

Original Research Article

Epidemiological determinants of road traffic accidents: a cross sectional study in Amravati, Maharashtra, India

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ABSTRACT

Background: Road traffic accidents (RTAs) represents a major epidemic of non-communicable disease in the present century affecting families, community and nation as a whole. Objectives was to study the epidemiological determinants of RTAs.

Methods: A hospital based study of RTA victims was conducted for a period of one year at the District General Hospital and Medical College hospital of Amravati, Maharashtra. A total of 1394 patients were studied. Descriptive statistics like percentage and proportions were calculated. Proportions were compared using Chi square test of significance.

Results: 86.7% were males and the maximum affected age group was 21 to 30 years. Majority of accidents were seen in summer season and on Monday of the week. Accidents were highest from 12 noon to 6 pm. Alcohol consumption was seen in 27% of the drivers. Two-wheelers were the commonest vehicle involved in RTAs. A total of 481 (34.5%) victims had fractures at various sites of the body, out of this 52.8% was of lower limbs. Right sided bony injuries were more common.

Conclusions: There are multiple factors associated with RTAs which due to the lack of road safety measures in the country are playing their role. It is the need of the hour to address this issue and formulate rules and regulations and evaluate its enforcement.

Keywords: Amravati, Epidemiological determinants, Maharashtra, RTAs

INTRODUCTION

Road traffic accidents (RTAs) are one of the leading causes of morbidity and mortality worldwide. The pace of scientific and technological development especially in the areas of automobile, locomotive and aviation technology has instilled an ingredient known as 'speed' in human life. Man's blind infatuation with speed in the absence of conducive road and traffic conditions and adequate

proficiency has become a major cause of human agony and suffering due to RTAs.

More than 1.25 million people die each year as a result of road traffic crashes. Road traffic injuries are the leading cause of death among people aged between 15 and 29 years.¹ 90% of the world's fatalities on the roads occur in low and middle-income countries, even though these countries have approximately 54% of the world's vehicles. Nearly half of those dying on the world's roads are "vulnerable road users": pedestrians, cyclists, and

motorcyclists. Road traffic crashes cost most countries 3% of their gross domestic product. Without sustained action, road traffic crashes are predicted to become the seventh leading cause of death by 2030. The newly adopted 2030 Agenda for Sustainable Development has set an ambitious target of halving the global number of deaths and injuries from road traffic crashes by 2020.²

In India 11% of deaths due to non-communicable diseases are because of injuries and 78% of injury deaths are caused by RTAs.³ During the year 2013, there were 4.86 lakh road accidents, which resulted in deaths of 1,37,572 people and injured 4,94,893 persons. These numbers translate into one road accident every minute and one road accident death every four minutes.⁴

Road accident scenario in our country is a matter of great concern, as it has become a major social, economic and health problem. Injured people often suffer physical pain and emotional anguish that is beyond any economic compensation. Permanent disability, paraplegia, quadriplegia, loss of eye sight or brain damage, can deprive an individual of the ability to achieve even minor goals and result in dependence on others for economic support and routine physical care. Other resource costs include police, legal, fire, victim services plus cost of property damage or loss in injury incidents.⁵

Strategies to reduce injuries and deaths due to RTAs are not receiving adequate attention from the health researchers. Information about these injuries are limited in India, as trauma registries and hospital-based research have not developed systematically. This information will indicate just how serious the injury problems are and where, exactly, preventive measures are most urgently needed. Thus to supplement the previous studies and to help the policymakers in implementing evidence-based strategies to prevent such accidents in future, the present study was planned in an urban setup. Human, vehicular and environmental factors play major roles before, during and after a trauma event; therefore accidents have to be studied in terms of an epidemiological triad i.e. agent, host and environment.

METHODS

This cross sectional study was carried out in the District General Hospital and Medical College hospital of Amravati city of Maharashtra from 1st January 2014 to 31st December 2014.

The district is in an advantageous position in national highway network. NH-6 passes through the city and district which acts as the truck route connecting the district with other important cities. State highway SH-6, SH-10, and SH-24 also pass through the district. The main mode of transport here is by roads and railways. Total number of vehicles registered in the district for the year 2013 - 2014 was 5, 00,972 and out of this 4, 08,509 were two wheeler vehicles.⁶

For the purpose of the study, RTAs are those accidents that occur on a way or street open to public traffic; resulted in one or more persons being killed or injured, and at least one moving vehicle was involved.⁷ All RTA victims admitted and brought to the hospitals under study for treatment and who gave consent to participate in the study were included. Fatal RTA's were excluded.

