.189
	Fine Slt	1.000	2.791	5.333	4.771	5.238
	Low Sar	1.000	0.217	1.772	4.007	1.677

Image evaluation in accordance with the change in gradient power at T1: SNR for normal SLT was found to be the highest at TE 40 with 495.5, and TE 30 was found to be the lowest. Fine SLT was found to be the highest at TE 30 with 485.6, and low SAR was found to be the highest at TE 40 with 503.0. In the case of PSNR, for Normal SLT, it was the largest at TE 40 with 21, without any significant difference from TE 10 to 30. Fine SLT was the largest at TE 30 with 24.09, and even in case of other TE values, there was no significant difference. In case of low SAR, the

PSNR was the largest at TE 10. However, even in other TE values, there was no significant difference. In the case of CNR, for Normal SLT, it was the highest at TE 40 with 46.0, and fine SLT was the highest at TE 30 with 44.8. Low SAR was the highest with TE 40 at 48.5. In the case of UACI, normal SLT was increased at TE 40 with 21.8. Fine SLT was the highest with TE 30 at 5.4. Low SAR was the highest at TE 30 with 20.6 (Table 4).

Table 4: Image evaluation at T1 in accordance with the change in gradient power

	Gradient Power	TE 10	TE 20	TE 30	TE 40
SNR	Normal Slt	474.948	462.214	451.954	495.574
	Fine Slt	236.418	459.141	485.615	459.417
	Low Sar	485.665	496.560	470.298	503.006
PSNR	Normal Slt	24.083	24.083	24.083	24.122
	Fine Slt	24.088	24.088	24.090	24.084
	Low Sar	24.841	24.083	24.090	24.098
CNR	Normal Slt	43.880	41.830	39.770	46.090
	Fine Slt	42.210	44.030	44.880	43.870
	Low Sar	42.030	45.430	47.060	48.570
UACI	Normal Slt	1.000	0.301	0.149	21.880
	Fine Slt	1.000	0.489	5.430	3.662
	Low Sar	1.000	0.100	20.600	18.560

Discussion

MRI yields outstanding resolution compared with CT, ultrasound, and general radiography. The high contrast resolution can be used to easily distinguish even the soft tissue in the human body via imaging, and facilitates examination anatomical cross sections of the human body in various directions⁶. The MRI technician can control the MRI sequence to adjust various parameters. TR, flip angle, TE and others can be adjusted depending on the area of examination, to obtain highly valuable images for diagnosis^{7,8}. Lee Young Dae The relative signal intensity of MRI increases following changes in TE, however, the signal intensity of the image remained unchanged^{9,10}. In this study, measurements of changes in TE in 4 phases for T1 and T2, showed no major changes in SNR, PSNR and CNR of T2 despite increased TE. However, when the TE was above 80, the values decreased, and in the case of T2, it was considered not to exceed 80. Similar to T2, in the case of T1, even when the TE value increased by the same amount, no major changes in SNR, PSNR and CNR, occurred, consistent with the results of Lee Young Dae. According to the report of various MRI techniques by Lee Seung Pil, if the Turbo Spine Echo: TES is used, the signal intensity of the joint cartilage was approximately 30% lower, and accurate selection of

pulse sequence in MRI examination enables elucidation of the disease or anatomical structure^{11,12}. In this study, the results obtained by changing the gradient power that controls the signal intensity in T2 were as follows: with fine SLT, SNR 623, PSNR 23.09, CNR 50.32, and UACI 5.33 which was found to be the largest, and a normal SLT yielded SNR 581, PSNR 24.092, CNR 45.3, and UACI 1.98. A low SAR yielded SNR 548, PSNR 24.08, CNR 44.8, and UACI 1.77. In the case of T2, the largest fine SLT signal intensity corresponded to normal SLT, and low SAR. In the case of T1, under low SAR, the values were: SNR 503, PSNR 24.09, CNR 48.5, UACI 18.5 which was found to be the largest. In the case of T1, the signal intensity was large in the order of low SAR, normal SLT, and fine SLT respectively, consistent with previously reported results.

MRI equipment used currently provides a stronger magnetic field with 3.0T rather than 1.5T, using equipment with high magnetic field due to short examination time and high resolution. However, with low magnetic field, short examination time and high resolution image can be obtained if the gradient power and additional factors are adjusted appropriately to assist with the patient's disease. The study limitation relates to inability to determine the frequency of gradient power.

CONCLUSION

The followings are conclusions upon the measurement results of MRI signal intensity depending on changes of gradient power.

1. In case of T2, all the signal intensities of SNR were decreased with normal SLT of 47, fine SLT of 21, and low Sar of 45 if TE 80 or more. PSNR showed similarity with 24 for all, while all the signal intensities of CNR and UACI showed differently after change of gradient power.
2. In case of T1, signal intensity of SNR at TE 40 showed the strongest with normal SLT of 495, fine SLT of 459, and low Sar of 503. PSNR showed with 24 for all, while all the signal intensities of CNR and UACI showed differently after change of gradient power.

Based on the results of this study, it is considered that the patients should be tested with different setting of gradient power by the areas of test and purposes when MRI sequence is prepared

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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The Factors Related to the Smartphone Addiction of Undergraduate Students

Kyung-Shin Paek

Department of Nursing, Semyung University, 65 Semyung-ro, Jecheon-si, Chungcheongbuk-do, 27136, Korea

ABSTRACT

Background/Objectives: College students have a potential for addiction of smartphone. This study was to ascertain the influence of perceived stress and motivation for using a smartphone on the smartphone addiction for them.

Method/Statistical Analysis: The participants were 339 students who enrolled at S University in Korea. The smartphone addiction scale (15 items) developed by Kim et al., perceived stress scale (14 items) developed by Cohen et al. and the motivation scale (24 items) for using a smartphone developed by Kang were measured. SPSS/WIN 22.0 was used to analyze hierarchical multiple regression, Person correlation coefficients, one-way ANOVA, Scheffe test and independent sample t-test.

Findings: Gender ($t=-4.15, p<.001$), academic achievement ($F=9.34, p<.001$) and smartphone use time per day ($F=6.56, p<.001$) were significant differences in smartphone addiction. The smartphone addiction was a significant correlation with perceived stress ($r=.366, p<.001$), social interaction ($r=0.119, p=.029$), entertainment ($r=0.330, p<.001$) and passing time ($r=0.226, p<.001$) in motivation for using smartphone. Hierarchical multiple regression analysis indicated that perceived stress ($\beta=0.284$), entertainment ($\beta=0.241$) and passing time ($\beta=0.158$) in the motivation for using smartphone were identified as significant factors of smartphone addiction for college student, after adjusting for gender, academic achievement.

Improvements/Applications: The prevention of smartphone addiction for college students requires not only diminishing perceived stress but also examining a motivation for using a smartphone and gender difference in using a smartphone.

Keywords: College student, Smartphone, Addiction, Perceived stress, Motivation.

Introduction

According to the report from the National Information Society Agency, the rate of smartphone overdependence increased from 16.2% in 2015 to 18.6% in 2017. 3.6% of adolescents, 2.8% of adults were a high-risk group for the smartphone^[1]. The smartphone use rate of the twenties including college student is 99.7%, it

shows more use rate than other age groups^[2]. Excessive smartphone use for young adults may encounter many problems such as the difficulty of school life^[3,4], depression^[5,6], sleep disturbance^[7,8], psychological distress^[8,9] and smartphone addiction^[10]. Studies^[3,5,8,9,10] have demonstrated that social-environmental and psychological factors are related to smartphone addiction. Smartphone addiction was closely related to stress and smartphone over user tends to experience more stress^[11]. In particular, the college student has various kinds of stress such as academic stress and job stress and they lead to smartphone addiction^[5,6,9,11]. Recently, it was reported that diverse motivations for using smartphone lead to smartphone addiction^[12]. It has shown that information seeking, convenience, social interaction, entertainment, and passing time of motivation for using smartphone were related to smartphone addiction^[12,13].

Corresponding Author:

Kyung-Shin Paek
Professor, Department of Nursing,
Semyung University, 65 Semyung-ro, Jecheon-si,
Chungcheongbuk-do, 27136, Korea
Email: kspaek@semyung.ac.kr

It is important to understand using motivation which reflects characteristics in the smartphone to prevent smartphone addiction. This study is to identify the relation between perceived stress, the motivation for using a smartphone and smartphone addiction and to determine factors connected with smartphone addiction and to provide basic data for preventing smartphone addiction of college students.

Research Method

Design and Participants: A cross-sectional descriptive survey was performed to verify factors influencing smartphone addiction of college students. The participants used for the study consisted 339 university students from one university in J. city. Questionnaires were distributed to 350 students, of which 339 questionnaires were returned (Response rate of 96.8 %).

Research instrument

Smartphone Addiction: Smartphone addiction scale developed by Kim et al. ^[14] was used to measure the smartphone addiction of college students. It is composed of 15 items with a 4-point Likert scale and overall scores range from 15 to 60. A higher total score means a more addictive use of a smartphone. The total score of smartphone addiction is categorized as follows: College students with under a total of 39 points of smartphone addiction belong to a general group, a total score from 40 to 43 points of smartphone addiction means a potential risk group and a total of 44 points or more of smartphone addiction correspond to a high-risk group. The reliability of internal consistency was .88 by Cronbach's alpha coefficient

Perceived Stress: Perceived stress scale developed by Cohen et al. ^[15] was used to measure the perceived stress. It is composed of a 5-point Likert scale with 14 items and overall scores range from 14 to 70. A higher total score means higher perceived stress. The reliability of internal consistency was .75 by Cronbach's alpha coefficient.

Motivation for Using a Smartphone: The motivation of using smartphone consisting of 24 items developed

by Kang ^[16] was used to measure the smartphone usage motivation. It is sorted by 5 subcategories which consist of information seeking, convenience, social interaction, entertainment, passing time. This subcategory score ranges from 1 to 7 and the Cronbach's alpha reliability coefficient was .92.

Data Analysis

The SPSS/WIN 22.0 was used to analyze data. General characteristics, smartphone addiction, perceive stress and motivation for using a smartphone were analyzed using descriptive statistics. Independent sample t-test and one-way ANOVA were used to measure the difference of smartphone addiction according to the general characteristics. The relationships between smartphone addiction, perceived stress, and motivation for using a smartphone were calculated using Person correlation coefficients. The related factors of smartphone addiction were analyzed using hierarchical multiple regression.

Results and Discussion

As recorded in table 1, the age distribution of participants (N=339) was from 18 to 28 years (mean 21.47; SD1.86). There were 142 males (42.0%) and 196 females (58.0%). Gender ($t=-4.15$, $p<.001$), academic achievement ($F=9.34$, $p<.001$) and smartphone use time per day ($F=6.56$, $p<.001$) were significant differences in smartphone addiction. The results of previous studies ^[17,18,19] reported that female students had more addictive to a smartphone than male students and they frequently use a smartphone to maintain their social relationship. The earlier studies ^[4,20] showed that the students with smartphone addiction have low grades and may encounter difficulty with academic performance. Smartphone addiction was a significant difference by daily smartphone using time. This means that who had longer time using a smartphone, would be more likely to be higher smartphone addiction. Bian et al. ^[10] reported that the higher levels of smartphone addiction, the longer daily using time of smartphone.

