

Original Research Article

A study of pattern of injuries and factors affecting the injury pattern among road traffic accident victims

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ABSTRACT

Background: Road traffic injuries remain a critical public health concern. The most affected are the young population. Road accidents are one of the top three reasons for deaths among the population from the age group of 5 to 44 years, globally. Road traffic injuries can be prevented by a national plan or various strategies.

Methods: It is a hospital based study done on all road traffic accident cases admitted in Owaisi Hospital between April 2013 to July 2014 using a pretested, pre-designed questionnaire and collecting Medico legal case records. Data is expressed in percentages. Association between factors and severity of injuries was calculated using Chi-square test.

Results: Majority of the victims had suffered grievous injury (95.29%). Majority (62.48%) had injuries involving upper limb, 52% had injuries involving multiple body regions. Majority of the times it was a sideways collision 275 (48.00%), followed by head on collision 198 (34.55%). Factors such as use of the seat belt, alcohol consumption, lighting on the road are found to be statistically significant with the severity of the injuries.

Conclusions: Majority of the victims had suffered from multiple injuries (52%). The road traffic accidents can be prevented mainly putting emphasis on the use of seat belt, avoidance of consumption of alcohol by the drivers, adequate lighting on roads which can reduce the burden of occurrence of the road traffic accidents.

Keywords: Road traffic accident, Simple injury, Grievous injury, Seat belt, Helmet

INTRODUCTION

Cities and towns are experiencing high levels of motorization which is thought to be a feature of urbanization. With improvement of purchasing power of people has contributed significantly to an increase in private ownership of vehicles. This is compounded by the fact that the various public transport measures are inadequate to cater to the mobility needs of the urban people who are always on the move. Road traffic injuries can be prevented by a national plan or various strategies, and by suitable funded agency with measurable targets of prevention regarding the road safety.

The global status report of 2013 shows that road traffic injuries remain a critical public health concern, as

approximately 1.24 million deaths occurred on the world's roads in 2010.¹ The global burden of disease due to road traffic incident (RTI) in terms of disability adjusted life years (DALYs) is expected to move from ninth position in 1990 to third position in 2020.^{2,3} If the present scenario is continued, it is projected that deaths due to road traffic accidents (RTAs) will be 1,50,000 and 2.8 million victims will be hospitalized by 2010. 1,85,000 deaths and 3.6 million victims will be hospitalized by 2015.

Estimates by the World Health Organization have indicated that globally, road traffic accidents have led to as high as 1.27 million deaths in 2004, which have been found to be equivalent to all the deaths caused by communicable diseases. The most affected are the young

population and it has been found that road accidents are one of the top three reasons for deaths among the population from the age group of 5 to 44 years, globally.⁴ The World Health Organization (2009) estimates that road traffic accidents will be the fifth leading cause of deaths worldwide by 2030, leading to an estimated 2.4 million fatalities per year.⁵

RTAs are an important public health problem requiring urgent attention in the context of developing countries such as India, which has the highest proportion of deaths due to RTAs in South East Asia. Statistics indicate that the incidence of accidental deaths in India has increased by 32.5% in the last 10 years (1998 to 2008).⁴ The RTA rate of 35 per 1000 vehicles in India is one of the highest in the world and so is the associated RTA fatality rate of 25.3 per 10,000 vehicles by Fitzgerald et al.⁶ During 2011, a total of 4,97,686 road accidents were reported by all States. The proportion of fatal accidents in the total road accidents has consistently increased since 2002 from 18.1 to 24.4% in 2011. The severity of road accidents measured in terms of persons killed per 100 accidents has also increased from 20.8 in 2002 to 28.6 in 2011.

The present study is undertaken to study the injury pattern among RTA victims and to determine the various factors influencing the severity of the road traffic injuries.

METHODS

This study was conducted on all road traffic injury victims admitted to the Owaisi Hospital attached to Deccan College of Medical Sciences between April 2013 and July 2014. A total 573 patients were studied. Information was collected using a pretested questionnaire and medico legal records. After taking an informed consent, the patients were interviewed and data was entered. Information of unconscious patients was collected from their relatives. After regaining consciousness, the patient was approached and re-interviewed. The medico legal records and case sheets of the victims were referred for collecting additional information and cross checking. The study was approved by the Ethical Committee of the Medical College.

