

SHORT ARTICLE

Retrospective Evaluation of Determinants of Road Traffic Injuries at a Naval Station

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Abstract

Introduction: Several factors like globalization, industrialization, migration, access to modern ways of living, increasing income levels, easy availability of vehicles, point of use entertainment/communication gadgets, media influence and others have brought human beings in close contact with a variety of challenges to safe driving, resulting in an increased occurrence of Road Traffic injuries across the globe. **Methods and Material:** A cross-sectional descriptive study was conducted at naval station amongst victims of road traffic accidents who reported to emergency department of naval hospital over period of six months. Interviews on structured questionnaire to explore various determinants of road traffic injuries (RTI). Data Analysis on 156 victims was carried out for proportion of study variables of interest, Chi square test to determine significant differences between demographic variables and RTA exposure. **Results:** Of 156 RTA victims, more than 50% were between 21 - 40 years; 69.9% were male; 93% accidents were contributed by driving speed more than 40km/hr; 47% occurred at road junctions followed by civil roads; 27% were due to collision. 23% accidents took place on Saturdays; 36% were in morning 06 - 12 hours. 1/3 accidents were caused by two wheeler vehicles. Negligence of driver (40.4%) poor road condition (24.4%) were major causes of the accident as reported by victims. 44.2% of the victims had minor injury; 58.7% drivers who met accidents were holding valid driving license; 38% were wearing protective gears and 56% narrated that road lights/ traffic signals were available at vantage points. Exposure to accidents was found to be having statistically significant difference when related to age, gender, type of accident, common causes of accident and use of protective gears. **Conclusions:** The stricter application of traffic laws and safety measures are required to bring down the road traffic accident rate and related mortality.

Keywords

Road Point of Use Entertainment gadgets; Road Safety Education; Epidemiological Model

Introduction

Injuries resulting from road accidents have seen exponential rise in past two decades, especially in developing countries like India which demands immediate public health as well as legislative actions to control the peak. (1) It is evident that multiple

factors like globalization, industrialization, migration, modern lifestyle, affordability, availability of motorized transportation, point of use entertainment/ communication gadgets, media influence etc had brought human beings in close contact with a variety of challenges to safe driving

ending in an increased occurrence of Road Traffic Injuries (RTIs). (2,3) The Global Status Report of WHO on Road Safety 2018 (4) mentions the total number of Road Traffic Accident (RTA) mortality figures were as high at 1.24 million per year and 3400 people die on the world's roads every day while in India alone, road traffic deaths per lac is 18.9, maximum number (38.7%) of deaths occurred by unspecified vehicle followed by two/three wheeler (32.4%) vehicles. India has 1% of the world's vehicles, but 6% of the total global RTA deaths which may just be the tip of the iceberg and it may be 15-20 times the number killed. (5,6,7)

Road accidents are largely preventable since they are not often due to ignorance, but are due to carelessness, thoughtlessness and over confidence. William Haddon, Head of Road Safety Agency, USA has already highlighted that Road safety is associated with numerous issues, each of which needed to be addressed separately (8). Recent judicial engagement and directives (9) is a welcome sign; however implementation of the same to save lives, remains to be seen. Accidents, therefore have to be studied in terms of an epidemiological model i.e. agent, host and environmental factors and analyzed in relation to time, place and person distribution. (10) This study is therefore an attempt to explore various determinants of road traffic injuries by retrospective evaluation of inputs from personalized interviews, case sheets and medico legal records of road traffic accidents reporting to emergency care department of a zonal hospital at a naval station.

Aims & Objectives

1. To identify the various determinants of road traffic injuries in a station
2. To recommend the road safety measures to overcome risk factors predisposing to road traffic accidents.

Material & Methods

A cross-sectional study was conducted at a naval station amongst the victims of road traffic accidents who reported to the emergency department of the naval hospital over a period of six months from Sep 19 to Feb 20. Only respondents who agreed and gave their informed consent were included in the study. Confidentiality of the study participants were ensured before enrolling them. Institutional approval was taken from the ethical committee of the hospital. Victims were those who injured by any motorized vehicles, whether driving the vehicle or

co-passengers or pedestrian hit by the vehicle causing accident. Further, respondents who were unable to speak and have fatal injuries, the response of their accompaniments were recorded in order not to lose the data on risk factors responsible for fatalities. Interviews on a structured questionnaire were carried out separately in a suitable setting in the hospital, commonly where the respondent felt comfortable, by the investigator himself.

The World Health Statistics 2011(1) has revealed 8.8% of total mortality due to injuries and out of total 90 % contributed by RTI. Hence, total burden of RTI is 7.92%. With this reference, the sample size was calculated as 111. In the present study data was gathered on 156 victims, including drivers or co passengers who reported to emergency care over duration of 6 months.