Table 1: Smartphone addiction based on the characteristics of the participants (N = 339)

Variables	Categories	N(%)	M(SD)	t or F	Post hoc
Gender [†]	Male	142(42.0)	31.80(6.94)	-4.15***	
	Female	196(58.0)	34.94(6.79)		

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Age(years)	≤19	56(16.5)	35.17(7.10)	1.86	
	20-23	232(68.4)	33.46(6.69)		
	≥24	51(15.0)	32.72(8.15)		
Grade	1st	52(15.3)	35.36(6.73)	2.36	
	2nd	70(20.6)	34.48(6.21)		
	3rd	123(36.3)	32.59(6.02)		
	4th	94(27.7)	33.40(8.59)		
Major ^{††}	Humanities & social sciences ^a	162(47.8)	33.70(7.39)	1.98	
	Natural science ^b	89(26.3)	32.53(6.75)		
	Health & medical sciences ^c	76(22.4)	34.69(6.31)		
	Physical education & art	12(3.5)	34.00(7.48)		
Residence type [†]	Dormitory etc.	294(87.0)	33.82(7.15)	1.27	
	One's house	44(13.0)	32.38(5.97)		
Academic achievement	Good ^a	191(56.3)	32.29(6.92)	9.34***	ab, c
	Moderate ^b	113(33.3)	34.91(6.76)		
	Poor ^c	71(20.9)	34.08(7.65)		
Economic status	Good	83(24.5)	32.74(7.48)	0.90	
	Moderate	185(54.6)	33.85(6.52)		
	Poor	71(20.9)	34.08(7.65)		
Duration of using smartphone (month)	<60	64(18.9)	33.28(7.09)	0.20	
	60-120	232(68.4)	33.63(7.10)		
	>120	43(12.7)	34.16(6.49)		
Daily smartphone using time (minute)	<120 ^a	30(8.8)	29.43(6.80)	6.56***	a c, d
	120-300 ^b	172(50.7)	33.12(6.70)		
	301-600 ^c	86(25.4)	34.90(7.27)		
	>600 ^d	51(15.0)	35.66(6.58)		

Note: [†]:No response was excluded; ^{††}:Physical education & art was excluded from ANOVA analysis.

*** $p < .001$

Such as shown in table 2, the perceived stress ($r=.366$, $p<.001$), social interaction ($r=0.119$, $p=.029$), entertainment ($r=0.330$, $p<.001$) and passing time ($r=0.226$, $p<.001$) in motivation for using smartphone were significant correlation with smartphone addiction. In this study, smartphone addiction was positively associated with perceived stress. This result corresponds to other studies ^[11,18, 21] that smartphone addiction of college students showed increased levels of perceived stress and was closely related to stress. It is causing college students a great deal of stress because they should be designing lives. Thus, identifying students with

having a high level of perceived stress and providing them with appropriate services may help them to prevent a smartphone addiction. In this research, the motivation for using a smartphone was identified as a significantly related factor to smartphone addiction among college students. It is consistent with the result of Kang ^[16] and Choi ^[22] which reported that entertainment oriented type, relationship oriented type and time pass of motivation for using smartphone were significantly correlated with smartphone addiction. Lee ^[23] suggested that motivation for using a smartphone is directly connected with frequency in use and prolonged time for a smartphone.

Table 2: Correlation between perceived stress, motivation of using a smartphone and smartphone addiction (N = 339)

	Smartphone Addiction	Perceived Stress	Motivation of Using a Smartphone
Smartphone addiction	1		
Perceived stress	.366***	1	
Motivation of using a smartphone	.220***	-.013	1
Information seeking	.012	-.074	
Convenience	.051	-.048	
Social interaction	.119*	-.075	
Entertainment	.330***	.113*	
Passing time	.226***	-.014	

*: $p < .05$; ***: $p < .001$

As appeared in table 3, the factors influencing the smartphone addiction were analyzed by using a hierarchical multiple regression analysis. In Model 1, the smartphone addiction was significantly influenced by gender ($\beta=0.183$), academic achievement ($\beta=0.149 \sim 0.163$). In Model 2, perceived stress ($\beta=0.284$), entertainment ($\beta=0.241$) and passing time ($\beta=0.158$) in the motivation for using a smartphone, gender ($\beta=0.102$), academic achievement ($\beta=0.100 \sim 0.107$) were significant predictors of smartphone addiction. These five factors explained 24.3% of the variance in the smartphone addiction. The general F score of multiple regression in Model 2 was significant ($F=11.828$, $p < .001$). Perceived stress was found to be the most effective factors of smartphone addiction. The results of prior studies [11,18,21] reported that college students who experience more stress are immersed in a smartphone to get away from their stressful situation

and it leads to smartphone addiction. In motivation for using a smartphone, entertainment and passing time were identified as significantly influencing factors to smartphone addiction. It indicates that motivation to pursue entertainment through smartphone would like to increase the risk of collegians' smartphone addiction. Also, using a smartphone as a source of spending time might be accompanied by a reduced their sense of volitional control and induces them to use smartphone constantly. It is consistent with the result of Park and Shin [12,16,22] which reported that entertainment and passing the time of motivation for using smartphone make an impact on the overuse of the smartphone. Recently, advanced researches [12,13] showed that diverse motivations of using a smartphone-related to smartphone addiction. To prevent smartphone addiction early, it is necessary to check the motivation of using a smartphone, which reflects the unique characteristics of the smartphone of students.

Table 3: Predictors on the smartphone addiction (N = 339)

Variables	Model I		Model II	
	β	t	β	t
Constant		49.20***		2.20*
Gender	.183	3.42***	.102	2.06*
Academic achievement (moderate)	.149	2.79**	.107	2.15*
Academic achievement (poor)	.163	2.94**	.100	1.96*
Perceived stress			.284	5.64***
Entertainment in the motivation of using a smartphone			.241	4.23***
Passing time in the motivation of using a smartphone			.158	2.31*
	$R^2=.074$, $F=7.69$ ***		$R^2=.243$, $F=11.82$ ***	

Note: Dummy variable: Gender (0: male, 1: female)

*: $p < .05$; **: $p < .001$; ***: $p < .001$

Conclusion

This study is an attempt to make an offer a basic data for making strategies to check the smartphone addiction among college students by examining the relationship of smartphone addiction with perceived stress and motivation for using a smartphone and identifying factors related with smartphone addiction. This study showed that perceived stress and entertainment, passing time in the motivation of using a smartphone are significant influencing factors of smartphone addiction for college students. These findings suggest that preventing smartphone addiction among collegian requires not only diminishing perceived stress but also examining a motivation for using a smartphone. Also, it needs to identify that gender differences in using smartphone such as smartphone activities.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Convergence Study on the Stress Response and Life Satisfaction of a Workplace Worker -Focused on Regular and Non Regular worker-

Bo Ram Choi¹, Jung Im Kim²

¹Department of Nursing, Yong-In Songdam College, Yongin-si, Gyeonggi-do, Republic of Korea, ASI KR KS009 YONGIN, Republic of Korea; ²Department of Nursing, Kyungdong University, Wonju-si Gangwon-do, Republic of Korea, ASI KR KS007 WONJU, Republic of Korea

ABSTRACT

Background/Objectives: The purpose of this study is to compare the stress response and the satisfaction of life to regular workers and non - regular workers.

Method/Statistical Analysis: Data collection was conducted from July 1 to 31, 2017 for 600 workers of K company. Analysis was performed using the SPSS 23.0 version program and analyzed by χ^2 -test, t-test, ANCOVA and Pearson's correlation coefficient.

Findings: The results showed that the stress response was higher in the irregular workers than in the regular workers ($f=11.09$, $p=.001$). In the stress response, the irregular workers showed higher somatic symptoms ($f=6.18$, $p=.013$), depression ($f=13.70$, $p=.001$) and anger ($f=6.15$, $p=.013$) than the regular workers. Stress response and life satisfaction showed significant negative correlation ($r= -.387$, $p < .001$).

Improvements/Applications: Workplaces need to pay attention not only to regular workers but also to the stress of non-regular workers, and to programs that improve their life satisfaction and alleviate stress reactions.

Keywords: Stress, Life Satisfaction, Workers, Regular Workers, Non-Regular Workers

Introduction

As of the end of August 2016, there are 64,444,000 non-regular workers among 19,627,000 total wage workers in Korea, accounting for about 32.8% of the total wage workers^[1]. Non-regular workers are widely used terms in Korea and Japan. Employment types are atypical, informal, non-standard, or non-permanent, and these non-regular workers are special types of work that are outside the characteristics of regular regular workers^[2]. These non-regular workers show a special difference from regular workers in terms of duration of employment, hours worked and the way of providing work^[3]. The characteristics of non-regular workers

are temporary workers (term, contract, daily, casual, and appointment) because they are not continuous, and working hours and labor contract periods are fixed. Non-regular workers experience stress due to job insecurity caused by uncertainty due to instability in the contract period which may create other stressors^[4]. Unlike the regular workers, various job stress factors such as unemployment experience, turnover experience, and job insecurity have a negative impact on the social and psychological health of workers^[5]. In addition, due to job autonomy, job instability, and inadequate compensation due to work characteristics, irregular workers have higher job stress than regular workers^[6], which has serious effects on the physical and mental health status of workers^[7]. These workers' health status was at a higher risk of worsening health status when they were in low income or when their employment status was irregular^[8]. In addition, non-regular work has been shown to reduce health-related behaviors and quality of life for workers, and their quality of life has been shown to

Corresponding Author:

Jung Im Kim

Department of Nursing, Kyungdong University, Korea

Phone: +82-10-3077-0076

Email: jikim@kduniv.ac.kr

affect mental health [9]. Job stress of workers affects job performance in the workplace [10], while high job stress negatively affects life and lowers satisfaction with life. And negative effects were observed [11]. We are trying to prevent and prevent the health effect factors that occur in the working conditions experienced by irregular workers in the workplace. We also have to activate many studies according to the employment type of the workplace [12]. However, it is difficult to find a study that uses variables such as stress response and life satisfaction, which can affect health, by comparing the regular and non - regular workers in the form of workplace employment. The purpose of this study was to compare the stress response and life satisfaction of regular and non - regular workers in the workplace.

Materials and Method

Study Design: This study is a descriptive research study to investigate the difference of stress response and life satisfaction centering on regular and non - regular employment types of workplace workers.

Selection Process of the Subject: Data collection was conducted from July 1, 2017 to July 31, 2016, among 600 workers who understood the purpose of this study and agreed to participate. Out of the questionnaires, the final 580 data were used for the analysis except for the unsubstantiated data. The tools used in the study were obtained after obtaining the consent of the final modifier and the applicant.

Data Analysis

All data were analysis using SPSS statistics version 23.0 program. The personal characteristics and job characteristics of the subjects were analyzed by χ^2 -test and t-test. The stress response (somatization, depression and anger) and the degree of life satisfaction were analyzed by descriptive statistical analysis. The ANCOVA analysis was conducted to examine the differences in the stress response and life satisfaction according to the employment type of the subjects. Correlation between the subject 's stress response (somatization, depression and anger) and life satisfaction was assessed using the Pearson correlation method.