Minimum sample size required was calculated using the formula $n=4pq/d^2$.⁸ Taking a prevalence of RTA in Maharashtra as 13.8% with 5% error, the minimum sample size required was 196.⁴ A total of 1394 RTA victims were included during the period of one year.

The accident victims were interviewed with a predesigned proforma and clinical examination was done either in the casualty or in the wards. The proforma contained details like demographic profile of victims i.e. age, sex, marital status, religion, type of family, education, occupation, residence and socioeconomic status etc. Other details like day, time and month of accident, time taken to receive first aid (time lag), type of vehicle, type of collision, characteristics of the drivers etc. was also recorded. The data regarding various injuries sustained by the victims were also collected. The medico legal records and case sheets of the victims were referred for collecting additional information and where necessary for cross-checking. When the condition of the patient did not permit the conversation, the attending persons were interviewed. Trauma index (TI) was used for the initial assessment of trauma patients.⁹

Data was entered in Microsoft Excel 2010 and coding of all variables was done. Data analysis was done in Statistical Package for Social Science version 16 software (SPSS). Descriptive statistics like percentage and proportion were calculated. Proportions were compared using chi-square tests of significance. $P < 0.05$ was considered significant.

A written informed consent was taken from the victims or relatives or concerned attending person. Ethical approval for the study was obtained from the institutional ethical committee of the Medical College. Permission was obtained from the District General hospital and Medical college hospital.

RESULTS

A total of 1394 injured RTA victims from 1207 RTAs were included in the study. Table 1 shows that in all age groups majority of victims were males and the difference was found to be statistically significant. 80% of the accident victims were illiterates or had low educational status i.e. up to 8th standard and were unskilled workers (63.1%).

Highest number of RTA's (16.8%) took place on Monday, followed by Sunday (15.2%) and least number of accidents on Tuesday (12.1%) as shown in Figure 1.

The result was not found to be statistically significant ($p>0.05$). Figure 2 shows that maximum RTA's occurred from 12 noon to 6 pm (41.2%) and from 6 p.m. to 12 midnight (36%), total accounting for about 77.2% of cases.

Table 1: Age and sex-wise distribution of RTA victims (n=1394).

Age (years)	Male (%)	Female (%)	Total (%)
0-10	21 (1.5)	11 (0.8)	32 (2.3)
11-20	143 (10.3)	18 (1.3)	161 (11.5)
21-30	437 (31.3)	49 (3.5)	486 (34.9)
31-40	300 (21.5)	41 (2.9)	341 (24.5)
41-50	174 (12.5)	27 (1.9)	201 (14.4)
51-60	83 (6.0)	15 (1.1)	98 (7.0)
61-70	38 (2.7)	19 (1.4)	57 (4.1)
>70	13 (0.9)	5 (0.4)	18 (1.3)
Total	1209 (86.7)	185(13.3)	1394 (100)

$\chi^2=41.329$, $d(f)=7$, $p=0.0000007$.

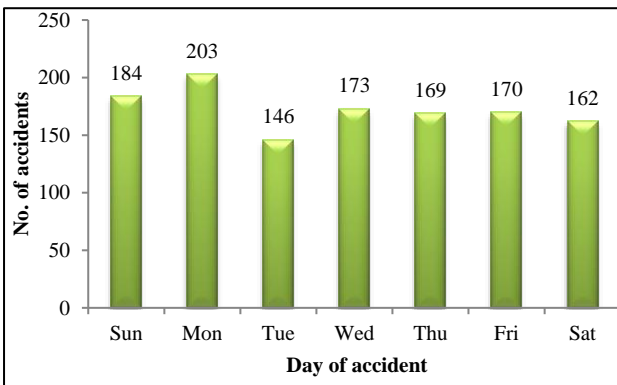


Figure 1: Distribution of RTAs according to day of accident (n=1207).

