Original Article

Altered Sleep Pattern and its Effect on Cognition among Nursing Staff of a Tertiary Care North Indian Hospital

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Abstract

Introduction: Disruption in sleep pattern is common in modern society due to work schedule demand.

Aim: to investigate the effects of altered sleep patterns on cognitive performance among nursing staff.

Methods: A cross-sectional study was conducted in Government Medical College, Jammu, enrolling 81 nursing staff working either day(N=41) or nightshifts(N=40). Data was gathered through self-administered questionnaires and cognitive assessment tools: the Pittsburgh Sleep Quality Index (PSQI) and the Montreal Cognitive Assessment (MoCA) respectively.

Results: The study revealed a significant difference in sleep deprivation among shift workers with 67.5% of night shift nurses reporting sleep deprivation compared to 26.82% of day shift staff. Cognitive assessments indicated that night shift nurses had significantly lower MoCA scores (mean score:24.39±3.98) compared to day shift nurses (meanscore:29.52±4.22). Cognitive parameters such as attention, short-term memory recall, and executive function were significantly compromised in sleep-deprived nurses as compared to Non sleep-deprived counterparts.

Conclusion: Our findings highlight the detrimental impact of night shift work on sleep quality and cognitive performance among nursing staff. A substantial proportion of nurses experience sleep deprivation, leading to cognitive impairments.

Keywords: Sleep deprivation, cognitive performance, nursing staff, night shifts, circadian rhythm

Introduction

A lack of sleep, or sleep deprivation, is a widespread phenomenon in various occupations. Nursing is a demanding profession characterized by irregular work schedules, including shift work, which can disrupt the natural circadian rhythm and lead to sleep deprivation[1,2]. Sleep deprivation due to shift work is associated with modified activity/ rest pattern that may cause a significant disruption

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of circadian rhythms of biologic functions, driven by the human body's internal clock located in the suprachiasmatic nucleus of the hypothalamus[3]. When work schedules conflict with natural rhythm, as often occurs in shift work, it can result in a cascade of adverse health outcomes, including impaired sleep quality, reduced cognitive performance, and an increased risk of accidents and errors[4].

Sleep deprivation results from disrupted sleep patterns and significantly affects physical and mental health[5]. Nurses require focus, sound judgment, and quick reactions, making them particularly vulnerable to the negative impacts of sleep deprivation[6]. Shift work results in a conflict between a days oriented circadian physiology and requirement for work and sleep at the wrong biological time of day.

Research has linked sleep deprivation to an increased risk of medical errors in hospital settings, highlighting the importance of addressing this issue to ensure patient safety[6,7].

Accordingly, this study aims to investigate the effect of altered sleep patterns on cognition among nursing staff and assess the prevalence of sleep deprivation and its association with cognitive performance among nursing staff.

Material and Methods

This study employed a cross-sectional design to investigate the effect of altered sleep patterns on cognitive function among nursing staff. The study was conducted at the Government Medical College, Jammu over 03 month w.e.f September 2025 to November, 2025. A prior clearance from Institutional Ethics Committee was obtained vide no.IEC/ GMCJ/2025/2625, dated 15 November, 2025. The study population consisted of 81 nursing staff recruited from various departments of Associated Hospital of GMC, Jammu working in Day and Night shifts. The sample size was calculated by using MedCalc software on a previous study[8]the number of independent variables (m) in the logistic regression model. The sample size of 81 was divided into two groups, i.e. Group1 (N=41): Working in Day Shift and Group2 (N=40): Working in Night Shift.

The inclusion and exclusion criteria for the study were as under:

Inclusion Criteria:

- currently employed as a nursing staff at the study site.
- Age between 20 and 40 years.
- willing to provide informed consent to participate in the study.

Exclusion Criteria:

- history of any significant medical illness (e.g., uncontrolled diabetes, cardiovascular disease).
- history of any surgical illness.
- current use of medications known to affect sleep or cognitive function.

Data Collection: Data was collected using self-administered questionnaires and cognitive assessment tools. Demographic information, including age, gender, and area of work, was recorded and so were the lifestyle factors such as smoking, history and alcohol use.

Work-related factors, including the number of shifts were documented.

Sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PQSI), a widely used and validated tool for measuring subjective sleep quality. It is a self-rated questionnaire which assesses sleep quality and disturbances over a 1-month time interval. Nineteen individual items generate seven "component" scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The sum of scores for these seven components yields one global score[9].