Results

General Characteristics of the Subject: Table 1 shows general characteristics and job characteristics according to the employment type of the subject. The total number of subjects included in the analysis was 580, of which 149 (25.7%) were males and 431 (74.3%) were females, and both regular and irregular workers were female workers. The average age was 33 in regular workers compared to 30.3 in irregular workers ($p < .001$). The average working period was 59.5 months for regular workers and 32.7 months for non-regular workers ($p < .001$). The number of non - regular workers was 26 (7.9%), which is higher than that of regular workers (3.6%). In the average salary, 223 regular employees (89.2%) were over 3 million won and 292 (88.8%) were less than 2 million won ($p < .001$). However, there was no difference between spousal living level, education level, and religion.

Table 1: General Characteristics of the Subject

Variables	Regular	Non-regular	χ^2 or t	p
	n = 250(43.1%)	n = 330(56.9%)		
Age(year)	33.0 ± 7.5	30.3 ± 7.8	8.57	<.001
Gender				
Female	200(79.7)	231(70.2)	6.68	.010
Male	51(20.3)	98(29.8)		
Marital Status				
Married	91(36.3)	90(27.4)	5.34	.069
Single	153(61.0)	227(69.0)		
Others	7 (2.7)	12 (3.6)		
Education Level				
College	115(45.8)	167(50.8)	1.88	.390
University	55(21.9)	72(21.9)		
Master	81(32.3)	90(27.4)		

Conted...

Religion				
Protestant Christian	64(25.5)	93(28.3)	4.79	.309
Catholic Christian	29(11.6)	24 (7.3)		
Buddhism	27(10.8)	33(10.0)		
None	130(52.1)	180(54.4)		
Period of employment (month)	59.5 ± 41.6	32.7 ± 33.8	4.42	<.001
Working Style				
Day work	242(96.4)	303(92.1)	4.68	.031
Shift work	9 (3.6)	26 (7.9)		
Annual Salary (10,000 won)				
<200	7 (2.8)	292(88.8)	5.80	<.001
200≤ <300	20 (8.0)	30 (9.1)		
≥300	223(89.2)	7 (2.1)		

Stress Response and Life Satisfaction Score: Table 2 shows the stress response and life satisfaction scores. The stress response of the subjects was 52.86 ± 17.99 points on the scale of 110 points, and the physical symptoms were 22.65 ± 8.93 points on 45 points, 17.83 ± 6.62 points on 40 points, 12.37 points on 25 points ± 5.18 points. Life satisfaction was 42.34 ± 11.11 points out of 70 points.

Table 2: Stress Response and Life Satisfaction score

Variables	Min	Max	Mean ± SD
Stress response	22	110	52.86 ± 17.99
Somatization	9	45	22.65 ± 8.93
Depression	8	40	17.83 ± 6.62
Anger	5	25	12.37 ± 5.18
Satisfaction with life	10	70	42.34 ± 11.11

Stress Response and Satisfaction of Life According to Employment Type: Table 3 shows the results of the stress response and life satisfaction according to employment type. Variables that showed a difference between regular and non - regular workers were covariates. There was a statistically significant difference in the subscales of the stress response, body reaction, depression, and anger score. Compared with regular workers, irregular workers showed higher stress response ($f=11.09$, $p=.001$) By subdivision The scores of somatization ($f = 6.18$, $p= .013$), depression ($f = 13.70$, $p= .001$) and anger ($f = 6.15$, $p=.013$)

Table 3: Stress Response and Satisfaction of Life according to Employment Type

Variables	Regular (n = 251)	Non-regular (n = 329)	f	p
	Mean ± SD			
Stress response	50.15 ± 18.00	54.93 ± 17.74	11.09	.001
Somatization	21.55 ± 8.64	23.49 ± 9.06	6.18	.013
Depression	16.74 ± 6.53	18.67 ± 6.58	13.70	.001
Anger	11.86 ± 6.53	12.76 ± 5.14	6.15	.013
Satisfaction with life	42.93 ± 11.45	41.89 ± 10.84	2.07	.151

Relationship between Stress Response and Satisfaction of Life: Table 4 shows the subject's stress response and life satisfaction. There was a statistically significant negative correlation ($r = -.387, p < .001$) with the stress response in the subjects' life satisfaction, and

the somatization ($r = -.277, p < .001$), depression ($r = -.442, p < .001$), and anger ($r = -.302, p < .001$) were found to be statistically significant. That is, the higher the stress response, the lower the satisfaction of life.

Table 4: Relationship between stress response and satisfaction of life

Variables	1.	2.	3.	4.	5.
	r(p)	r(p)	r(p)	r(p)	r(p)
1. Stress response	1				
2. Somatization	.889 (<.001)	1			
3. Depression	.885 (<.001)	.641 (<.001)	1		
4. Anger	.812 (<.001)	.544 (<.001)	.690 (<.001)	1	
5. Satisfaction with life	-.387 (<.001)	-.277 (<.001)	-.442 (<.001)	-.302 (<.000)	1

Discussion

Compared with regular workers, irregular workers showed a higher total score of stress response. The results were similar to those of high job stress due to job instability and high job demands at workplaces where 50.2% of the workers were irregular workers^[13], and the stress of non-regular workers who were employed in the form of part- Was a result that was in contrast to the study^[9]. This is because, as seen from the general characteristics, it is thought that the irregular workers are highly likely to have job demands for irregular workers at workplaces where most of the daytime employees work like regular workers, and the job instability due to the employment characteristics of irregular workers. In the study of occupational characteristics of irregular workers^[5], stress was found to affect social psychological stress, and it was found that job culture due to differences in work culture and salary in the workplace Stress factors have a significant impact on workers' mental health and have been shown to increase the risk of mental health high-risk workers^[14]. The subjects' stress response and life satisfaction were inversely correlated, indicating that higher stress responses lowered life satisfaction. In the workplace, workers' stress was increased due to lack of autonomy, differences in salaries, job demands, and job instability^[15]. The daily stress of female nursery teachers affected the psychological state such as anxiety, and the better the psychological state, the higher the satisfaction of life^[16]. In the study of local public servants^[17], overall satisfaction with job satisfaction was high. In other studies, the higher the expectation of life satisfaction, the less stress and well-being^[18].

Conclusion

The purpose of this study is to provide basic data on the health promotion of workers by analyzing the relationship between stress response and life satisfaction in regular and non - regular employment types. According to the results of the study, a health promotion program is needed to improve the health of the workplace and to provide differentiated approach according to the type of employment and to alleviate the stress reaction of non - regular workers and to improve life satisfaction. Also, based on the results, the following suggestions are made. First, there is a need for comparative and repeated research on stress and life satisfaction that may affect worker 's health, focusing on regular and non - regular workers in various workplaces. Second, through this study, it was found that non - regular workers had higher stress response and lower life satisfaction than regular workers. Therefore, it is necessary to study the application of stress reduction program to non - regular workers.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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What is the ‘Good Nurse’?: An Integrative Literature Review

Kyungmi Lee¹, Su Hyun Kim²

¹Assistant professor, Department of Nursing, Daegu Haany University, Haanydaero 1, Kyungsan, South Korea 41944; ²Professor, College of Nursing, Kyungpook National University, Gukchabosangro 680, Jung-gu, Daegu, South Korea 41944

ABSTRACT

Background/Objectives: This study aimed to investigate the attributes of the ‘good nurse’ from patients’ and nurses’ perspectives in the literature.

Method: A total of 11 studies were identified from literature search. The data relevant to the characteristics of good nurses was extracted and categorized into two subsets of personality traits and professional competence according to conceptual distinction.

Finding: The characteristics of regardful, humanistic, supportive, and faithful were the most frequently identified personality trait of ‘good nurses.’ The attributes of professional manner, practical competence, patient-centered care, and communication were regarded as the essential professional competence for ‘good nurses.’

Improvements/Applications: The characteristics of ‘good nurses’ identified in this study, including not only the professional competence but also the personality traits, indicate the need to make comprehensive and balanced approach of nursing education for training ‘good nurses.’

Keywords: *character, nurse, perceptions, patient preference, systematic review*

Introduction

The social recognition and role expectations for the profession of nursing have changed since the beginning of nursing history^[1]. The essentials of a good nurse early in the twentieth century included the traditional roles of being a diligent observer and loyal assistant to the doctor^[2]. Conventional wisdom, that all women had a calling in life to take care of others, was associated with the idea of the nurse-as-woman and pervaded society in earlier times^[3]. Until the end of the twentieth century, in the public mind, theoretical knowledge or university-based education was not necessary for nurses, as more importance was placed on nurses’ technical skills^[4].

However, recently, nurses’ roles have greatly expanded from the direct bedside care-giver to the healthcare manager, including acting as a researcher, educator, and healthcare policy participant in promoting patients’ health and well-being^[1].

While the role of a nurse has changed and developed over the past few decades, intrinsic concepts, such as having respect for life, being an advocate for human rights, promoting health, and relieving suffering, remain unchanged as the core obligations and missions of a nurse^[5]. To fulfill those values, a nurse is required to possess inherent personality traits and qualities. According to Park^[6], a nurse who had a desirable personality was usually referred to as a good nurse, and it was important to possess not only practical proficiency but also moral and ethical values. Pfefferkoron^[7] stressed that a nurse who had excellent technical skills could be a good technician but not a good nurse, and asserted the importance of having gracious courtesy in order to be a good nurse.

However, a discussion of what makes a good nurse has not been highlighted in recent years when considering that consumer-oriented nursing services

Corresponding Author:

Su Hyun Kim
Professor, College of Nursing,
Kyungpook National University,
Gukchabosangro 680, Jung-gu, Daegu, South Korea 41944
Phone: +82-10-7763-9125
Email: suhyun_kim@knu.ac.kr

have been greatly emphasized within the profession of nursing. Several previous studies mainly explored the level of patient satisfaction regarding nursing services, patient care needs and priorities, or differences in patients' and nurses' perceptions of nursing care^[8,9]. In determining the essential requirements necessary for quality nursing care, the discourse surrounding *good nurses* will play a significant part as a key factor. Patients are experiencing nursing care service within the context of direct nurse-patient relationships and in that, nurses' inherent personal traits can be a remarkable factor that affects patients' satisfaction level with nursing care services^[10,11].

Therefore, it is important to clarify professional competence and personality traits that are required for nurses in accordance with the changing needs of the society in addition to the unique fundamental characteristics of nurses that do not change over time. Clinical environments in recent years have become more complex, and an increasing dependency on medical technology has taken root in the contemporary healthcare system. By investigating patients' and nurses' perceptions of a good nurse, nurses' qualifications that meet the needs of changing society can be identified. Accordingly, this study aims to identify the specific characteristics and qualifications of a good nurse through an integrative review, using the method by Whittemore and Knafl^[12]. The research question of this study was as follows: What are the personality traits and professional competence needs of a good nurse as perceived by patients and nurses?