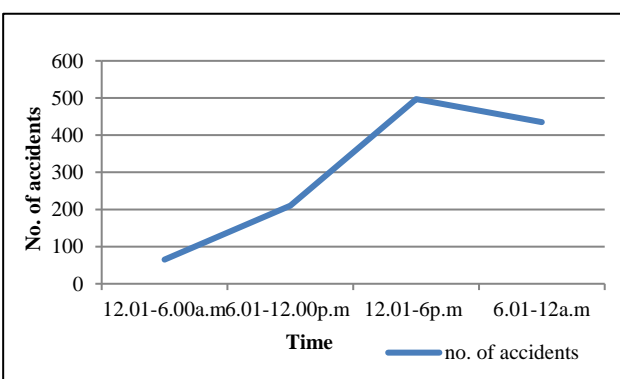


Figure 2: Distribution of RTAs according to time of occurrence (n=1207).

Maximum accidents occurred in summer season i.e. from March to June (37.4%) followed by 32.9% in winter as shown in Figure 3. Rainy season accounted for lowest i.e. 29.7% of the accidents. The result was found to be significant ($p<0.01$). Majority of the victims (66.7%) reached hospital within the golden hour (1 hour).

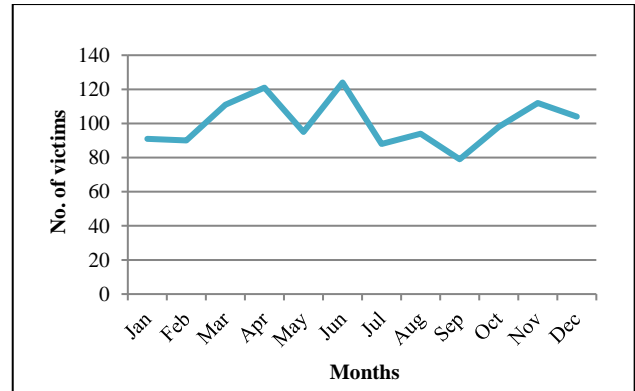


Figure 3: Month wise distribution of RTAs (n=1207).

The most common offenders were two wheeler vehicles i.e. involving 815 accidents out of 1207. Maximum numbers of accidents (59.1%) in two wheelers were due to skidding, overturning etc. i.e. single vehicle involvement. Pedestrians were involved in 197 accidents.

Major accident prone factors on the road identified by the victims (22%) were some form of obstruction (pits, animals, men at work, trees, stones, speed breaker etc.). Accidents were more common in vehicles (62%) which were less than five years old.

Out of 597 drivers of motorized vehicles which met with an accident 428 (71.7%) had a valid driving license. 27.1% of 597 drivers had consumed alcohol at the time of the accident. None of the two wheeler riders or pillions were using helmets and none of the car passengers were using seat belts or other safety measures. Over speed was reported in 17.3% of them. 118 of the 597 drivers who met with the accidents had less than 5 years of driving experience.

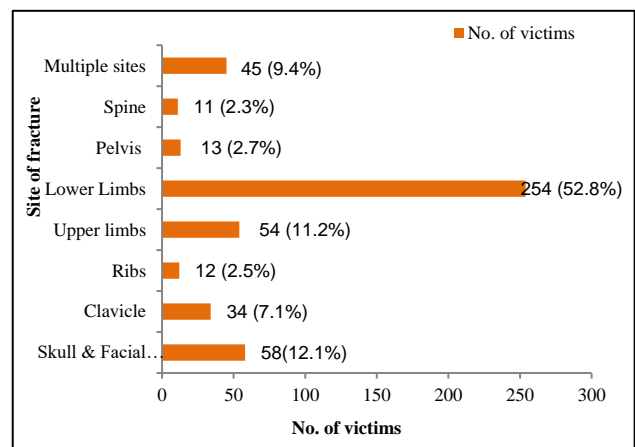


Figure 4: Distribution of various fractures in RTA victims (n=481).

A total of 481 (34.5%) victims had fractures at various sites of body. Figure 4 shows that out of this a very large proportion of victims, 254 (52.8%) had lower limb fractures.

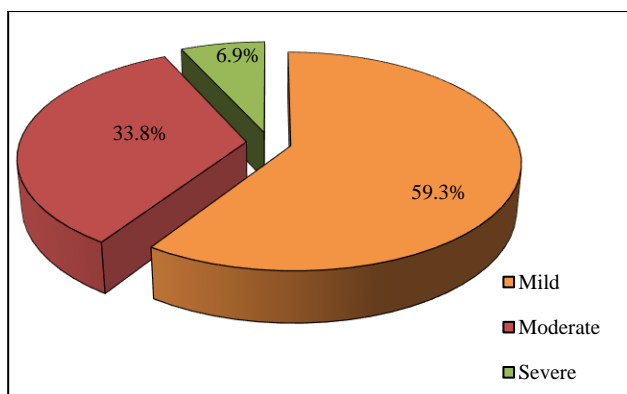


Figure 5: Classification of severity of injuries according to Trauma index (n=1394).