Inclusion criteria

All the patients admitted to Owaisi Hospital due to road traffic injury were included.

Exclusion criteria

Victims brought dead due to road traffic injuries, victims who were immediately referred to higher centre and those who did not give consent were excluded.

Statistical analysis

Data was entered into MS excel. Data on injury pattern was expressed in percentages. Data was analyzed using

Epi-info™ 7.1.3.10 version software. The association between various factors and severity of injury was calculated using Chi-square test.

Definition of study variables

RTA has been defined as accident which took place on road (including sidewalk or footpath) between two or more objects, one of which must be any kind of a moving vehicle.⁷

Injury is the transfer of one of the forms of physical energy (mechanical, chemical, thermal, etc) in amounts or at rates exceeding the threshold of human tolerance.⁸

Road traffic injury: For the purpose of study, a road traffic injury has been defined as injury which took place on road (including sidewalk or foot path) between two or more objects, one of which must be any kind of moving vehicle.⁸

Types of injuries

Simple injury: One which is neither extensive nor serious and which would heal rapidly without living any permanent deformity or disfiguration

Grievous injury: As per IPC section 320, grievous injury is defined as any one of the following kinds of hurt as "grievous" (first) - emasculation; (secondly) - permanent privation of the sight of either eye; (thirdly) - permanent privation of the hearing of either ear; (fourthly) -privation of any member or joint; (fifthly) - destruction or permanent impairing of the powers of any member or joint; (sixthly) - permanent disfiguration of the head or face; (seventhly) - fracture or dislocation of a bone or tooth, (eighthly) - any hurt which endangers life or which causes the sufferer to be during the space of twenty days in severe bodily pain, or unable to follow his ordinary pursuits.

Emasculation, permanent privation of the sight of either eye, permanent privation of the hearing either ear, privation of any member (part, organ or limb) or joint, permanent disfiguration of head or face, fracture or dislocation of a bone or a tooth, destruction or permanent impairing of powers of any muscle or joint, any hurt which endangers life, or which causes the suffer to be, during the space of 20 days, in severe body pain or unable to follow his daily routine.

According to the road traffic act (1997), a person is considered to be driving under influence of alcohol when blood alcohol concentration is more than 0.03 g/dl.

Data was entered in MS-Excel 2007 and data was analysed using SPSS software. Results were displayed in numbers; percentages only. P value less than 0.05 considered as statistically significant.

RESULTS

Majority of the victims had suffered grievous injury 546 (95.29%). Only 27 (4.71%) of them had simple injuries.

Table 1: Road traffic accident victims based on type of injury.

Type of injury	N	Percentage
Simple	27	4.71
Grievous	546	95.29
Total	573	100.00

Table 2: Distribution of injury pattern among RTA victims.

Distribution on body	N	Percentage
Injuries on the head and neck	19	3.31
Injuries to the chest	6	1.05
Injuries to the abdomen	12	2.10
Injuries to upper limb	358	62.48
Injuries to the lower limb	164	28.62
Injuries to the unspecified parts of trunk, limb or body regions	14	2.44
Injuries involving multiple body regions	298	52

Out of total 573 cases, 358 (62.48%) had injuries involving upper limb, followed by injuries to the lower limb accounting for 164 (28.62%), injuries to the abdomen for 12 (2.10%) and least number of cases were seen with injuries involving chest 6 (1.05%). 298 (52%) had injuries involving multiple body regions.

Majority of the times it was a sideways collision-275 (48%) and head on collision 198 (34.55%). The victims hit from behind were 97 (16.93%) and 3 (0.52%) of them gave the history of self-fall. Among the 270 drivers, it was observed from the above table that 210 (77.77%) were driving license holders, 42 were non-holders of the driving license, 18 (6.67%) were not applicable.

Table 3, shows that only 15 (5.56%) drivers were going with high speed. Ten were two wheeler drivers and 5 were three wheeler drivers).

Table 3: Distribution of study subjects according to accident characteristics.

Characteristics	N	Percentage
Type of collision		
Head on	198	34.55
Sideways	275	48.00
From behind	97	16.93
Self fall	3	0.52
Driving license		
Holder	210	77.77
Non-holder	42	15.56
Not applicable	8	6.67
High speed		
Yes	15	5.56
No	255	94.44

Table 4 shows that seat belt use, alcohol consumption and lighting on the road are statistically significantly associated with the severity of the injuries. The helmet use and the type of road (wet, rough, tarred) are not statistically significant with the severity of injuries among road traffic accident victims.