Method

Literature Search: We conducted a literature search to identify articles published between 2000 and 2017 using databases of PubMed, CINAHL, MEDLINE, research Information Sharing Service. We performed a wide range of search with combinations of key words based on the research questions: *patients, good nurse, nurse, professionalism, character, characteristic, trait, perception, patient preference, perspectives, view, description, and expectations*. Inclusion criteria were as follows: studies that (a) focused on *good nurse* or the characteristics of good nurse from patients' and/or nurses' perspectives; (b) were published in peer-reviewed journals between January 2000 and June 2017, and (c) were published in English or Korean. We

excluded studies about patients' satisfaction, service evaluation, theses or dissertations. We retrieved 76 studies from the databases search and removed 10 studies for duplicates. By reviewing the title and abstract, we removed the irrelevant studies and selected 8 studies for satisfying inclusion criteria by reading the full text of the studies. We added two studies by searching the references manually and selected a total of 11 studies for the systematic review [Figure1].

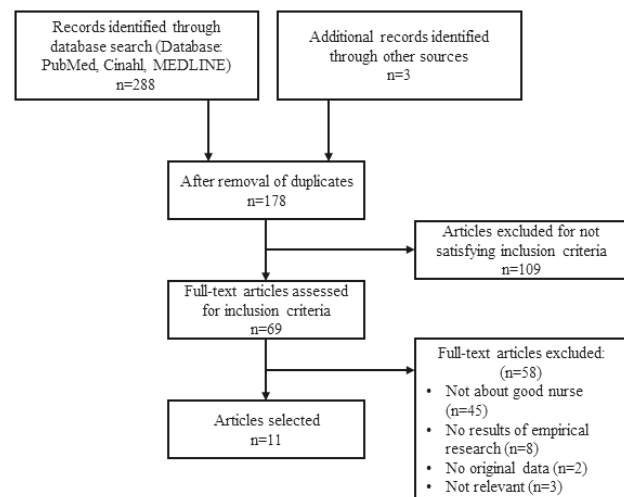


Figure 1: Flow chart of study selection

Data Evaluation: We appraised the study quality using the Mixed Method Appraisal Tool^[13]. The answers to the four criteria applied for each type of study design were summed and converted into a score ranging from 0% to 100%. The final evaluation results were derived from adjusting of the results from the two researchers.

Data Analysis and Presentation

From the final list of selected studies (n=11), we extracted relevant data and categorized them into personality traits and professional competence. This categorization was based on Sumner's description of the nurse self, which is separated into personal self and professional self.^[14] In this study, personality trait was defined as a person's inherent nature or unique characteristic. Professional competence was defined as the ability and power to do something successfully within a profession by using a large amount of experience and knowledge^[15]. We created four subcategories under each of the two groups of data using conceptual similarity. Concepts from each group of data relevant to personality traits and professional competence was depicted using Wordle, which generates an image giving greater prominence to words that appear more frequently in the source text [Figure 2].

Results

Of the 11 included studies, eight studies were conducted on patients while only two studies on nurses. Regarding the study design, eight studies used qualitative study designs, two studies used quantitative study designs, and one study used a mixed method study design. The quality assessment score ranged from 50% to 100%, in which all except two studies had score $\geq 75\%$ [A1-A3, A5-A6, A8-A11].

Personality Traits of Good Nurse: Personality traits of a good nurse described in a total of 11 studies were categorized as *regardful* (n=11), *humanistic* (n=9), *supportive* (n=8), *faithful* (n=7). *Regardful* was mentioned most frequently as personality trait of a good nurse and it was described in 11 of the studies [Figure 2]. The attributes of a *regardful* nurse were identified as *respectful* [A1-A11], *considerate* [A3, A4, A7, A10], *courteous* [A1, A3], and *polite* [A1]. *Humanistic* was important personality trait of a good nurse in nine of the studies. The attributes of a *humanistic* nurse were described as *compassionate* [A2-A4, A8, A10, A11], *warm* [A1-A4, A7, A11], *kind* [A1-A3, A8, A10], *caring* [A2, A6, A8, A11], *empathetic* [A1, A2, A10, A11], *selfless* [A2, A7], *accepting* [A11], *intimate* [A2], *friendly* [A1], *sincere* [A10], *sympathetic* [A3], and *willing to help* [A2].

The attributes of a *supportive* nurse were described as *cheerful* [A1-A4, A10], *humorous* [A1-A4, A6], *helpful* [A1, A2, A11], *positive* [A2, A10, A11], *fun* [A1, A6], *reassuring* [A1, A11], *courageous* [A2, A6], *giving hope*, and *giving praise*. *Faithful* was represented as personality trait of a good nurse in seven of the studies. The attributes of *faithful* were described as *responsible* [A2, A3, A8, A9], *honest* [A1, A2, A9], *trustworthy* [A1, A10], *ethical* [A2, A8], *virtuous* [A4], and *loyal* [A2].

Professional Competence of Good Nurse: Professional competence of a good nurse described in a total of 11 studies were categorized as *professional manner* (n=11), *practical quality* (n=10), *patient-centered care* (n=10), and *communication* (n=9). Of the subcategories of professional competence, participants emphasized the subcategory *professional manner* most frequently as it appeared in all 11 studies. The attributes of professional manner identified were *calmness* [A1, A2, A4, A6, A11], *pride* [A2, A6, A11], *patience* [A3, A4, A10], *cleanliness* [A1, A5, A7], *gentleness* [A1, A3], *dressing in appropriate attire* [A1, A5], *being a role model*, and *following standards of profession's code of ethics*.

Practical quality was derived from ten studies and included attributes in this category were *knowledge* [A1-A10],

technical skill [A1-A4, A6-A8, A11], *experience* [A2, A4, A6], and *critical thinking* [A2, A8]. *Knowledge* was most frequently mentioned above all other attributes as it appeared in all 10 studies [Figure 2]. "Critical thinking" was reported in two studies conducted on nurses only [A2, A8].

Patient-centered care was elicited from 10 studies and identified attributes of patient-centered care were *fulfilling patient's needs* [A2-A4, A8, A11], *explaining* [A4, A7, A9-A11], *providing timely care* [A4-A6, A9], *providing patient education* [A4, A8, A9], *providing empowerment* [A9, A11], and *preserving patient's rights* [A6, A7].

Communication was reported as professional competence in nine of the studies, and its specific attributes were identified as *listening* [A1, A6-9, A11], *having conversation* [A1-A3, A7, A9, A11], *establishing rapport* [A2, A5, A6, A9], and *communicating among healthcare team* [A3, A5, A9].



Personality traits Professional competence
Figure 2: Characteristics of good nurses perceived by patients and nurses

Discussion

Personality Traits of Good Nurse: The personality trait of a good nurse that carried the most emphasis was *regardful*, and the most important attribute of a *regardful* nurse was *respectful*. Patients stated that they had experienced the loss of identity and existence in hospitals, expressing their strong desire to be respected as a human being [16]. They felt respected when nurses did not see them as the disease itself and classify them by numbers or symbols, but acknowledged the diversity of individual culture and guaranteed patients' participation in the decision-making process. This is consistent with the fundamental principles of nursing, that the respect for patients is respect for dignity and fundamental rights to life, suggesting that the respect for patients is a moral right granted to patients and a concept that must be upheld in the field [17].

The second most emphasized trait of a good nurse was *humanistic* and the most important attributes of a *humanistic* nurse were identified as *warm*, *compassionate*

and *kind*. As the concept of marketing increasingly applies to hospital services in recent years, *kindness* is often requested from nurses^[18]. Unlike others in the service sector from whom simple *kindness* is required, being *warm-hearted* and *compassionate* seem to be the more essential and significant qualities for nurses who customarily deal with patients and human lives at work. Patients are exposed to an unfamiliar hospital environment to overcome their medical conditions, and satisfying their basic needs is ensuring psychological stability, which also affects the extent of recovery^[19].

Meantime, the attribute of *ethical* within the category *faithful* was commented by nurses only. This seems to be because nurses are subject to basic training on the principles, concept, and rules of ethics as part of the university curriculum and their compliance with professional ethics is emphasized via code of ethics. Nurses are required to participate as professionals in the decision-making process that can affect the life of patient and be responsible in their actions as the actual advocate for patients^[20].

Professional Competence of Good Nurse: Within professional competence of a good nurse, most emphasis was given to *professional manner* and its representative attribute was *calmness*. A cancer patient indicated that nurses who stayed calm and rational despite the patient's state of panic reassured that the patient could trust the nurses. This implies that patients may be negatively influenced if nurses are emotionally affected by patients or guardians, fail to control their emotion or show anger or tears in their presence^[21], or fail to restrain emotional response by both patients and themselves because they are excessively steered by positive or negation emotions^[19]. To help patients who experience various diseases and instability, nurses will need to find a balance between humanitarianism, *compassion for patients* and *calm, professional manners*.

Practical quality was the second most important competence of a good nurse, only except for a study conducted on psychiatric patients. The representative attribute within *practical quality* was nursing knowledge and skills. This supports today's phenomena^[22] in which nursing education underlines the importance of nursing students acquiring the knowledge and skills. In a study on psychiatric patients, however, it was found that the professional competencies of a *good nurse* included *explanation, ensuring patient participation in the treatment process, attentiveness, and conversation*^[23].

Patient-centered care was identified as professional competence of a good nurse and its specific attributes were *fulfilling patient's needs*, and *explaining*. For patients whose independence has been compromised by the disease, demands for daily life assistance were as important as their demands for professional nursing skills. *Fulfilling patient's needs* was closely related to another attribute, *timely care*. Patients considered it a professional competency when nurses responded immediately to their minor/major demands and were willing to resolve issues.

Of many nursing care activities that fall under patient advocacy, patients prioritized nurses' explanation. Explanation by nurses also ranked top in a study in 1979 on general demands made by inpatients^[24]. The findings of the studies conducted in the 1970s are consistent with those of this study based on recent studies, indicating that patient demands for nurses' explanation have been important to this day.

Lastly, *communication* was derived as professional competence of a good nurse and *listening* was reported as important attribute within *communication*. While many patients wished to engage in personal communication or wanted nurses to expose their personal stories in the process of engaging in patient-nurse conversation or building rapport, the same was not mentioned by nurses. This was similar to previous studies^[15] that reported how nurses believed it to be safe to not reveal their personal stories or life to patients. If nurses could enhance their skills^[25] to take advantage of self-exposure and demonstrate humanitarian empathy and communication for treatment purposes, it could be possible to provide a therapeutic environment in which nurses can build rapport with patients.

Based on the findings of this study, *good nurses* will need to find balance between their character and professional competency and have a mix of nursing qualities, perceived differently by nurses and patients. Therefore, introducing an organic framework for nursing education covering character-building and professional classes in the curriculum is the most important. Meanwhile, the chronic shortage of nurses and other such constraints in Korea prevent nurses, even the ones with all the required qualities, from practicing what they learn in real life. It is therefore imperative that studies be performed to explore the range of practical character-

building education and system and the structural aspect of the clinical settings that undermines the quality of nursing care. Further studies are also required, considering that the perception of a *good nurse* may change by the severity of disease or cultural background.

The limitations of this study are as follows: the number of nurses studied in this paper was smaller than that of the patients, which necessitates additional studies on the comparison between nurses' and patients' perceptions. Additionally, it is necessary to conduct an in-depth study on the comparison of nurses' and patients' perceptions regarding what makes a good nurse by their disease and department as there are only a few studies on this particular topic. Despite its limitations, this paper comprehensively reviewed the studies conducted on participants with specific diseases or in specific wards or departments to better understand the concept of *good nurses* as perceived by patients and nurses. The findings are direct attention to the general trends in the expectations and demands of society and the qualities unique to nurses who deal with patients with specific diseases or in specific wards/departments.