Table 2 shows the comparison of bony injuries on left and right side of the limbs. Out of 357 bony injuries of limbs, 238 (66.7%) were on right side as compared to 119 (33.3%) on left side of body and this was found to be statistically significant ($p < 0.05$) i.e. right side of the body suffers more injuries than left side.

Table 2: Sidewise comparison of bony injuries of extremities (upper and lower limbs).

Injury to bone of extremities	Right (%)	Left (%)	Total (%)
Dislocation	20 (51.3)	19 (48.7)	39 (100)
Fracture	218 (68.6)	100 (31.4)	318* (100)
Total	238 (66.7)	119 (33.3)	357 (100)

DISCUSSION

This study was conducted to observe the various epidemiological factors of RTA. The study showed that out of 1394 victims, 86.7% were males (male female ratio- 6.54:1). The highest numbers (34.9%) of victims in both sexes were between 21-30 years of age. Mean age was 34.41 years. These findings are similar to other studies in India.¹⁰⁻¹⁴

In present study it was seen that maximum i.e. 16.8% of RTA's took place on Monday and 15.2% on Sunday and least number of cases on Tuesday. Other days have shown almost constant figures with little variations. Maximum accidents occurred in summer season (37.5%) followed by 32.8% in winter. Rainy season accounted for 29.7% of the accidents. Various studies in India showed different cyclical trend with respect to day and month depending on local reasons.¹²⁻¹⁴ Peak occurrence of RTA's in present study was similar to other studies on RTA i.e. between 12 noon to 6 p.m. (41.2%). This coincides with the peak traffic during that time.

In the present study it was seen that maximum accident cases (77.7%) were associated with motorized two wheelers. Many studies have a similar result.^{15,16} It is

economical, convenient and easily available mode of transport for people in our area. Moreover accidents may be more in two wheelers due to the higher speed it can achieve over short distance, easy to handle but less stable. All these leads to greater mechanical energy during accidents which make the injuries severe. Two wheelers, pedestrians and cyclists are vulnerable road users.

Out of 597 drivers of motorized vehicles which met with an accident 28.3% drivers had no valid driving license. Similar results were shown by Patil et al.¹² Mahajan et al found that only 6% of drivers did not have a valid driving license.¹⁷ In present study 27.1% of 597 drivers had consumed alcohol during the accident. Various studies showed 15-45% of drivers had consumed alcohol.^{11,12,17,18} Singh et al revealed that only 3.8% victims were intoxicated with alcohol at the time of accident.¹³ This difference may be due to difference in socioeconomic status, easy availability of alcohol, strict rules of drunken driving prevailing in those areas etc.

In present study none of the two wheeler riders or pillions used helmets and none of the car passengers used seat belts. A total of 481(34.5%) victims had fractures at various sites of body. Out of this a very large proportion of victims, 254(52.8%) had lower limb fractures. There were a total of 39 dislocations of various joints. Out of 357 bony injuries involving either side of limbs, 66.7% were on right side. This is in line with other studies.^{13,15,16}

The fractures are due to the interaction of gravitational force and velocity of the vehicle at the time of accident. Most of the victims were of two wheelers and they try to balance on lower extremities when balance is lost. There are chances that the vehicle will fall on the lower limbs. The weight and velocity of the vehicles injures the unprotected lower extremities more than the upper extremity by direct trauma. Among four wheelers, lower limbs and chest are more involved because during the accident they hit and get crushed between the steering wheel, dashboard or the front or back seats.

The most active and mobile body parts respond quickly to any stimulus. Similarly, the most active and mobile body part (head and extremities) try to maintain equilibrium of the body during sudden stimulus of an accident and hence injuries of head and extremities are more common.¹⁹

Right sided body injuries are more common than left because there is an inbuilt defense mechanism in human being to avoid getting mortal injuries by exposing his non vital dominant part of body like right limbs (as majority of people are right handed) to life threatening injuries.²⁰

Limitations

The hospitals in which this study was undertaken do not have facilities to treat head injury and severe polytrauma patients. