

A cross-sectional study of epidemiological factors related to road traffic accidents in a metropolitan city

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ABSTRACT

Background: Traffic injuries are one of the major causes of morbidity in India. It involves human sufferings in terms of physical, emotional, and financial losses to the individual, family, and the country. A better insight into the epidemiological determinants will help prevent such injuries. **Objectives:** To estimate the proportion of fatal and nonfatal accidents and to determine the epidemiological factors related to nonfatal accidents. **Methods:** It was a cross-sectional study carried out in a tertiary care hospital over a period of 6 months. A simple random sampling technique was used for the selection of sample size of 476. Nonfatal accident victims were interviewed. **Results:** The proportion of nonfatal to fatal accidents was found to be 1.8:1. Around 72.9% of drivers did not use any safety measure while driving. Two-wheelers (39%) and light motor vehicles (28.3%) were mostly involved, 45% of drivers had speed more than 60 km/h. Obstacles in the road (41%), defective roads (36.5%), and poor street lighting (11.4%) were reported as contributing factors of the accident. Lower extremities and head neck and face were involved in 47.2% and 27.1% of cases, respectively. Around 40.4% of cases had a single-site fracture. **Conclusion:** Traffic injuries result from the interaction between agent, host, and environmental factors. Preventing these interactions is very well possible with little extra care given towards road safety and traffic behavior of individuals.

Keywords: Epidemiological factors, road safety, road traffic accidents, road traffic injuries

Introduction

Road accidents are human tragedies that involve high human suffering. They impose a huge socioeconomic cost in terms of untimely deaths, injuries, and loss of potential income. The negative impact of a road traffic accident (RTA) is felt not only on individuals, their health, and welfare but also on their family. Road safety has become an issue of national concern now. RTA is one of the major causes of morbidity and mortality in India. They not only disturb the economy of a household but the whole country. It affects all age groups including the economically productive population. Around 1.25 million people die every year from RTAs globally. Also, for each death there occur around 20 to 50 nonfatal injuries and 10 to

20 serious injuries. In India, in 2013, 1.66 lakh deaths due to RTAs were reported.^[1]

Multifactorial causation of RTAs demands the insight of driver-agent-environment complex and its impact on the survivors. RTAs are determined by the spectrum of epidemiological factors like faulty/old vehicles with defective parts, rash driving, drunken driving, defective roads, bad weather conditions, poor lighting, and so on. The study of these factors will help to know the factual causes of accidents and to set the priorities for the prevention of such injuries. Hence, this study was planned with the objectives of estimating the proportion of fatal and nonfatal types of RTAs among patients getting admitted to a tertiary care hospital in a metropolitan city and determining the epidemiological factors related to nonfatal RTAs.

Operational definitions: In the following study RTA is defined as, "An accident involving at least one vehicle in motion on-road

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that results in at least one person being injured or killed.” A fatal road accident is defined as, “A type of a road traffic accident in which death is occurring within 30 days of the accident.” And a nonfatal road accident is defined as, “A road accident in which death of the patient has not occurred.”

Materials and Methods

It was a cross-sectional descriptive study carried out at 1800 bedded tertiary level hospital in a metropolitan city over a period of 6 months in the year 2011. All patients presenting with fatal and nonfatal serious RTAs and patients requiring admission formed the sampling frame. Previous 2 months of hospital records showed the proportion of RTA patients in casualty was 42.87%. Thus, the expected prevalence for the sample size calculation was taken as 42% assuming the same trend during the study period. The final sample size estimated was 476.

All patients of RTAs with any type of injury were enumerated for calculating proportion using a simple random sampling technique. Patients with nonfatal serious RTAs of any age and sex were included in the study for understanding epidemiology and impact of RTAs. If no reliable source of information was available or cases where patients could not speak, or no eyewitnesses of an accident or no complete information was available from police records, then such cases were excluded.

Ethics committee approval was obtained for the study (Institutional Ethics Committee Approval was obtained on 7th June 2011). Written informed consent was taken before data collection. Patients of nonfatal RTAs admitted to hospital were interviewed in casualty using a pretested interview schedule. If the patient was unconscious, then the information was collected from the person who was involved in the same accident with him/her or any eyewitness or information from the police record was collected. After the patient regained consciousness and was able to give information then the information was confirmed from the patient. Data were entered in Microsoft excel and analysis was done by using SPSS 19 version.

Results

Among 476 road accident victims, 307 (64.4%) were involved in nonfatal accidents while 169 (35.6%) had a fatal outcome. Thus, the proportion of nonfatal to fatal accidents in this study was 1.8:1.

Out of nonfatal accident victims, the majority were in the age group 21–30 years (33.96%) followed by 31–40 age group (20.1%). Among 307 study subjects, 269 (87.6%) were male and 191 (62.2%) were unmarried. Around 15 (4.9%) were illiterate, 45 (14.7%) were educated up to primary school, 83 (27%) were educated up to middle school, 117 (38.1%) study subjects were educated up to high school while 47 (15.3%) educated up to graduation. Amongst 307 victims 147 (47.9%) were pedestrians, 85 (27.7%) were drivers, 38 (12.4%) were

passengers and 37 (12.1%) were pillion riders. Out of 85 drivers, 62 (72.9%) were not wearing any safety device (helmet or seatbelt) while driving. Only 27.1% of drivers used safety devices while driving (helmet 9.4% and 17.7% used seatbelt). Out of 307 victims, 23 (7.5%) was talking on a mobile phone at the time of the accident, 66 (21.5%) were under the influence of alcohol and 52 (16.9%) had a visual disability.

Table 1 shows the distribution of agent factors related to RTA.

Table 2 shows the distribution of environmental factors related to RTA.

Table 3 shows the distribution of the pattern of injury after RTA.

About 23 (7.5%) study subjects were talking on mobile at the time of the accident and among them, 15 (30.6%) study subjects were below 20 years age, and the relationship between age of victims and mobile use at the time of the accident was found to be significant ($P < 0.05$). Out of those who were under the influence of alcohol at the time of accident 22 (73.3%) had encountered fractures and association between alcohol intake and sustaining fractures was found to be significant ($P < 0.05$). Among 23 safety device user drivers, 60% did not have fractures. It was found that the use of safety devices was associated with less incidence of fracture as compared to the nonusers of safety devices (P -value 0.001). Also, it was observed that an increase in the speed of the vehicle was associated with an increased incidence of fractures among victims ($P < 0.05$). The road-related environmental factors like obstacles in the road, defective road, poor street lighting were associated with an increase in the occurrence of fractures among RTA victims. On applying Chi-square test there was a statistically significant relationship between environmental factors and occurrence of fracture (P -value 0.001).

Discussion

With the advancement of technology and the country’s growing economy, the average number of vehicles on the road is increasing. Hence, road safety is an ongoing matter of concern

Table 1: Distribution of agent factors related to Road Traffic Accidents

Agent Factors	Frequency (n=307)	Percentage
Type of vehicle involved	Two-wheeler	39
	Three-wheeler	5.2
	LMV	28.3
	HMV	23.5
Speed of vehicle (n=85)	> 60 km/h	45
	31-60 km/h	35.3
	< 30 km/h	9.4
	did not remember	9.4
Age of vehicle (n=85)	< 5 years	25.9
	5-10 years	35.3
	10-15 years	28.2
	>15 years	10.6

Table 2: Distribution of environmental factors related to Road Traffic Accidents

Environmental Factors		Frequency (n=307)	Percentage
Number of accidents on the days of week	Saturday	76	24.8
	Sunday	52	16
	Wednesday	27	8.8
Time of the day at which accident occurred	0-6 h	45	14.7
	6-12 h	64	20.8
	12-18 h	80	26.1
	18-24 h	118	38.4
Number of victims reached the hospital after accident	Within 1 h	34	11.1
	1-6 h	133	43.2
	6-12 h	100	32.5
	After 12 h	40	13.1
Victims who have received first aid after the accident		64	20.8
Road related factors	Obstacles in road	126	41
	Defective road	112	36.5
	Poor street lighting	35	11.4
	Lack of familiarity of road	20	6.5
	Absence of road signs	7	2.3
	Others (overcrowding of vehicles on road, loss of control of vehicles, adverse weather conditions)	7	2.3

Table 3: Distribution of pattern of injury after Road Traffic Accidents

Pattern of injury		Frequency (n=307)	Percentage
Frequency of body part affected in the accidents	Lower Extremities	145	47.2
	Head neck and face	83	27.1
	Multiple injuries	52	16.9
	Thorax and abdomen	27	8.8
Frequency of fractures occurred	Single site fracture	124	40.4
	Two site fracture	87	28.3
	Multiple site fracture	50	16.3
	No fracture	46	15

for our country. The age group of 21 to 40 years is the young and working population who have a more active life and who are involved in outdoor activities most of the time. It is usually observed that they take a risk like speedy driving and crossing road carelessly, etc., Males drive the vehicle more often and show more risk-taking behavior than females. Moreover, pedestrians are at equal risk of injury in a likely event of an accident. This precipitates in absence of zebra crossing at various places, crossing from anywhere, overcrowding on roads, unavailability of footpaths and if available then nonuse of footpaths, presence of vendors on the footpath, high speed of vehicles, violation of traffic rules, and so on. A study conducted at Pondicherry found that pedestrians and drivers were involved in around 57% of RTAs.^[2]