Conclusion

Our study indicated the personality traits and professional competence needs of a good nurse as perceived by patients and nurses. For being a good nurse, it is important to balance personality traits and professional competence. These findings of our study provide a better understanding of the direction of nursing education as well as the structural environments of clinical nursing field.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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ECG Biometrics in Forensic Application for Crime Detection

Mihir Narayan Mohanty¹, Saumendra Kumar Mohapatra²

¹Professor, Department of Electronics and Communication Engineering, ²Research Scholar, Department of Computer Science and Engineering, ITER, Siksha 'O' Anusandhan (Deemed to be University)

ABSTRACT

The physiological property of the human being is unique for each individual. This provides the identity of specific human. Biometric features are used with the help of engineering through machines in recent years for better operation. Similar features can be used for crime detection and security purpose. The biometric features provides information and useful in forensic science. Unlike many methods, heart signal is considered in this work. In different mental condition ECG is collected experimentally in our laboratory using cardio track device. The experiment is carried with eighty subjects. The age range is between nineteen to twenty one years. The data is verified for frighten boy committed some mistakes related to academic environment. Spectral analysis using Fractional fourier transform (FFT) and Wavelet transform (WT) has been performed for R peak detection. The wavelet coefficients are considered as the weights of neural network model for detection purpose. The standard neural network structure multi layer perceptron (MLP) is utilized with wavelet coefficients. The result found excellent as compare to earlier method and exhibited in result section

Keywords: Biometric Identification; ECG; R peaks; Wavelet; Neural Network.

Introduction

Biometric data for identification in forensic science backs to 20th century. Forensic science refers to the applications of scientific principles and technical methods to an investigation in relation to criminal activities, in order to establish the existence of a crime, to determine the identity. It is thus logical that this area was a fertile ground for the use of physiological or behavioral data to sort and potentially individualize protagonists involved in offences.

Biometric identification system is one of the innovative techniques in the field of identity management system. It is an improved technology for personal data storage system and highly secured as compared to traditional security mechanism like pin and password system. This method is similar to pattern recognition

technique where unique and discriminative features (biometric samples or recognition data) are extracted and then matching of these features with previously enrolled data takes place.

Biometrics is inherent behavioral or physiological properties of living beings. In other words, biometrics describes our appearance, *what* and *how* we are. Biometric traits include physiological properties like body height, face or fingerprint, as well as behavioral properties like voice, gait or signature. The main advantages of biometric authentication, including usability, availability, security and portability are directly inferred from this bond.

The complete procedure for biometric identification system is displayed in **Figure 1**. Generally in this identification technique different biological data are used for identifying someone as being him/herself. These data can be face, iris, fingerprint, ECG, and EEG as presented in **Figure 2**. While the use of biometrics for authentication purposes offers many advantages, there are also security and privacy concerns arising. Biometrics contains personal and possibly sensitive information. System, service or authentication providers shouldn't gain access to biometrics, as the information contained in biometric signals could be abused or lost.

Corresponding Author:

Mihir Narayan Mohanty
Professor, Department of Electronics and
Communication Engineering,
ITER, Siksha 'O' Anusandhan
(Deemed to be University), Bhubaneswar, India
Email: mihirmohanty@soa.ac.in

- Understanding the correct processes and the legal parameters can make the difference between having a suspect's confession accepted as evidence by the court or not. With the above in mind, this chapter will focus on several salient issues, including:
- The progression from interviewing to questioning to interrogating, and how this progression relates to investigative practices
- The junctures that demonstrate the need to change from interviewing a witness to questioning a detained suspect to interrogating an arrested suspect

- The issues of physical and mental distress, and how to avoid the perception of officer-induced distress during an interrogation

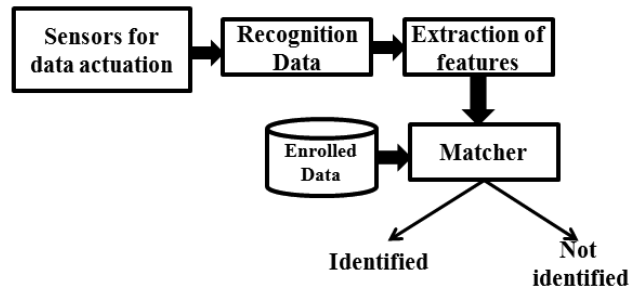


Figure 1: Biometric identification system

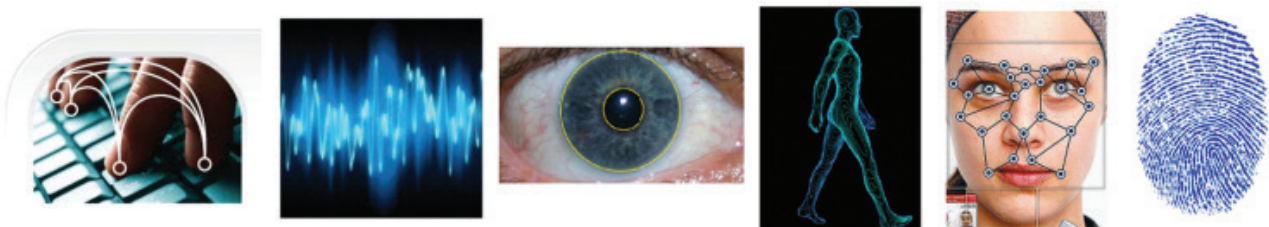


Figure 2: Different types of biometric modalities such as keystroke, voice, iris, gait, face and fingerprint.

Some of these data can be vulnerable to forgery, but our heart is constantly beating and can be used for obtaining different information based on the electrical heart characteristics^{1,2,3}. There is an expanding enthusiasm for utilizing the ECG in biometric recognizable proof. Every individual has an distinctive ECG characteristics which gives robustness for falsification using fraudulent techniques⁴. Generally there are two types of ECG biometric recognition methods: fiducial and non-fiducial. Fiducial method is a preprocessing step for the detection of heartbeat. Specific points are identified in this step which is vulnerable to processing errors, due to, e.g., noise. There is no need of ECG wave detection or configuration in non-fiducial methods. These methods are generally used for reducing the preprocessing error rate. Also there are some semi-non-fiducial methods in which at least the R-peaks are detected for window alignment^{5,6}. In ECG based biometric identification method the ECG data is collected every time the person arrives at the access point. There are some external factors like circadian cycle which affects the signal characteristics. For this reason the identification system should be vigorous and protected to variations in ECG. For obtaining a reasonable and perfect identification system, it is important to employ a method which can accurately deal with the usual biometric identification systems.

Keeping the level of user interaction for authentication as low as possible, adds to usability and ultimately increases user acceptance. They are available, because

most biometrics don't change significantly within weeks or months and they are on hand wherever we go. From some biometrics like voice, gait or ECG, even liveliness can be derived. They are secure, because many offer high classification rates, they are not prone to shoulder surfing and counterfeit attacks at least require a certain degree of equipment and preparation. And last but not least they are portable, because most biometrics can be measured with sensors that have small form factor and would easily fit into most mobile devices⁷. A structure of different types of bioinformatics is presented in **Figure 3**.

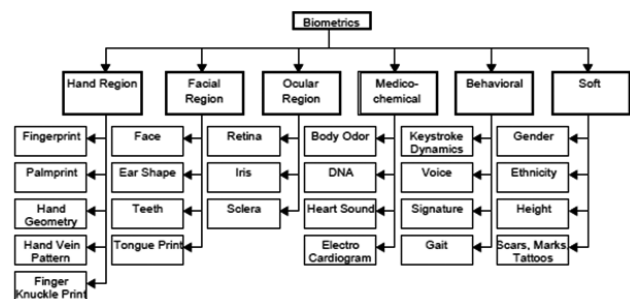


Figure 3: Structure of the different types of Bioinformatics²⁴

Sate of the Art of the Work: It is one of the complicated tasks to develop an ECG based biometric identification system which can identify a person accurately. Different techniques have been applied by the researcher for getting a better identification system and some of them are cited here.

A recent study was driven by the fact that blood circulation causes periodic subtle changes to facial skin color⁸. This fact was utilized in^{9,10,11,12,13} for HR estimation and^{14,15,16} for applications of heartbeat signal from facial video. These facial color-based methods, however, are not effective when taking into account the sensitivity to color noise and changes in illumination during tracking. Thus, Balakrishnan *et al.* proposed a system for measuring HR based on the fact that the flow of blood through the aorta causes invisible motion in the head (which can be observed by Ballistocardiography) due to pulsation of the heart muscles¹⁷. An improvement of this method was proposed in¹². These motion-based methods of^{17,18} extract facial feature points from forehead and cheek.

ECG based human verification system was proposed in¹⁹ for both healthy and cardiac irregular condition. They have used heart beat level and segment level information fusion methods. principal component analysis (PCA), linear discriminant analysis (LDA) and within-class covariance normalization (WCCN) for beat variability compensation followed by cosine similarity and S-norm as scoring were used in their work. Their proposed PCA algorithms perform 25% realisable on PTB data base. Same PCA was applied in²⁰ for identification purpose and 92.9% classification accuracy was obtained in their work. Authors in²¹ extracted 19 features from each heart beat for the identification purpose. Template matching and adaptive thresholding was applied in their work for matching purpose. The matching was calculated by using correlation between features and 99% accuracy was obtained from their proposed system. ECG can be employed as a continuous authentication system. When the human heart pumps blood, subtle chromatic changes in the facial skin and slight head motion occur

periodically. These changes and motion are associated with the periodic heartbeat signal and can be detected in a facial video²². Takano *et al.* first utilized the subtle color changes as heartbeat signals from facial video acquired by a camera to estimate HR²³.

Biometrics Method for Human Identification Using Electrocardiogram: This work exploits the feasibility of physiological signal electrocardiogram (ECG) to aid in human identification. Signal processing methods for analysis of ECG are discussed. Using ECG signal as biometrics, a total of 19 features based on time interval, amplitudes and angles between clinically dominant fiducials are extracted from each heartbeat. A test set of 250 ECG recordings prepared from 50 subjects ECG from Physionet are evaluated on proposed identification system, designed on template matching and adaptive thresholding. The matching decisions are evaluated on the basis of correlation between features.

The advantages of using the ECG for biometric recognition can be summarized as universality, permanence, uniqueness, robustness to attacks, liveness detection, continuous authentication and data minimization.

With time-varying biosignals there is high risk of instantaneous changes which may endanger biometric security. Recordings of the cardiac potential at the surface of the body are very prone to noise due to movements. However, even in the absence of noise, the ECG signal may destabilize with respect to a biometric template that was constructed some time earlier. The reason for this is the direct effect that the body's physiology and psychology have on the cardiac function. Therefore, a central aspect of the ECG biometrics research is the investigation of the sources of intra-subject variability. ECG of two different persons is presented in **Figure 4**.