Data Analysis was carried out for the proportion of the study variables of interest, Chi square test to determine significant differences between demographic variables and RTA exposure. SPSS version 20 software was used.

Results

More than half (66.4%) of the victims represented the age group ≥ 30 yrs. 69.9% of the victims were male, half of the victims were educated from secondary to higher secondary level and 40.4% were dependants of serving while 31.4% were serving personnel. The study documents that 93% of accidents were contributed by driving speed more than 40km/hr; most (47%) of the accidents occurred at road junctions followed by civil roads, out of which 27% were due to collision between vehicles followed by 18.7% were due to collision with pedestrians.

(Table 1) shows that the highest number of accidents took place on Saturdays (23%), while maximum (36%) of the accidents were in the morning (6.00 am - 12.00 pm) time followed by 31.2% in between 12.00 pm to 6.00 pm. Nearly one third (32.7%) of the accidents were caused by two wheeler vehicles, followed by 18% were cyclist/auto rickshaw and 16.6% were four wheeler/ other heavy vehicle. 21.2% of victims were passenger and 11.5% were pedestrians. However, negligence of driver (40.4%) and poor road condition (24.4%) were the major causes of the accident as reported by the victims. Talking on mobile was found to be the commonest (20.5%) driver related causal factor followed by careless attitude to defensive driving was the next quoted factor. Findings showed that 44.2% of the

victims had minor injury, 32% had moderate and 23.8% had severe injury. The patterns of injuries among victims were as follows: maximum number (30.1%) of the victims had superficial injuries, followed by 24.4% had fractures 19.2% reported thoracic injuries, 15.4% had head injuries, 13.5% had abdominal injury and 11.5% had spinal injuries. Among the total fractures, lower extremities were the commonest site. 58.7% of drivers who met accidents were holding valid driving license; 38% were wearing protective gears viz helmets, seatbelts, and 56% narrated that road lights/ traffic signals were available at vantage points. (Table 2) shows the association of risk factors with severity of accident exposure amongst RTIs victims. Exposure to accidents was found to be having statistically significant difference when related to age, gender, type of accident, common causes of accident and use of protective gears with p value less than 0.05. while results was found not to be significantly associated with days of the week, average driving speed, mode of travel during accident, holding valid driving license.

Discussion

RTIs as evident from existing literature mainly affects the younger generation of productive age bracket adversely affecting future manpower resources of the country. State and region wise difference exist in prevalence and incidence of road accidents, injuries and deaths attributable to socio-economic, cultural, demographic, topographical differences and notification practices. The multitude impact of road accidents on individual, family and society in terms of morbidity, disability, economic and social fall out is immense and remains under recognized. (5,10) The present study elaborates the potential socio-economic-behavioral-epidemiological risk factors for road traffic injuries with an attempt to establish association of these risk factors with severity of road traffic accident exposure amongst RTI victims. The study found out statistically significant association with age less than 30 yrs, male gender, type of accident, cause of accident, use of protective gears. Similar results were corroborated with earlier studies. (3,5,7-13) Exposure to accidents was found not to be significantly associated with days of the week, average driving speed, mode of travel during accident, holding valid driving license.

In the present study, age group of 20 – 40 years was maximally affected being enthusiastic, tendency to

over speed, lesser years of driving experience, career constraints and greater mobility due to studies or employment. Lower proportions of accidents were reported in above 60 years and above could be due to the generally lesser mobility of the people. In the present study, the accident rates were 4.3 times higher amongst males than females and similar results were found in few other studies as well (11,12,13). Amongst the victims, two wheelers followed by pillion riders/passengers, cyclist/auto rickshaws, pedestrians and four wheelers/ heavy duty vehicles. It is interesting to note that among the type of vehicles, motor cycle and auto rickshaw were involved in the highest number of accidents. This could be due to the higher speed, which can be achieved over short distances and less stability of the vehicle. Bicycle riders appear to be at greater risk of sustaining injury amongst non-motorized transport. Rough driving, over speeding and vehicles offering poor controls are the possible reasons as suggested by victim's interviews. The usage of helmets, seatbelts, driving lights in this study (which includes non-fatal cases) was above 38% and was shown to be protective. The findings of present study corroborate with findings of study by Solanki et al (14) revealing lower incidence as well as severity of injuries in individuals who used protective gears. Study by Kiran et al (15) showed that maximum accidents occurred between 18.00 – 24.00hr while in the present study maximum accidents took place between 06.00-12.00hr. In another study conducted by Jha et al (16) in Puducherry, the peak time observed was between 16.00 - 19.00 hr however present study findings matches with study out by Verma et al (17) in Central India. The slight difference in timings as compared to the present study can be due to difference in work culture (and hence peak hours). In cases, where collision occurred with another vehicle, collision between vehicles was the commonest type (27%) collisions with pedestrian, sideways collision, fell down/skid, hit and run, rash driving and animal obstruction. It was found that, at most turnings the warning sign boards were missing.