Table 4: Relation of risk factors and severity of road traffic injuries.

		Simple injury		Grievous injury		Statistical value
		Number	%	Number	%	
Seat belt use	Yes	6	37.50	6	9.38	X ² =5 P=0.01
	No	10	62.50	58	90.62	
Helmet use	Yes	6	42.86	46	45.10	X ² =0.02 P=0.88
	No	8	57.14	56	54.90	
Alcohol consumption	Yes	8	53.33	22	5.61	X ² =41.45 P=0.00
	No	7	46.67	370	94.39	
Lighting on the road	No lighting	12	44.44	223	40.84	X ² =13.79 P=0.00
	Poor	8	29.63	50	9.16	
	Adequate	7	25.93	273	50.00	
Road condition	Rough road	5	18.52	15	3.36	X ² =6.48 P=0.3
	Wet or slippery	15	55.55	375	84.08	
	Tarred (smooth)	7	25.93	56	12.56	

DISCUSSION

Out of total 573 cases, majority of the victims had suffered grievous injury 546 (95.29%) and 27 (4.71%) of them had simple injuries.

Out of total 573 cases, 358 (62.48%) had injuries involving upper limb, followed by injuries to the lower limb accounting for 115 (28.62%), injuries to the abdomen for 12 (2.10%) and least number of cases were seen with injuries involving chest 6 (1.05%). 298 (52%)

had injuries involving multiple body regions. In a study done in Lusaka, Zambia, it was found that multiple injuries accounted for 66.9% cases and lowest was seen in abdominal injuries.⁹

In the present study, more number of victims had sideways collision 275 (48%) followed by head on collision 198 (34.55%). 97 (16.93%) were hit from behind and 3 (0.52%) of them gave the history of self-fall. In the study done at NIMHANS by Gururaj et al, among the two wheeler users 41.9% (752) reported skid and fall as the cause of their injury, 6.2% (107) reported a sideways collision and 3.4% (61) reported a rear end collision.¹⁰ In a study by Pathak et al, out of total 180 road traffic accident cases in 105 cases, a second vehicle was involved and 64.76% of them were sideways collision.¹¹ From the study findings, we can infer that, most of the collisions were sideways collisions. This indicates that care needs to be taken while taking turn or crossing a road.

In our study, among the 270 drivers, it was observed that 210 (77.77%) were driving license holders, 42 (15.56%) were non-holders of the driving license.

In the present study out of 573 victims, 10 two-wheeler drivers and 5 three-wheeler drivers were driving with high speed, i.e. 15 (5.56%), which was a factor along with other factors. A case study of Delhi showed that fatalities of bicyclists were highest on two or three lane roads during non-peak hours, when the motorised vehicles travelled at higher speeds by Tiwari et al.¹² From this we can opine that in spite of good roads, road traffic accidents which are caused due to high speed can be reduced. Thus, redesigning of roads and intersections could lead to improved efficiency of roads by reduction in delays resulting from traffic moving at sub-optimal speeds, reducing conflicts between pedestrians, bicyclists and motorized vehicles. Using GIS technology, Bagaria and Bagaria et al noted that a cluster of motorcycle crashes corresponded with a site with a raised speed breaker. The authors noted that the accidents ceased to take place once the light was replaced.¹³

In the present study, out of 80 four-wheeler drivers only 12 (15%) used seat belts while driving. In the present study, use of seat belt was found to be significantly associated with the severity of the injuries. In a study based on medico-legal autopsies of 450 RTA victims, four-wheeler occupants accounted for 26% of RTA fatalities and none of the car occupants were wearing a seat belt at the time of accident by Singh et al. It was observed that seat belt use by the drivers can reduce the burden of occurrence of the road traffic accidents.¹⁴ From the above we can infer that wearing seat belts is beneficial to prevent the road traffic accidents.