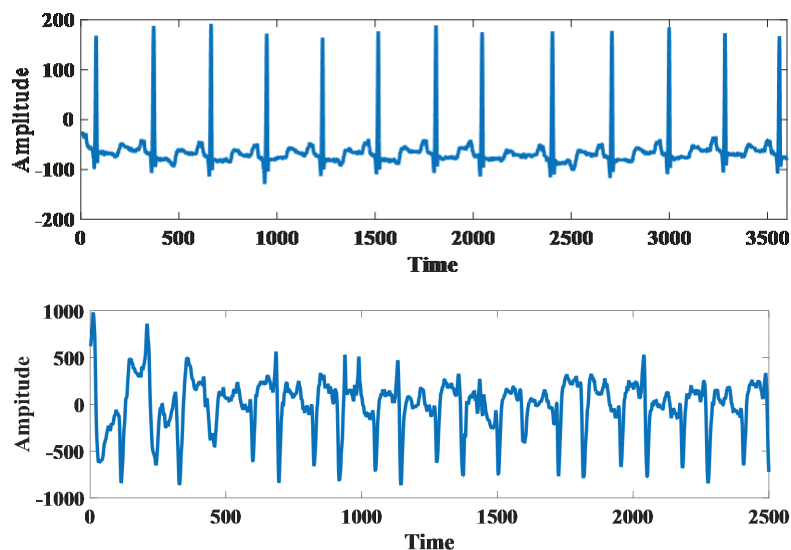


Figure 4: Different ECG patterns for different persons

Wavelet Transform: Basically wavelet transform decomposes the signal in different scales. This will represent to the resolution of the signal. The corresponding frequency can be found according to time localization. Because of its scaling property, it holds a unique position for time-frequency analysis of the non-stationary signals. Since ECG is a category of non-stationary as well as noisy signal, wavelet transform is chosen for such analysis²⁵. In this case, noise is removed and simultaneously the specific peaks are located clearly.

DWT provides a cosy relationship of a signal in time and frequency domain and can be defined as:

$$D(c_1, c_2) = \sum_{c_1} \sum_{c_2} S[c_2] 2^{\frac{1}{2}} \left(\dot{E} 2^{-\frac{1}{2}} j - c_2 \right) \quad \dots(1)$$

Here $D(C_1, C_2)$ is the DWT coefficients $S[C_2]$ is the discrete signal.

In wavelet analysis any signal space of a multi-resolution approximation can be decomposed into lower frequency (lower-resolution) approximation and high frequency (higher-resolution) approximation. The noise is eliminated by discarding the detail coefficients D1, D2. Secondly, in our method, using filtering approach before wavelet and FT analysis we have removed most of the unwanted noise of the signal. The probability of error in R peak detection is minimized in spite of the presence of drastic irregularity in the baseline^{26,27}.

Haar wavelet is the simplest and first of wavelet family that resembles to a step function. Daubechies is the mostly discussed wavelet family in signal processing approach. It is generally represented as dbN where, N signifies order of the wavelet. An order of 2, 4 and 6 has been used for comparison of the unhealthy person from a normal person. In this case the 'R' peaks are detected successfully by selecting the optimum coefficients. Different mother wavelets like Coiflet, Symlet and Daubechies have been tested for this problem. The best result with Daubechies has been reported. In case of high pass filtering Db 6 and for low pass filtering Db 2 have shown the best result and is shown in result section.

For 'R' peak detection the following processor has been proposed.

- Consider the filter ECG signal as the input and calculate the wavelet co-efficient.
- Initialize the window time the total time can be

evaluated as total number of samples/sampling frequency.

- Find the maximum and minimum for each window from all possible QRS segment.
- Now locate the R peaks of QRS complexes from different segment.

Neural Network: An artificial neural network (ANN) is a generalized mathematical model which is based on biological nervous systems. The fundamental elements of neural networks are artificial neurons. Input, output, and hidden are three basic layers of a simple neural network as presented in **Figure 5**. In feed-forward networks, the signal flow is from input to output units, strictly in a feed-forward direction. Both linear and non-linear classification problems can be solved by applying ANN with various type of network structure and learning algorithm.

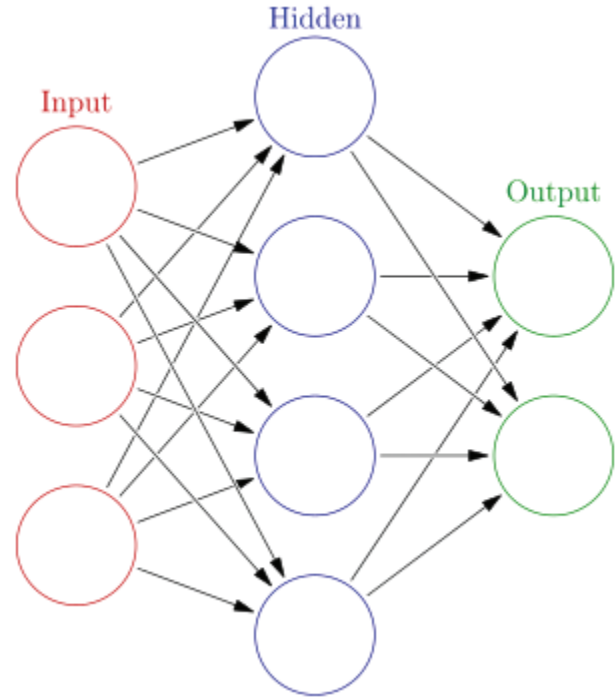


Figure 5: Standard neural network structure

In neural network the output of the hidden layer h and output layer y can be calculated as:

$$h = \sigma(W_1 x + b_1) \quad \dots(1)$$

$$y = \sigma(W_2 h + b_2) \quad \dots(2)$$

where W_1 and W_2 are the weights of neuron and x is the input. b_1 and b_2 are the bias. σ is the activation function. The weights are considered with the wavelet coefficients.

Results

In different mental condition ECG is collected experimentally in our laboratory using cardio track device. The experiment is carried with eighty subjects. The age range is between nineteen to twenty one years. The data is verified for frighten boy committed some mistakes related to academic environment. ECG signal with high pulse rate (above 100) is considered for the proposed work. A sample signal is presented in Figure 2. For extracting the QRS complex from the signal, it is decomposed by applying wavelet decomposition method. A decomposed ECG is shown is **Figure 6**.

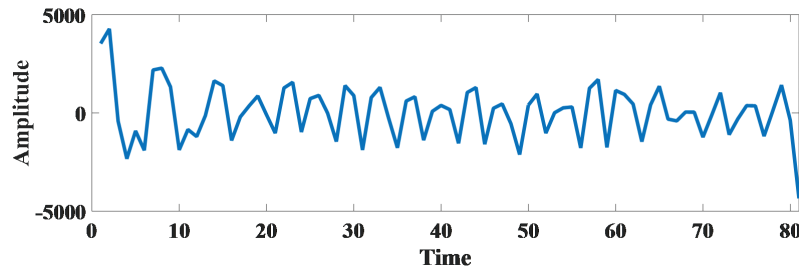


Figure 6: Decomposed ECG

As shown in **Figure 7**, the heartbeat rate is highest. Since, the normal heart beat rate of an average healthy person lies in between 72 to 120. Thus, a value of 132 as heartbeat indicates the degree of illness the person is affected with. Hence it requires immediate attention. The R-peaks are also of highest amplitude. Similar results could be observed from the wavelet features in **Figure 8**.

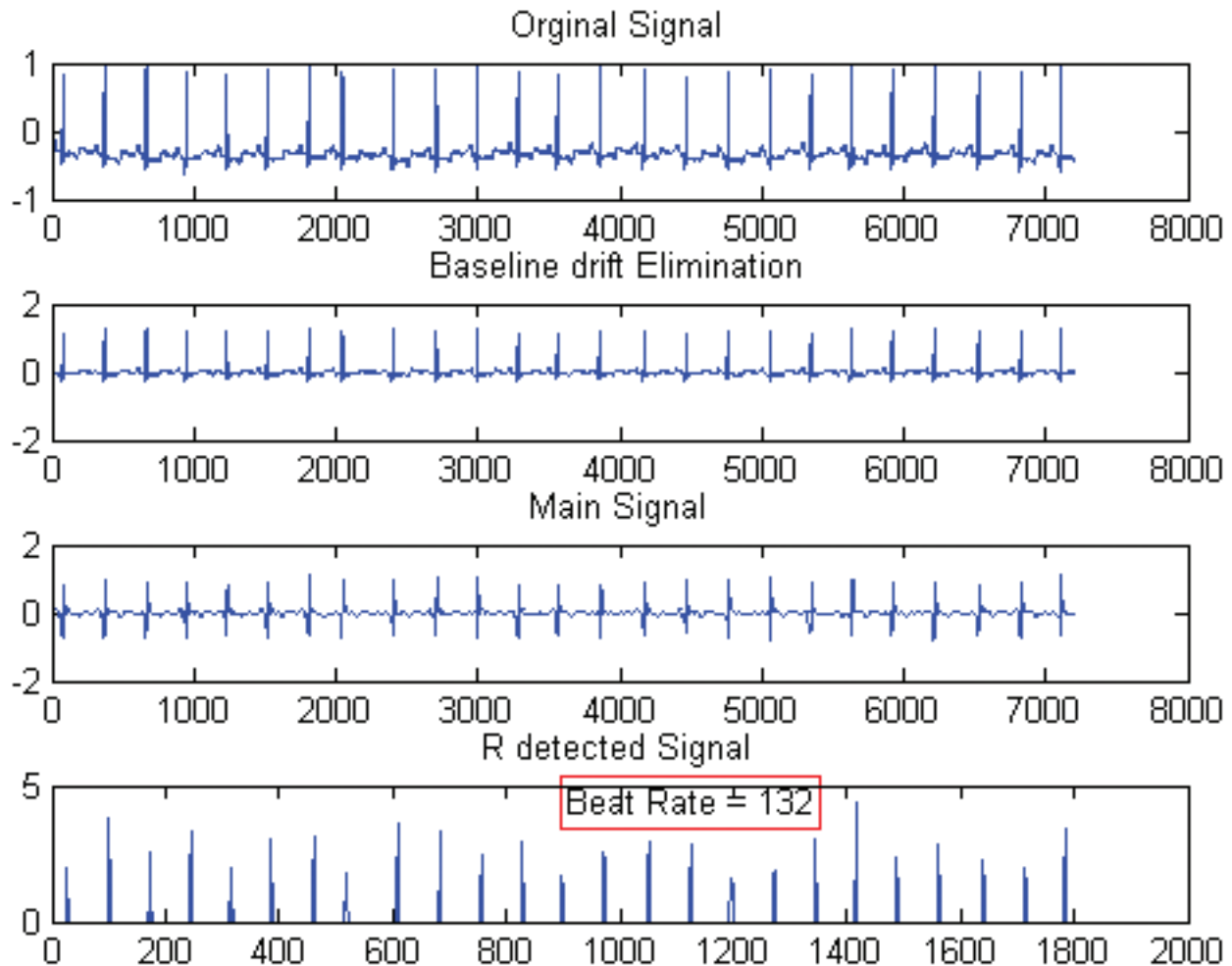


Figure 7: Identification of a terminal ill person from R-peak using db2 wavelet features