Among the serious injuries, lower limb fractures were the commonest followed by head injuries. The most severe injuries suffering category was that of "occupants of motorized two-wheelers". This is explained by the fact that motorized two-wheelers have triple risk. Firstly they are uncovered; secondly they are relatively unstable and thirdly there is a tendency to ride them at higher speeds. This all

amounts to an impact of greater mechanical energy during the accident which leads to injuries that most of the times are severe. Headgear had a protective effect on head injuries. This study found 41.3% drivers of different vehicles were without driving license. The reason may be the easy accessibility of the vehicles, usually youngster at home and the casual attitude of driving besides lesser experience. In the present study, 5% of the drivers involved in RTA had consumed alcohol. The role of alcohol in impairing driving ability is well documented. Similar results were found in few other studies as well. (11-17)

High Income Countries of the world till early 1970's had witnessed similar trends of road traffic injuries. Subsequently many countries turned this scenario and developed, implemented, monitored and evaluated road safety activities by putting strong systems in place to overcome challenges and barriers in road safety (4). The results are there in front of us as seen by continuous decline in road deaths and injuries in most countries of the world. Few countries in the world are moving towards Vision Zero with the vision that no one should die on roads. (1)

Although existing data from national registry indicates the ever increasing burden and impact of road crashes but efforts to address the problem is still far from satisfactory. Our growing graph indicates that our ongoing efforts are insufficient or our efforts are mis-prioritised and misdirected. Lack of central and state lead agencies, limited funding, poor coordination mechanisms, limited impact of laws, laxity in enforcement, limited safety features on roads and in vehicles, deficient trauma care coupled with absence of public engagement are a few problems plaguing our systems.(2,10)

The Motor Vehicles Amendment Bill 2016 is a landmark step in this direction. Several judicial directives in recent times are aimed at strong actions to be taken by governments. The implementation of these key steps will be an urgent necessity to improve the current scenario. This calls for participation of all key stakeholders in different ministries, industry, academia and civil society to develop coordinated and convergent actions to advance road safety in India. The five years of the Bangalore Road Safety Programme is a readymade integrated model to be replicated. The Centre's contribution to helmet legislation, reduction of drink

& drive, pedestrian safety and post-crash care are well known and are built on data-driven programmes. (10) The United Nations Decade for Road Safety (2011–2020) advocates application of “five pillars” (Road safety management, safer road infrastructure, safe vehicles, safer road use behavior and post-crash care) as a framework to reduce road accidents and deaths globally. (4)

Conclusion

There is clearly a requirement for road safety education which should be directed towards road users, who are frequently involved and injured in RTAs. Thus stricter application of traffic laws and safety measures are required to bring down the road traffic accident rate and related mortality. Helmets and seatbelts have a significant role in preventing severe head injuries and highly advocated. Concrete measures need to be taken for pedestrian and bystander safety. Well-equipped adequately staffed trauma centers should be dedicated to managing limb and life threatening road traffic injury victims. Time is ripe to rethink our strategies to beat challenges and focus on creating a road safety revolution in the country.

Recommendation

This study solicits the emphasis by parents, guardians, school and licensing authorities on high school students, the future generation which is soon going to qualify the legal age bar to drive on roads, to be oriented to understanding the mechanics of braking distance, defensive driving and hazards of substance abuse especially while driving any motorized vehicle. Road side random breath testing for alcohol should be done by using breath analyzers, which is proxy indicator of blood concentration level of alcohol. The licensing authorities have a very important role to play in development of appropriate driving skills by adopting stricter, more comprehensive and scientifically based test laying a stress on road rules, regulations and traffic control devices. At the time of giving license to the public transport drivers (Bus and Trucks), they can be trained in first-aid skills so that victims are attended immediately in the post-accident period.

Limitation of the study

Data in case of respondents who were unable to speak and have fatal injuries was collected from their accompaniments with the purpose of not to lose the data on risk factors responsible for fatalities.

Authors Contribution

TA: Study protocol & Methodology, Data Collection, Data Analysis, Manuscript Writing. SKS: Conceptualisation, Investigation, Project Administration, Manuscript review. NA: Ethical clearance, Funding acquisition, Manuscript review and editing