Global cognitive function was assessed using the Montreal Cognitive Assessment (MoCA). It is a brief, 30-point cognitive screening tool developed in 2005 to detect mild cognitive impairment (MCI)[10].

Statistical Analysis: Data was analysed using SPSS software version 22.0. Descriptive statistics (e.g., mean, standard deviation, frequencies, percentage) were used to summarize the characteristics of the study sample. For continuous variables, independent t-tests were used to compare means between groups, as appropriate. To examine the association between sleep quality and cognitive function, correlation

analyses were conducted. Statistical significance was set at p<0.05.

Results: Majority of our subjects were aged between 21-30 years (52.5%), predominantly female (79.01%); almost all non-smokers (97.53%) and did not consume alcohol (96.29%). The shift distribution was nearly equal between day (49.38%) and night (50.61%) shifts.

Most of the healthcare workers in our study were posted in the IPD departments (77.77%) followed by working in OPD unit (14.81%) and then emergency unit (7.4%).

There was a notable difference (p= 0.0005) in sleep deprivation between the two study groups. While among the Day shift staff, 26.82% reported experiencing Sleep Deprivation, a significantly higher proportion (67.5%) of Night shift staff reported Sleep Deprivation.

Table 1: Quality of sleep (PQSI)

Parameters	Day shift staff (Mean±SD)	Night shift staff (Mean±SD)	Statistical Significance	
			t-value	P-value
Quality	1.15±0.23	1.45±0.33	-4.76	<0.001
Latency (hours)	1.67±1.53	1.03±1.23	2.02	0.041
Duration (hours)	6.34±1.24	5.79±1.32	2.12	0.037
Efficiency	0.97±0.06	0.08±0.05	72.43	<0.001
Any disturbances	0.76±0.504	1.36±0.45	-5.67	<0.001
Use of sleeping drugs	0.23±0.12	0.13±0.43	1.43	0.155
Daytime dysfunction	1.7±1.24	2.06±0.77	-1.57	0.122
Overall quality of sleep	7.95±5.45	6.79±2.34	1.24	0.219

There was a significant difference in Sleep Quality parameters between day shift and night shift staff, with night shift staff generally experiencing poorer sleep quality (Table 1).

A significant difference (p = 0.001) in MoCA mean score among two groups, the Day shift staff score of 29.52±4.22 versus that of the Night shift staff 24.39±3.98 was observed.

Table 2: Cognitive parameters (MoCA)

Parameters	Day shift staff (Mean±SD)	Night shift staff (Mean±SD)	P-value
Short term memory recall	3.23±2.11	3.35±2.18	0.004
Attention, concentration, working memory	4.64±3.87	3.25±2.75	0.005
Executive functions	4.01±1.34	3.93±1.03	0.005
Visuo-Spatial Abilities	3.12±1.2	3.03±0.9	0.68
Language-Confrontation, Repetition, and Fluency	4.82±2.12	5.46±1.23	0.45
Orientation to time and Place	4.82±2.45	3.3±1.78	0.34

The sleep-deprived staff (total 38 out of 81, irrespective of shift duty) scored significantly lower in all cognitive parameters compared to their non-sleep deprived counterparts (Fig. 1).