Among the 116 two-wheeler users only 44.83% of them wore a helmet when they were injured, whereas 55.17% of them did not wear a helmet. In the present study the

factor of helmet use and type of injury are not found to be statistically significant. Studies across the country show that majority of RTA victims had not worn helmets at the time of the accident.⁴ In an epidemiological study by Singh et al, among the 545 two-wheeler users (riders and pillion) only 158 (28.99%) of them wore a helmet when they were injured whereas 387 (71.01%) of them did not wear a helmet.¹⁵ Head trauma is the main cause of death and morbidity in motorized two wheeler users, contributing to around 75% of RTA deaths in European countries.¹⁶ In the study conducted at NIMHANS by Gururaj et al, number of two-wheeler riders and pillion wearing helmets at the time of injury was less than 5%.¹⁰ From the above comparison we can infer that, wearing a helmet will be beneficial for preventing the road traffic accidents.

In the present study it is observed that the victims who consumed alcohol during the accident were 30 (7.37%), and who did not consume were 377. In the present study, alcohol consumption was found to be significantly associated with the severity of the injuries. Gururaj et al noted that driving under the influence of alcohol was responsible for 15 to 25% of RTIs.¹⁰ In a study of evaluation of traffic accident cases admitted to the emergency department of the Cumburiyet University Hospital, Turkey, 14.28% of the cases had consumed alcohol.¹⁷ From this we can infer that road traffic accidents can be reduced by driving without drinking alcohol as alcohol causes cognitive impairment.

In the present study, 280 (48.87%) of the victims said that the lighting was adequate at the time of occurrence of RTI (injuries that took place during day time were included under 'adequate' lighting for analysis) and 58 (10.12%) of them said that the lighting was inadequate. In the present study, the factor of lighting of the road was found to be significantly associated with the severity of the injuries. In a study conducted by Bagaria et al, it was noted that a cluster of motorcycle crashes corresponded with a site with a broken street light. The authors noted that the accidents ceased to take place once the light was replaced.¹³ In the study done by Gururaj et al, lighting on the road was a contributory factor in 15% of crashes.¹⁰ From the above comparison we can infer that lighting plays a vital role in preventing the road traffic accidents.

Majority 390 (68.06%) of RTI took place on wet/slippy roads, 120 (20.94%) on the rough road, and 63 (11.0%) of them on the tarred road at the time of injury. Dandona et al reported that poor road conditions are responsible for 4-10% of RTIs.¹⁸ Similar observations were made by Verma et al in a study from Delhi that congested and slippy roads were responsible for 20% and 17% RTAs respectively.¹⁹ In an epidemiological study by Pathak et al, 68.1% accidents occurred on smooth roads.¹¹ In the study done by Gururaj et al, presence of a road problem like slippy areas was a contributory factor in 15% of crashes.¹⁰ In a southern Indian city, 25% (n=368) RTAs

had taken place when the roads were wet and slippery by Jha et al.²⁰

CONCLUSION

Majority injuries are the grievous injuries (95.29%). Majority of the victims had suffered from multiple injuries 298 (52%). Sideways collision being more indicates care needs to be taken while taking turn, crossing roads. Only 15% used seat belts while driving. Seat belt use is less in spite of their being a mandatory law in place. Only 44.83% of two-wheeler users wore a helmet. Helmet use should be a felt need by the two-wheeler users to prevent head injuries. Alcohol impairs the person's ability in every sense and it should be punishable under every circumstance.

In the present study, factors such as use of the seat belt, alcohol consumption, lighting on the road while driving are found to be statistically significant with the severity of the injuries.

Road traffic injury has emerged as a major public health problem, which can be controlled and prevented. It denotes a responsibility from the common man to the persons responsible for making and implementing law including the people from health care delivery system. The RTAs can be prevented mainly putting emphasis on the use of seat belt, avoidance of consumption of alcohol by the drivers, avoiding wet/slippery roads.

Recommendations

All the citizens should be made aware of the risk factors regarding road traffic accidents. All medical professionals and public health specialists including para medical staff should be made aware of the care of the patient from the site of injury to the place of admission to minimise the effect of injury. The civil engineers should be concerned about the proper construction of roads, condition of the road and maintenance of the road to prevent the road traffic accidents. The traffic police authorities and other legal authorities should strictly implement laws regarding the prohibition of driving after consuming alcohol, non use of seat belts or helmets while driving. Adequate road lighting should be maintained by the concerned electrical authorities.

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