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Tables

TABLE 1 DATA PERTAINING TO PATTERN OF ROAD TRAFFIC ACCIDENT AMONG VICTIMS

Study Variable	n (%)	95% CI
Day of accident		
Monday	25 (16%)	(20.8 - 29.2)
Tuesday	18 (11.5%)	(14.4 - 21.6)
Wednesday	22 (14 %)	(18.2 - 25.8)
Thursday	13 (8.3%)	(10.5 – 15.5)
Friday	23 (14.7%)	(19.1 – 26.9)
Saturday	36 (23 %)	(33.1 - 38.9)
Sunday	19 (12.5%)	(14.8 – 23.2)
Time of accident		
>00.00 – 06.00hr	18 (11.6%)	(14.6 – 21.4)
>06.00 - 12.00hr	56 (35.9%)	(50.9 –61.1)
>12.00 – 18.00hr	47 (30%)	(43.4 – 50.6)
>18.00 – 24.00hr	35 (22.5%)	(30.4 – 39.6)
Mode of travel during accident		
Bike/scooter rider	51 (32.7%)	(45.6 – 56.4)
Passenger or pillion rider	33 (21.2%)	(28.6 – 37.4)
Pedestrian	18 (11.5%)	(15.2 – 20.8)

Cyclist/Auto rickshaw	28 (18%)	(24.2 – 31.8)
Four wheeler&Other Heavy Vehicle	26 (16.6%)	(22.2 – 29.8)
Causes of accident		
Driver’s fault/negligence	63 (40.4%)	(59.4 – 66.6)
Poor vehicle condition	25 (16%)	(21.2 – 28.8)
Road factor	38 (24.4%)	(33.8 – 42.2)
Others	30 (19.2%)	(26.8 – 33.2)
Driver related causal factors (n=63)		
Talking on mobile	13 (20.5%)	(10.3 -15.7)
Listening music	7 (10.0%)	(5.5 - 8.6)
Drug Addiction	5 (7.7%)	(4.1 – 5.9)
Smoking/ tobacco chewing	11 (18%)	(9.2 – 12.8)
Alcohol consumption	9 (13.5%)	(7.1 – 10.9)
Associated medical illness/ personal condition	8 (12.7%)	(7.2 - 8.8)
Careless attitude	10 (17.6%)	(8.6 – 11.4)
Severity of Injury		
Minor	69 (44.2%)	(64.1 – 73.9)
Moderate	50 (32%)	(44.8 – 55.2)
Severe	37 (23.8%)	(34.4 – 39.6)
Site of Injury		
Head Injury	24 (15.4%)	(21.6 – 26.4)
Fractures	38 (24.4%)	(33.2 – 42.8)
Spinal Injury	18 (11.5%)	(15.4 – 20.6)
Superficial Injury/sprain	47 (30.1%)	(43.6 – 50.4)
Abdominal Injuries	21 (13.5%)	(18.2 – 23.8)
Thoracic Injuries	30 (19.2%)	(26.2 – 33.8)
Holding Valid Driving License (105)		
Yes	62 (58.7%)	(54.9 – 62.5)
No	43 (41.3%)	(39.1 - 43.5)
Use of Protective Gears (105)		
Yes	40 (38%)	(35.2 - 40.8)
No	65 (62%)	(58.6 – 65.4)
Availability of Road Lights/ Traffic signals (38)		
Yes	21 (56%)	(53.6 – 58.4)
No	17 (44%)	(15.1 – 18.9)

TABLE 2 ASSOCIATION OF RISK FACTORS ASSOCIATED WITH SEVERITY OF ACCIDENT EXPOSURE TO RTI VICTIMS

Study Variable	Severity of Injury			Chi square	p value
	Minor (n = 69)	Moderate (n=50)	Severe (n=37)		
Age in years					
≤ 30 yrs (54)	19	23	11	4.8	0.041
≥ 30 yrs (102)	50	27	26		
Sex					
Male (109)	51	28	30	7.31	0.026
Female (47)	18	22	7		
Days of the week					
Weekdays	46	33	23	0.228	0.892
Weekends	23	17	14		
Average driving speed					
< 40 km/h (11)	6	3	2	0.0485	2.24
40 – 60 km/h (74)	31	23	20		
≥ 60 km/h (71)	32	24	15		
Mode of travel during accident					
Bike/scooter rider (51)	26	19	6	9.69	0.288
Passenger or pillion rider (33)	12	10	11		

Pedestrian (18)	8	5	5		
Cyclist/Tri-wheeler (28)	9	11	8		
Four wheeler/ Heavy vehicle (26)	14	5	7		
Type of accident					
Collision between vehicles (42)	12	16	14	9.31	0.049
Collision with pedestrians (29)	17	7	5		
Sideways collision (23)	9	7	6		
Hit and Run (16)	7	5	4		
Fell down/skid (25)	13	9	3		
Animal obstruction (7)	11	6	5		
Causes of accident					
Driver's fault/negligence (63)	18	26	19	25.5	0.000
Poor vehicle condition (25)	6	10	5		
Road factor (38)	19	12	7		
Others (30)	26	2	6		
Holding Valid Driving License (105)					
Yes (62)	23	21	18	1.39	0.099
No (43)	12	19	14		
Use of Protective Gears (105)					
Yes (40)	21	11	8	7.51	0.023
No (65)	17	26	22		