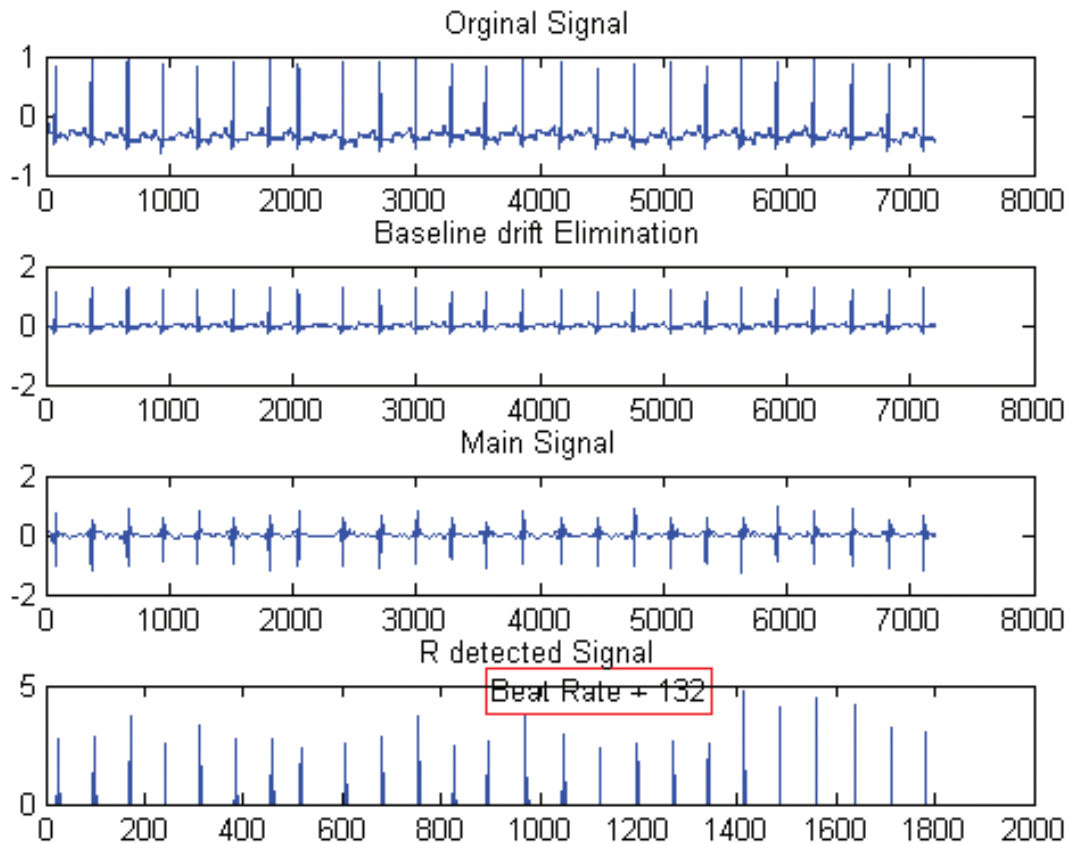


Figure 8: Identification of a terminal ill person from R-peak using Haar wavelet features

The R-peaks are also large although less than that in Figure 7 and Figure 8. Both db and Haar family of wavelet has been used to rate the normal person based on his/her heartbeat. Analysis of these coefficients indicates corresponding R-peaks point towards a normal human being.

After getting the required QRS feature a neural network model is designed for the classification purpose. It classifies the normal ECG and the ECG with high pulse rate. The performance of the neural network classifier is presented in **Figure 9**.

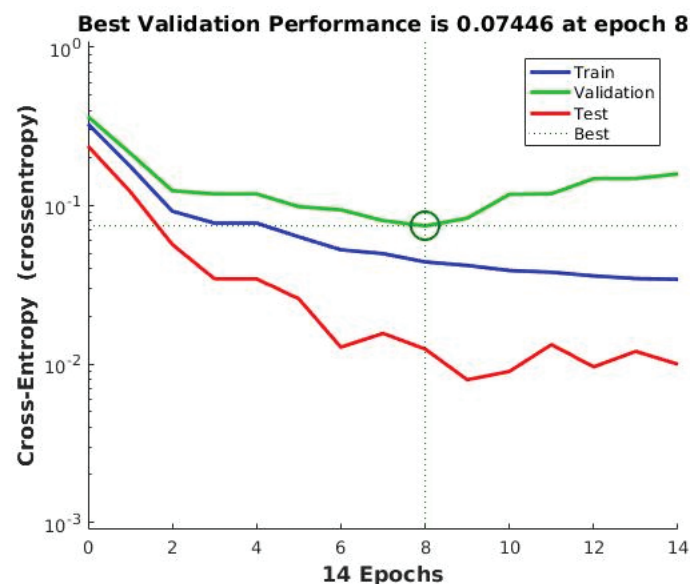


Figure 9: Performance of the Neural Network classifier

Accuracy of a classifier is measured from the confusion matrix. In Figure 10 confusion matrix of the proposed classifier is presented and 96% accuracy is obtained. ROC curve of the neural network in training, testing and validation is presented in **Figure 11**. Result obtained from the proposed system is compared with earlier method and is presented in **Table 1**.



Figure 10: Confusion matrix of the classifier

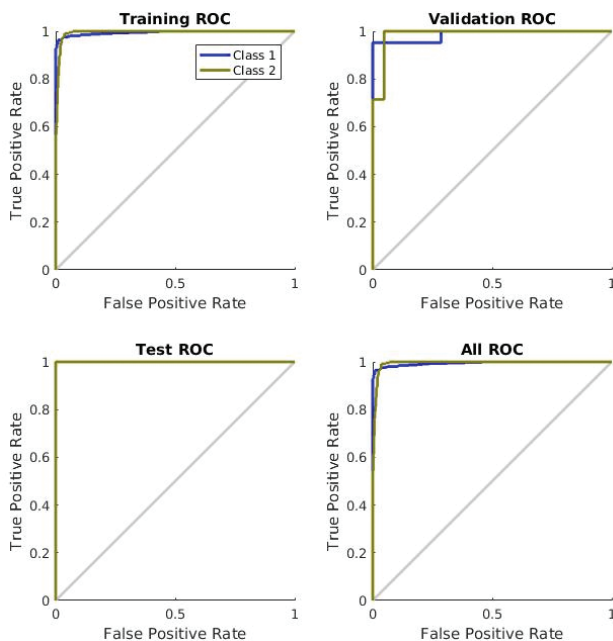


Figure 11: ROC of the neural network classifier

Table 1: Comparison of result with earlier method

Method	Accuracy
EMD [2]	76.19%
SVM [4]	93%
PCA [20]	92.9%
Proposed System	96%

Conclusion

ECG based biometric recognition system is proposed for human authentication purpose. Wavelet features are classified using neural network classifier and the result shows that the neural network classifier for identification is performing well. This system can be implemented in forensic science for biometric identification purpose. Further different feature extraction and classification methods can be taken for better result.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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A Two-Year Prospective Study of Custodial Deaths from Punjab Region of India

Mittal D R¹, Jasbir S², Rai G³, Kumar K⁴, Sharma R K⁵

¹Junior Resident, Government Medical College Amritsar; ²Assistant Professor, Saraswathi Institute of Medical Sciences, Hapur; ³Additional Professor & Head, Dept of Forensic Medicine & Toxicology, Government Medical College Amritsar; ⁴Assistant Professor, Government Medical College Amritsar; ⁵Professor & Head, Dept of Forensic Medicine & Toxicology, Saraswathi Institute of Medical Sciences, Hapur

ABSTRACT

On one hand the horizon of human rights is expanding but at the same time the crime rate is also increasing. In this context, custodial deaths are among most contentious deaths for investigation by forensic experts. These deaths sometimes invite mass resentment and condemnation. Not that always such deaths are due to unnatural or violent causes; indeed most of the time they are due to natural causes. To analyse custodial deaths from all aspects present prospective study was undertaken. A total of 135 (119 male and 16 female) cases of custodial deaths were examined in detail over a study period of 2 years. Based on place of confinement 100 cases (74.07%) died in jail custody, 33 cases (24.45%) died in mental hospital custody and in 2 cases (1.48%) death occurred in police custody. Among 92 cases (out of 135) in which final cause of death was declared, the death was natural in 95.65% while in 4.35% it was unnatural. Pulmonary tuberculosis was the most common natural cause among prison custodial deaths (22.8%, n=16). In mental hospital custody coronary artery disease (12.8%, n=9) was the leading cause of natural death. As far as unnatural deaths are concerned, there were two cases each of suicidal and accidental deaths (2.17% each) and no case of homicidal death was noticed.

Keywords: custodial deaths, jail, police, mental hospital.

INTRODUCTION

Unfortunately, the term 'custody' has not been defined in Criminal Procedure Code (CrPC). Its core meaning is that the law has taken control of the person. This control is not the final or absolute control of ownership but controlling of a person's liberty or curtailing in a substantial manner a person's freedom of action. But at the same time there is implied responsibility for the protection and preservation of the person in custody. The person in custody is thus totally dependent on his or her custodian for proper care and attention.

Custodial death is heard in news and media from time to time and most of the highlighted cases invite public resentment and condemnation. Such events invariably have substantial allegations of omission of proper care and attention or commission of atrocities and torture or abuse of power in one or the other way on part of the authorities' concerned.

Not that always such deaths are due to unnatural or violent causes; indeed most of the time they are due to natural causes.^[1,2] Inadequate medical facilities, delayed medical attention, inadequately trained staff and insensitive custodial authorities are frequently blamed causes by the researchers, to contribute to untimely natural or unnatural prison deaths. Therefore all cases of custodial deaths need to be investigated thoroughly to bring out the actual facts surrounding the death.

Every case of custodial death is supposed to be reported to the National Human Rights Commission (NHRC) and the police is also required to report the findings of the magistrate's inquiry to the Commission along with the postmortem report.^[1] This is an important protection but these steps are frequently ignored. According to Human Rights Watch investigation, a judicial inquiry was conducted only in 31 of the 97 custodial deaths reported in 2015 and 26 cases were not even submitted for an autopsy.^[3]

The autopsy surgeon has a unique role in documenting medical evidence in cases of custodial deaths. His/her role assumes significance in events when the custodial authorities try to hide or alter the actual facts behind the death to save themselves from any penal action. He/she can find out the cause of death after meticulous examination and may also come out clear about manner of death on thorough evaluation of available information.

MATERIAL & METHOD

The prospective analytic study was carried out in the Department of Forensic Medicine and Toxicology, Government Medical College Amritsar (GMCA) from 1.10.2014 to 30.9.2016 on cases of custodial deaths brought for postmortem examination. The postmortem was conducted as per the guidelines laid down by NHRC.

Custodial deaths were categorized into three groups namely jail custody, police custody and mental hospital custody (in the custody of Government Mental Hospital Amritsar) deaths.

The inquest papers, hospital record, autopsy findings and the results of laboratory investigations including histopathology and chemical analysis were perused. All the observations are tabulated and the results are compared with the previous studies.