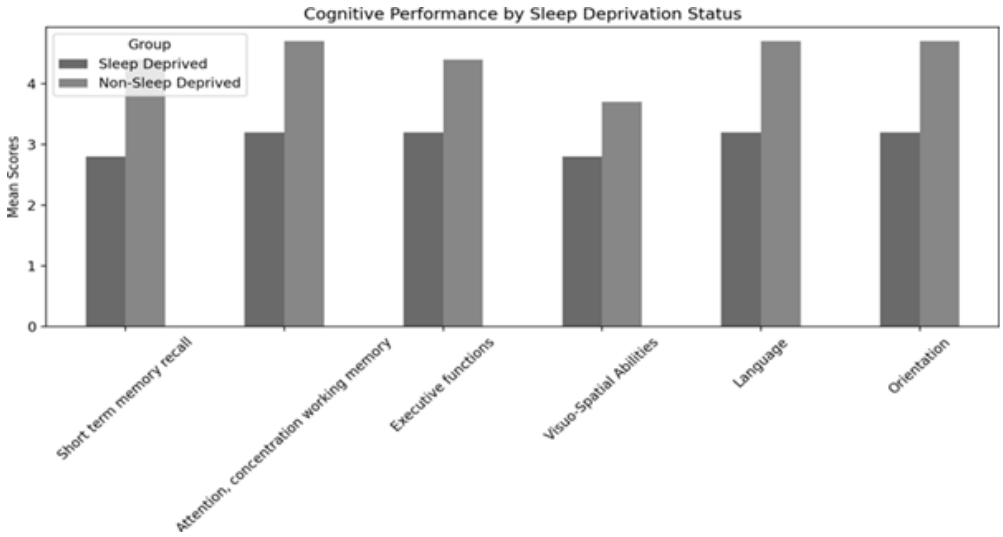

Fig. 1: Cognitive performance by sleep deprivation status

Discussion

Sleep is an integral part of human life and is linked to optimal performance across a broad range of physiological and psychological functions[11].The largest workforce in the hospital environment is the Nursing team and are essential to the healthcare system. The current study assessed the effects of altered sleep patterns on working memory among nursing personnel. The findings of the present study underscore the significant challenges faced by nursing staff working night shifts concerning both sleep quality and cognitive performance. The results indicate a heightened prevalence of sleep deprivation among night shift nurses, with 67.5% suffering compared to just 26.82% of day shift nurses. This finding aligns with previous research[1,12,13]. The PQSI data of our study (Table 1) indicate that night shift staff face considerable challenges regarding sleep quality, which in turn may have implications for their overall health and well-being.

Healthcare professionals are among the groups most vulnerable to disturbances in the sleep-wake cycle due to intense work demands and frequent shift work. These working conditions contribute to increased glucocorticoid release, intensifying stress responses and compromising sleep quality. Consequently, non-restorative sleep, fatigue, and sleep dissatisfaction are frequently reported[14].

In our study, day shift staff perform significantly better on the MoCA compared to night shift staff (Table 2), indicating potential cognitive impairments caused by night shift work. Our results are supported by Deepa Lakshmi et, al., Alfonsi et al and Lin et al.[1,9,15].Poor sleep quality has been widely associated with deficits in cognitive domains, including sustained attention, working memory, learning, and decision-making[16]. Memory consolidation, especially of episodic and procedural content, is impaired, along with inhibitory control and reaction time. Over time, these impairments are associated with executive dysfunction, increased impulsivity, and reduced cognitive flexibility[17].

Our data shows a strong relationship between sleep deprivation and cognitive performance. It was observed that sleep-deprived nurses have impaired performance across all cognitive parameters measured, including attention and memory recall ($p < 0.01$ for all comparisons) in comparison to dayshift workers. Similar findings were reported in the work by Güngör and Sönmez[17].The prefrontal vulnerability hypothesis suggests that sleep deprivation especially impairs cognitive performances that depend on the prefrontal cortex. These include higher functions, such as language, executive functions, divergent thinking, and creativity[19].

National Sleep Foundation, USA, suggests that 7–8 h of sleep is essential for maintenance and restoration of metabolic homeostasis[20].

After completing a night shift, nurses compensate for their sleep during the day. Nevertheless, according to a study, individuals who sleep during the day sleep approximately 4 hours less than those who sleep at night[21].

In addition to playing a key role in sustaining neural circuitry, sleep is fundamental to bodily repair, energy conservation, and immune protection, thus supporting general health and individual well-being[22].

In cases of sleep deprivation, noradrenaline undergoes functional changes in hypothalamic neurons, shifting from excitatory to inhibitory activity, thereby reducing the release of orexin, a neuropeptide crucial for maintaining alertness and promoting a state of drowsiness. Simultaneously, reductions in adenosine and nitric oxide interfere with restorative sleep and disrupt the transitions between sleep and wakefulness[23].

Limitations: 1. Small sample size

2. Exclusive reliance on self-reported measures may introduce subjective bias.

Therefore, futurestudies are planned with larger samplesize.

Conclusion

This study highlighted the significant impact of altered sleep patterns on cognitive function in nursing staff, particularly night shift workers. It found that 67.5% of night shift nurses reported significant sleep issues, and they had notably lower scores on the MoCA, indicating that sleep deprivation affects cognitive performance and may compromise patient safety and care quality.

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