Lack of awareness of the importance of safety devices while driving, poor enforcement of road traffic regulations, feeling uncomfortable while driving or mere overconfidence results in non-use of helmets and seatbelts. A study reported that only 50% of the two-wheeler victims had used helmets and only 19.3% of four-wheeler drivers used seat belts at the time of

the accident.^[3] Alcohol compromises the judgment of drivers, pillion riders and pedestrians while driving or crossing the road. This not only affects a person under the influence of alcohol but causes a major loss in the form of lives of other sober individuals and loss of property too. Other studies showed similar results as ours.^[2,4] The risk of an RTA is higher in drunken drive and it increases significantly when the driver's blood alcohol goes more than 0.04 g/dL.^[5] As our study focussed on nonfatal accidents the percentage here may not depict actual drunken drive cases as many of them might have had a fatal outcome. Also, visual disability (low vision, color blindness, night blindness) is an important cause of RTAs as it increases the risk for both drivers and pedestrians. Another study also reported similar findings.^[6] Talking or texting on mobile phones while driving creates a distraction from the road which contributes to the causation of accidents. WHO's Global status report on road safety states that the use of mobile phones while driving increases risk of an accident by four times and texting while driving by 23 times. Drivers' reaction time is found to have decreased by 50% due to the distraction of mobile. Conversation on mobile while driving a car causes more distraction than listening to music.^[7] One other study found more than 50% distracted due to mobile phones at the time of the accident.^[8] Another study reports frequent use of mobile phones for texting or searching for information while riding and drink riding motorcycle is associated with higher chances of a crash.^[9]

A maximum number of accidents occurred between 18 to 24 h followed by 12 to 18 h and on weekends. In metro cities, roads are crowded with vehicles all the time, which is even more in the peak hours of morning and evening when people go to the workplace and come back home. During this time the roads are full of pedestrians, auto-rickshaws, buses, cars, and two-wheelers. Despite good traffic handling on the highways

and on other roads, there is always a chance of accidents if proper care is not taken at an individual level. Careless driving when roads are not crowded is one of the important factors of accidents occurring at late night hours. Fast driving on relatively empty roads, hurry to reach home, any weekend plan, etc., make weekends more accident-prone. Over-speeding the vehicle is another irresponsible behavior from the driver side. The speed limit of every kind of road is specified but drivers, out of ignorance or overconfidence speeds up the vehicle which then becomes difficult to control. The risk of death increases 4.5 times in pedestrians hit by a car when speeding increases from 50 to 65 km/h.^[7] Other studies also report similar findings as that of ours.^[4,10,11]

Lack of first aid during the first hour of accident delays treatment and further recovery of victims. The first hour after an accident is considered as a golden hour and victims who can reach the hospital during this period have maximum chances of survival. Treatment during this golden hour also contributes to reducing the physical, psychological and socioeconomic impact on patient's life. In contrast to our findings, a study found that a maximum number of patients received treatment within 1 to 6 h.^[12] This depends largely on the distance between the health facility and accident spot. The facility available nearby, prompt referral, affordability of victim, and presence of decision-maker with the victim at the time of the accident, also affects the time of treatment received and their outcome.

Obstacles in the road in the form of digging on road, parking of vehicles anywhere on roads, hoardings or banners of political parties and festival manuals, sudden turn of vehicles without any indication, repair work under progress, fog, smog, etc., also are a major contributor in RTAs. In our study obstacles, defective roads and poor street lighting were reported as a cause in the majority of cases. In a study of environmental factors related to RTA deaths and injuries due to RTA was found to be more in a cloudy day than clear, more in the evening than daytime and more at avenues and side-tracks than highways.^[13]

Both two and four-wheeler accidents impacted lower limbs more due to imbalance and bumper striking, respectively. Head, neck and face region involved due to nonusage of safety devices at the time of the accident. More serious injuries like a head injury might lead to death and therefore in nonfatal cases, limb injuries are reported more. Another study also reported similar results.^[12]

Family physicians have a very strong bond with their patients. Primary care physicians can play an important role in behavior change communication. The host factors like drunken drive, nonuse of safety device, talking over mobile phones are certain risk factors that need to be addressed as lifestyle modifications. A physician can display these messages in clinics. This will help to reinforce and authenticate these messages. Primary care physicians can act as a health educator and behavior influencers for primary prevention of accidents.

Conclusion

Strict enforcement of traffic rules and promotion of the use of safety measures, achieving behavioral change communication by safety education will help to break the interaction of the host with an agent and environmental factors. Other measures like timely servicing of the vehicle, replacement of old vehicles by new ones, maintaining speed under the limit, avoid rash driving will protect against accidents. Fixing environment by the display of regulatory signs and traffic signals on the road, adequate lighting, prompt repair of roads, proper diversions in case of construction work on the roads will prevent accidents and injuries. Strengthening and proper alignment of the public transport system will help to reduce overcrowding of vehicles in peak office hours, especially in metro cities.

Traffic accidents put an extra burden on health care which can be very well prevented with a little extra care given towards road safety and traffic behavior of individuals. Information, education, and communication about road safety play a vital role in adopting safety measures by the population.

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Conflicts of interest

There are no conflicts of interest.

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