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A Study on Factors Influencing Road Traffic Accidents Including Survival Period of Victims, Mortality Pattern and Preventive Measures for Road Traffic Accidents

Manish Kumar Sharma[1], Yogesh Sharma[2] and Manisha Sharma[3]

[1]Assistant Professor, [2]Professor & Head, Forensic Medicine Department, RNT Medical College, Udaipur, Rajasthan, India, [3]Biochemist, RNT Medical College, Udaipur, Rajasthan, India

Abstract

The term accident has been defined as an occurrence in a sequence of events which usually produces unintended injury, death or property damage. Today, accidents are among the leading causes of death. The present study was conducted in the Department of Forensic Medicine at RNT Medical College, Udaipur. The major head injuries were seen in 154 (77.6%) cases. The skull fractures were seen in 87 cases (56.4%). Subdural haematomas were the most frequent intracranial haematomas seen in 24 cases (15.5%). Cervical spine injuries were seen in 3 (1.5%) cases. In present study chest injuries were seen in 88 (44%) cases. Abdominal injuries were seen in 78 (39%) cases. The study was conducted to prevent road traffic accident. The time required for transport of victims to hospitals was between 1.5 to 3.5 hours. 38.5% deaths occurred within half an hour of the accident whereas about three quarter (77.1%) died within 12 hours.

Keywords: *Road traffic accident, head injury, intracranial haematoma*

Introduction

The term accident has been defined as an occurrence in a sequence of events which usually produces unintended injury, death or property damage.[1] Today, accidents are among the leading causes of death; in some cases the foremost cause. The number of minor as well as serious injuries, human suffering and economic loss due to disabilities caused by accidents is very difficult to estimate by any measurements. Thus while medical science has conquered the ravages of many diseases, accidents have become a new "epidemic" of public health importance calling for equal effort for control and prevention.[2]

Among all types of accidents - in home, in places of work (e.g. mines and industries), at play (e.g. sports and elsewhere); those caused by motor vehicles claim the largest toll of life and tend to be the most serious. Throughout the world, the growth of transport system has been and continues to be a key element in economic development. In the developing world, current trends in population, industrialization and urbanization are putting heavy pressure on transport networks in general and on road systems in particular. Some of the unwanted side-effects of this growth in traffic such as congestion, noise, and many types of pollution are well documented and immediately obvious to the individual citizen; other causes of growing numbers of deaths and injuries from road traffic accidents are apparent only through aggregated statistics. Road traffic accident reveal a serious and growing problem, with absolute fatality and causality figures rising rapidly in majority of developing countries and with death rates; relative to either population or numbers of vehicles, considerably higher than the developed world.[3]

Accidents constitute complex phenomena of multiple causation. The etiological factors may be classified into two broad categories – human and environmental.[2]

Corresponding Author:
Biochemist,
RNT Medical College, Udaipur, Rajasthan-313001, India, Email: sharmayogesh958@yahoo.com

Materials and Method

The present study was conducted in the Department

of Forensic Medicine at RNT Medical College, Udaipur. The material for the present study were the autopsy subjects brought for postmortem examination. During the period of study (i.e. full one year), 200 cases of accidents deaths were considered for this study.

Observations

Table 1: Vehicles responsible for accidents (n=200)

Vehicles involved	No of cases	percentage
Two wheelers	115	57.5
Cars and jeeps	44	22
Medium transport	06	3
Heavy vehicles	31	15.5
Others	04	2
Unknown	00	00
Total	200	100

As shown in Table 2 two wheeler most commonly used by farmers and labourers. Two wheelers were the commonest offenders, being involved 115 cases (57.5%).

Table 2: Road accidents: site of injury (n=200)

Site of injury	All injuries	
	No of cases	%
Head and face	154	77
Neck	22	11
Thorax	147	73.5
Abdomen and pelvis	78	39
Upper limbs	112	56
Lower limbs	117	58.5
Number of injuries	630	
Injury per case	3.15	

The above table shows distribution of cases according to body parts involved. Multiple body parts were involved in each case.