OBSERVATIONS

Out of 695 autopsies conducted during this period, the number of custodial death cases was 135 (19.42%). Based on place of confinement 100 cases (74.07%) died in jail custody, 33 cases (24.45%) died in mental hospital custody and in 2 cases (1.48%) death occurred in police custody. (Table-1) Among those dying in jail custody 50% were convicted prisoners, 47% were undertrial prisoners and 3% were internee. (Fig-1)

Out of 135 deaths 88.1% (n=119) were male and 11.9% (n=16) were female. Among males maximum deaths occurred in jail custody (82.35%; n=98) followed by mental hospital custody (16.81%; n=20) and one (0.84%) died in police custody. Among females 13 (81.25%) died in mental hospital, 2 (12.5%) died in judicial custody and 1 (6.25%) died in police custody. (Table-2)

The proportion of overall custodial deaths was highest in 26-35 years (26.7%) age group followed by

36-45 years (21.50%) and 46-55 years (16.30%) age groups. In jail, maximum deaths 32% (n=32) occurred in the age group of 26-35 years. While in mental hospital maximum deaths 45.7% (n=16) occurred in the age groups of 46-65 years. Two cases-a 35 year old female and a 16 year old male-died in police custody. (Table-3)

A total of 104 (77.04%) persons received medical care before their death, while 31 (22.96%) died at their place of confinement and had not received medical care before their death.

In 43 cases of custodial deaths laboratory reports (chemical analysis and/or histopathology) were still pending. So the statistical analysis regarding cause and manner of death could be performed only in 92 cases (out of 135) in which final cause of death were established. Out of these 92 cases 88 (95.65%) died of natural causes while 4 (4.35%) died due to unnatural causes. (Table-4)

Among natural causes 38.64% cases had single organ involved, majority having pulmonary involvement, 28.26% cases had two organ system involved and 20% had multi-organ failure. Pulmonary tuberculosis was the most common natural cause of death in prison custody (22.8%, n=16). In mental hospital custody coronary artery disease (12.8%, n=9) was the main cause of natural death. (Table-5) Out of total 33 cases of mental hospital deaths only 2 cases (6.06%) had pulmonary tuberculosis. (Table-6)

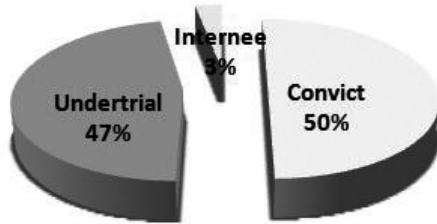
Out of total 102 cases of judicial/police custody deaths 53 cases (51.96%) were suffering either from TB or HIV or HCV or multiple infections. (Table-6)

As far as manner of unnatural deaths is concerned, there were two cases each of suicidal and accidental deaths (2.17% each) and no case of homicidal death has been noticed. Suicide was committed by 2 cases (n=2/92; 2.17%); one each in police and mental hospital custody. Hanging was the method used for suicide in both the cases.

Accidental death also accounted for 2 cases (n=2/92; 2.17%); one each died in jail and police custody. Accidental death in jail occurred due to accidental overdose of intravenous morphine in an undertrial prisoner. In police custody the accidental fall from height and consequent head injury resulted into death of the female inmate. (Table-4)

Table 1: Incidence of custodial death cases as per confinement

Type of custody	No. of cases	Percentage
Jail custody	100	74.07
Police custody	2	1.48
Mental Hospital custody	33	24.45
Total	135	100

**Figure 1: Conviction status of prisoners in jail custody****Table 2: Age wise distribution of custodial death cases**

Age group (in years)	No. of cases	Percentage
16-25	20	14.8
26-35	36	26.7
36-45	29	21.5
46-55	22	16.3
56-65	15	11.1
66-75	11	8.1
76-85	2	1.5
Total	135	100

Table 3: Gender wise distribution of custodial death cases

Gender	Judicial			Police	Mental Hospital	Total
	Convict	Undertrial	Internee			
Male	48 (96%)	47 (100%)	3 (100%)	1 (50%)	20 (61.61%)	119 (88.10%)
Female	2 (4%)	0 (0%)	0 (0%)	1 (50%)	13 (39.39%)	16 (11.90%)
Total cases	50	47	3	2	33	135

Table 4: Manner of death in custodial death cases (n = 92/135)

Manner of death	Mental Hospital	Judicial			Police	Total
		Convict	Undertrial	Internee		
NATURAL	23	36	26	3	0	88(95.65%)
UNNATURAL						
Accidental	0	0	1	0	1	2(2.17%)
Suicidal	1	0	0	0	1	2(2.17%)
Homicidal	0	0	0	0	0	0(0%)
Total	24	36	27	3	2	92(100%)

Table 5: Cause of death in custodial death cases (n = 92/135)

Cause of death	Mental Hospital	Judicial			Police	Total
		Convict	Undertrial	Internee		
Asphyxia	1*	0	0	0	1*	2
Hemorrhage & Shock	0	1	1	1	0	3
Septicemia	2	1	2	0	0	5
Poisoning	0	0	1*	0	0	1
Shock	0	0	1	0	0	1

Conted...

Organ failure						
<i>One organ failure</i>						
Brain	2	1	1	0	1*	5
Lungs	4	11	10	1	0	26
Liver	0	2	0	0	0	2
Heart	1	0	0	0	0	1
<i>Two organ failure</i>						
Brain &Heart	2	0	0	0	0	2
Brain &Lung	2	3	3	0	0	8
Heart &Lung	7	4	1	0	0	12
Liver &Lung	1	2	0	0	0	3
Kidney &Lung	0	1	0	0	0	1
Multi-organ failure	2	10	7	1	0	20
Total	24	36	27	3	2	92

*Unnatural deaths

Table 6: Prevalence of HIV, TB and HCV infections in custodial death cases

	TB	HIV	HCV	HIV+ HCV	HIV+ TB	TB+ HCV	HIV+ HCV+TB	Total
Judicial/police (n = 102)	22 (21.57)	11 (10.78)	12 (11.76)	4 (3.92)	1 (0.98)	1 (0.98)	2 (1.96)	53 (51.96)
Mental hospital (n = 33)	2 (6.06)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (6.06)

(Parenthesis indicates percentage)

DISCUSSION

According to the NHRC, the number of custodial deaths in 2000-2001 was 1,037 while in the year 2012-2013 they have increased to 2,157. A total of 1,702 prisoners have died in Indian jails during 2014; out of which 1,507 were natural deaths and 195 were unnatural deaths.^[2]

In present study the incidence of custodial death was 19.42% of the total autopsies. In previous studies from same region conducted by Gargi^[4] (1995-97) and Vohra^[5] (2009-2010) the incidence of custodial death was 0.77% and 2.93% respectively. This increased proportion of custodial deaths is on account of the fact that since 2013, the GMCA is conducting autopsies in custodial death cases and referred cases requiring forensic pathologist expertise besides in-hospital deaths. Autopsies in all other cases are now being conducted at District hospital.

Out of 135 cases of custodial deaths, 11.9% were female and majority of them died in mental hospital

with only two deaths occurred in prison. Vohra^[5] has also mentioned 18.6% female deaths, majority of them died in mental hospital. Gargi^[4] and Bardale^[6] reported all males while Mittal^[7] reported only one female death in prison. Higher incidence of female deaths in mental hospital was during their old age after they had been left here by the relatives for rest of their life.

Predominantly the custodial deaths (26.7%) were seen in the age group of 26-35 years while Bardale^[6] and Vohra^[5] reported maximum age incidence (24.3%) in age group of 31-40 years. It shows that crime rate is enhancing amongst the younger age group.

The present study found more incidence of death among convicts (50%) comparative to undertrials (47%); the finding is in line with findings of Bansal et al^[8] who has reported, respectively 58.7% and 41.3% deaths among convicts and undertrials. Contrary to this observation Vohra^[5] has mentioned 71.4% deaths involving undertrial prisoners.

In present study 77.04% of inmates received medical care before their death. The studies of Vohra^[5], Bardale^[6] and Mittal^[7] put this figure respectively at 55.71%, 64.28% and 69.56%. It points towards a positive trend of timely referral of sick custodial patients.

Natural Deaths: The current study found that natural causes were responsible for majority of custodial deaths (about 95%).^[4-12] Among natural deaths most of the deaths were due to pulmonary system involvement; pulmonary tuberculosis being the leading cause. This finding is supported by various other researchers.^[4-6,11-14] However, Wobeser et al^[9] and Frueshwald et al^[10] found that majority of deaths were due to cardio-vascular diseases. This is attributed to overcrowding, closed living conditions, insufficient ventilation and poor nutrition in Indian jails as compared to western countries.

In our study out of 102 cases in judicial/police custody 21.57% were having tuberculosis, 10.78% were HIV infected and 11.76% were HCV infected. Besides, 8.7% cases were infected with multiple infections. (Table-6) Bansal^[8] and Bardale^[6] found the prevalence of HIV respectively in 13.5% and 14.08% of prison inmates. From above observation it is clear that prisoners constitute high risk group for acquisition of these infections.

Unnatural Deaths: The unnatural deaths comprised only 4.35% of cases which is lowest figure found as compared to figures reported by other authors. General welfare of prisoners and vigilance in Punjab jails might be comparably better than other study regions. The reason for this can be attributed to NHRC activism, media and general public awareness regarding custodial deaths, and constant fights of various NGO's against the custodial torture.

Suicidal and accidental deaths were found to have equal incidence (2.17% each). In this respect, the present study differs from other researchers, who found overall higher incidence of suicides, and also the most common manner of unnatural death. (Table-4)

However present study is in consonance with studies by Vohra^[5], Bardale^[6], Bansal^[8], Agnihotri^[11], Sonawane^[12] and Sonar V et al^[13] as far as most common method used for suicide viz. hanging. Therefore authorities should be careful that the inmates are not in the possession of such materials which may help them in taking the extreme step of ending their lives.

No case of homicide has been noticed in present study and this indicates effective control of authorities over inmates. However one disturbing fact is that all deaths occurring under police custody were unnatural. (Table-4) Moreover these deaths had occurred shortly after arrest and one of the arrestee was detained without any entry in daily diary. These shocking practices used by police undermine public faith in law enforcement.

Accidental deaths were due to drug overdose (poisoning) and accidental fall. The access of prisoners to poisons/drugs of abuse indicates lapses in jail security and has been found to be the commonest cause of unnatural deaths by few authors.^[7,14]

CONCLUSION

Custodial deaths are predominantly due to natural causes and pulmonary tuberculosis is the leading cause in developing countries, which is further compounded by high prevalence of HIV and HCV infections among prisoners. There should be regular health check-up and an effective programme to screen and treat inmates. Better maintenance of prisons, trained, sensitive and more dedicated staff including medical staff and de-crowding of prisons are few of important suggestions to be followed.

Access to various drugs and poisons inside jail is also a matter of concern and this could not be possible without connivance of jail officials. Those involved in such practices should be warned and strict action need to be taken. De-addiction and rehabilitation services to addict prisoners and timely medical care to sick ones should be provisioned as a matter of right.

An unnatural death in police custody is another grave area of concern. The way forward is to strictly enforce existing laws and guidelines on arrest and detention. The Supreme Court's D.K Basu decision particularly with respect to recording detentions, informing families, producing suspects before magistrates and providing medical examinations should be adhered to by the police.

Only a more humane approach towards prisoners and providing care and timely medical aid as a matter of right will go a long way to bring down the incidence of prison deaths in India.

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