Table 3: Type of injury (n=200)

Type of injury	No of cases	percentage
Abrasions	166	83
Contusions	106	53
Lacerations	167	83.5
Fractures and dislocations	186	93

As depicted in Table 3 all types of injuries were common fracture and dislocation were common seen in 186 cases (93%).

Table 4: Time required to reach hospital (n=200)

Time required to reach hospital	Pedestrians	Cyclist	Scooters	Occupant of car, jeep	Medium transport MTV	Occupant of trucks and buses HTV	Others	Total
≤ 15 min	12 (22.6%)	5 (100%)	3 (3.4%)	6 (26%)	1 (33.3%)	1 (6.25%)	0	28
15-30 min	4 (7.5%)	0	12 (13.6%)	2 (7.6%)	0	2 (12.5%)	0	20
30-45 min	24 (45.2%)	0	43 (48.8%)	13 (56.5%)	2 (66.6%)	4 (25.0%)	3 (25.0%)	89
45-60 min	3 (5.6%)	0	6 (6.8%)	1 (4.3%)	0	0	0	10
1-1.5 hr	3 (5.6%)	0	6 (6.8%)	1 (4.3%)	0	0	0	10
1.5 – 2 hr	4 (7.5%)	0	8 (9.09%)	1 (4.3%)	0	2 (12.5%)	2 (16.6%)	17
2 – 2.5 hr	1 (1.8%)	0	3 (3.4%)	0	0	1 (6.25%)	6 (50.0%)	11
2.5 - 3.0 hr	1 (1.8%)	0	4 (4.5%)	0	0	0	0	5
> 3 hr.	1 (1.8%)	0	3 (3.4%)	0	0	6 (37.5%)	1 (8.3%)	11
Spot deaths	0	0	0	0	0	0	0	0
Total cases	53	5	88	23	3	16	12	200

Table 5: Deaths at different time after road accidents (survival period) (n=200)

Survival period	Pedestrians	Cyclist	Scooters & motorcyclists	Occupant of car, jeep	Medium transport MTV	Occupant of trucks and buses HTV	Others	Total
0 – 0.5 hr	23 (43.3%)	3 (60.0%)	34 (38.6%)	6 (26.0%)	1 (33.3%)	3 (18.75%)	4 (33.3%)	74 (37.0%)
0.5 - 1 hr	10 (18.8%)	2 (40.0%)	13 (14.7%)	8 (34.7%)	0	0	0	33 (16.5%)
1 –6 hr	4 (7.5%)	0	11 (12.5%)	3 (13.04%)	0	5 (31.25%)	3 (25.0%)	26 (13.0%)
6 – 12 hr	3 (5.6%)	0	3 (3.4%)	2 (8.6%)	0	0	0	8 (4.0%)
12 – 24 hr	4 (7.5%)	0	2 (2.2%)	1 (4.34%)	1 (33.3%)	6 (37.5%)	2 (16.6%)	16 (8.0%)
24 – 48 hr	2 (3.7%)	0	7 (7.9%)	3 (13.04%)	0	2 (12.5%)	0	14 (7.0%)
48 – 72 hrs	2 (3.7%)	0	13 (14.7%)	0	0	0	3 (25.0%)	18 (9.0%)
3- 5 days	0	0	0	0	0	0	0	0
5 – 7 days	0	0	0	0	0	0	0	0
7 – 14 days	3 (5.6%)	0	4 (4.5%)	0	1 (33.3%)	0	0	10 (5.0%)
> 14 days	2 (3.7%)	0	0	0	0	0	0	2 (1.0%)
Total cases	53	5	88	23	3	16	12	200

Table 6 gives the number of cases who died at different intervals after injury. .

Table 6: Frequency of major regional injuries among different road users (n=200)

Regional Injury	Pedestrians	Cyclist	Scooterist & Motorcyclist	Occupant of car, jeep	Medium transport MTV	Occupant of trucks and buses HTV	Others
Head injury major	28 (52.8%)	3 (60%)	36 (40.9%)	8 (34.7%)	2 (66.6%)	6 (37.5%)	2 (16.6%)
Spinal Injuries	4 (7.5%)	0	8 (9.0%)	2 (8.6%)	1 (33.3%)	3 (18.75%)	0
Chest injuries major	7 (13.2%)	0	10 (11.3%)	2 (8.6%)	0	3 (18.75%)	1 (8.3%)
Abdominopelvic major	2 (3.7%)	0	4 (4.5%)	3 (13.0%)	0	0	2 (16.6%)
Upper limbs	7 (13.2%)	1 (20%)	16 (18.1%)	3 (13.0%)	0	2 (12.5%)	3 (25.0%)
Lower limbs	5 (9.4%)	1 (20%)	14 (15.9%)	5 (21.7%)	0	2 (12.5%)	4 (33.3%)
Total cases	53	5	88	23	3	16	12

Table 7: Major regional injuries in different road users (n=200)

Regional Injury	Total	Pedestrians	Cyclist	Scooters	Occupant of car, jeep	Medium transport MTV	Occupant of trucks and buses HTV	Others
Head injury a Fracture skull & face b Subdural haematoma subarachnoid haemorrhage extradural haematoma intracranial bleed c. Brain injury d. Herniation and brain compression	154 (77%) 87 (43.5%) 24 (12.0%) 20 (10%) 23 (11.5%)	93 57 (61.2%) 12 (12.9%) 10 (10.7%) 14 (15.05%)	04 0 4 (80%) 0 0	25 10 (40%) 2 (8%) 8 (32) 5 (20)	12 4 (33.3%) 2 (16.6%) 2 (16.6%) 4 (33.3%)	17 14 (82.3%) 3 (17.64%) 0 0	3 0 3 (100%) 0 0	00 0 0 0 0
Abdominal injury Liver Spleen Kidney Bladder Gut	78 (39.0%) 27 (13.5%) 13 (6.5%) 18 (9.0%) 9 (4.5%) 11 (5.5%)	53 17 (32%) 8 (15.7%) 10 (18.8%) 7 (13.2%) 11 (20.7%)	17 7 (41%) 3 (21.4%) 5 (29.4%) 2 (11.7%) 0	4 2 (50%) 1 (25%) 1 (25%) 0 0	2 0 0 2 (100%) 0 0	1 1 (100%) 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0
Chest injury: Fracture ribs Fracture sternum Lung Heart Diaphragm	88 (44%) 74 (37%) 4 (2%) 75 (37.5%) 9 (4.5%) 4 (2%)	45 (81.1%) 34 (61.8%) 1 (1.8%) 45 (81.1%) 2 (3.6%) 1 (1.8%)	4 (80%) 5 (100%) 1 (20%) 2 (40%) 1 (20%) 1 (20%)	22 (25%) 11 (12.5%) 2 (7.1%) 23 (26.1%) 3 (3.4%) 1 (1.1%)	5 (21.7%) 11 (4.3%) 3 (13%) 1 (4.3%) 1 (4.3%) 0	2 (66.6%) 2 (66.6%) 2 (66.6%) 1 (33.3%) 0 0	8 (50%) 0 0 1 (6.25%) 0 0	2 (16.6%) 3 (25%) 0 0 0 0
Cervical spine injury	03 (1.5%)	2	0	0	0	0	0	1
Upper limbs fracture humerus fracture BBF	112 (56%) 98 (49%) 14 (7%)	45 40 (88.8%) 5 (11.2%)	26 22 84.6%) 4 (15.3%)	18 15 (83.3%) 3 (16.6%)	5 2 (40%) 2 (40%)	10 10 (100%) 0	8 8 (100%) 0	8 8 0
Lower limbs Fracture femur Fracture BBL Fracture pelvic bones	117 (58.5%) 53 (26.5%) 44 (22%) 20 (10%)	57 20 (35%) 10 (17.5%) 8 (14%)	32 12(37.5%) 18 56.2%) 02 (6.2%)	12 5 (41.6%) 6 (50%) 1 (8.3%)	10 4 (40%) 4 (40%) 2 (20%)	6 5 (83.3%) 1 (16.7%) 0	00 7 0 7 (100%)	17 0 0 0
Other cases	33 (16.5%)	20	0	3	0	0	0	10
Total cases	200	53	5	88	23	3	16	12

Discussion

Table 8: Comparison between present study and various authors vis-à-vis distributing injuries

Authors	No. of cases	Injuries per case	Body parts involved					
			Head & face (%)	Chest (%)	Abdominal (%)	Upper limb (%)	Lower limb (%)	Spine (%)
McCarrol et al. (1962)[4]	200	2.9	61	49.5	41.5	19	53.5	7.5
Gissane (1963)[5]	500	3.5	71.8	35.6	14.2	15.6	29.4	13.4
Sevitt (1968)[6]	250	2.2	63	36	12	14	34	14
Chandra et al. (1979)[11]	1132	--	71.99	9	7.7	--	17.2	--
Srivastava and Gupta (1989)[7]	462	--	36.36	16.82	8.8	--	37.01	--
Maheshwari and Mohan (1989)[8]	807	--	31	5	2	14	50	2
Ghosh (1991)[9]	90	1.98	62.22	42.2	35.55	12.22	21.11	6.67
Tirpude (1990)[10]	80	2.01	67.5	47.5	26.5	11.2	25.0	5.0
Present study	200	3.15	77	73.5	39	56	58.5	11

All types of injuries are common in road accident victims. fractures, dislocations and lacerations were commonest seen in 93% and 88.5% of all cases respectively followed by abrasions in 93% and contusions in 54% cases (Table 3).

Time required to reach hospital:

Only 14% of the victims were rushed to hospital within 15 minutes of accident. Remaining one-fourth (24%) victims reached hospital in first half an hour. 73.5% reached hospital in next one hour and 79% rushed to hospital in more than one and half hours (Table 5). This delay is due to lack of initiative inrushing victims to nearest hospitals. The area is very hilly and hard geographical conditions. So delay in transport of accident victims. Similar observations in time required to reach hospital and first aid at the spot of accidents were given by Maheshwari and Mohan (1989).[8]

Table 9: Comparison between present study with regard to survival period

Authors	Survival period							
	0-5 hrs (%)	2-6 hrs (%)	6-12 hrs (%)	12-24 hrs (%)	1-2 days (%)	3-5 days (%)	5-7 days (%)	7-14 days (%)
Sevitt (1968)[6]	16	1.6	--	13.2	--	15.2	10	--
Sevitt (1973)[12]	35.8	13.38	5.5	4.72	5.1	5.1	4.72	7.5
Chandra et al. (1979)[6]	36	--	--	36	6.36	5.1	3.7	6.6
Srivastava & Gupta (1989)[7]	51.53	--	13.2	--	--	20.5	--	--
Present study	37	13	4	9	7	Nil	Nil	5

Similar observations in time required to reach hospital and first aid at the spot of accidents were made by Maheshwari and Mohan (1989).[8]

Survival Period:

The 57 subjects who were dead at site of accident cannot be separated from 77 cases, who were dead on arrival in hospital within half an hour of injury. These 77 subjects were included in group who survived less than half an hour. Hence greatest proportion of deaths occurred within first half-hour when 38.5% of the victims had died.

Thus the severe brain injury and serious lacerations of liver and lung accounted for early deaths. Whereas in the first week, subdural haematoma and cerebral compressions were a common cause of deaths. In victims surviving more than 2 weeks, lower limb injuries and cerebral compressions accounted for death.

Major Regional Injuries:

Head Injury:

The major head injuries were seen in 154 (77.6%) cases. The skull fractures were seen in 87 cases (56.4%). Subdural haematomas were the most frequent intracranial haematomas seen in 24 cases (15.5%). Contusions and laceration brain was seen in 20 (12.9%) cases. Herniation of brain was seen in 23 (14.9%) (Table 6 and 7).

Chandra *et al.* (1979)[11] also observed similar trends. Head injury was seen in 71.99% cases, fractures of skull in 57.5% cases and subarachnoid haemorrhage and subdural haemorrhage in 47.79% and 37.45% cases respectively. Contusions and lacerations of brain was seen in 35.15% cases. Similar trends was noted by other workers like Sevitt (1973)[12], Ghosh (1991)[9] and Tirpude *et al.* (1998).[10]

Cervical Spine Injuries:

Cervical spine injuries were seen in 3 (1.5%) cases. They were common in pedestrians (Table 6 and 7).

Tirpude *et al.* (1998)[10] noted spinal injuries in 7.4% cases, Sevitt (1968)[6] in 8% cases and Chandra *et al.* (1979)[11] in 2% cases.

Chest Injuries:

In present study chest injuries were seen in 88 (44%) cases. Fractures of ribs were seen in 74 (37%) cases followed by lacerations and contusions of lung seen in 75 (37.5%) cases, fracture of sternum in 4 (2%) cases. Fracture of ribs was seen in 66.6% occupants of medium vehicles and 47.2% occupants of cars and jeeps, 66% occupants of medium vehicles and 47.8% occupants of cars and jeeps showed laceration of lungs. The majority of serious injuries to chest occurred from forced compression of sudden deceleration (Table 6 and 7).

Sevitt (1968)[6] observed chest injuries in 36.4% cases. The fracture ribs was seen in 29.6% cases. Laceration and contusion lung in 14.4% cases. Rupture of diaphragm in 5.2% cases and heart in 1.2% cases respectively.

Similar concurrent finding of chest injuries were seen by Chandra *et al.* (1979).[11]

Abdominal Injuries:

Abdominal injuries were seen in 78 (39%) cases. The lesions were major ruptures of liver in 27 (13.5%) cases, spleen in 13 (6.5%) cases, gut in 9 (4.5%) cases, kidney in 18 (9%) cases and bladder in 9 (4.5%) cases.

Sevitt (1968)[6] observed major abdominal injuries in 11.6% cases. Laceration of liver was seen in 7.2% cases, spleen in 4.8% cases and kidney in 1.6% cases.

Chandra *et al.* (1979)[11] observed laceration of liver in 17.2% cases, spleen in 5.6% cases and kidney in 4.6% cases. Similar trend was observed in abdominal injuries by Ghosh (1991).[9]

Upper Limb Injuries:

Upper limb fractures were seen in 112 (56%) cases. Fracture both bones forearm was seen in 14 (7%) cases and humerus in 98 (49%) cases. Chandra *et al.* (1979)[11] observed upper limb fracture in 9.4% cases and Tirpude *et al.* (1998)[10] observed in 11.25% cases.

Lower Limb Fractures:

Lower limb fractures including pelvic fractures were seen in 117 (58.5%) of cases. Fracture both bones leg was seen in 44 (22%) cases, fracture femur and hip bones in 53 (26.5%) cases and 20 (10%) cases respectively.

The similar trend was noted by workers like Chandra *et al.* (1979)[11], Ghosh (1991)[9] and Tirpude *et al.* (1998).[10]

The preventing and control measures

A. The Road:

Due care should be given in maintaining the existing roads by improving road surface, removing road side

obstacles and constructing guard rails, smoothening the sharp arises and painting the traffic signals as required which should be visible by the night time also.

B. The Vehicles

Vehicles designs should be such as to improve visibility for the driver and protect the occupants in even of crash.

C. The Road User:

The responsibility of a driver is of paramount value in controlling and preventing road accidents. it is the driver who can save not only his own life but lives of other road users. So maximum stress should be given on the training and education of the drivers.

D. Emergency Medical Care:

The care of the injured is of foremost importance:

There should be provision of the traffic aid posts at suitable distances on the high risk national and state highways with provisions of quick transport of the injured and necessary first-aid.

Conclusion

Road vehicles have no respect for anatomical boundaries or surgical specialties and two, three or more body regions were injured in accidents. Vital parts like head and chest affected in most of the road traffic accidents.

On average major injury per case was 3.15 and fatal injury per case was 1.21. Keeping in view the results of study, it is suggested that to decrease the mortality in accident victims, the quick transport of the victims to hospital should be available.

The four-wheeler driver should compulsorily use seat belts while driving that can prevent life endangering chest and abdominal trauma that has very high incidence of fatality.

Effective ambulance system should be introduced to transport the victims of road traffic accidents for early treatment.

Speed limit is an important factor to decrease the road traffic accident. All drivers should follow their lane while driving that can decrease the incidence of road traffic accidents. Titanium coated substance should be used to indicate the traffic signals on highways because they are also visible in dark time.

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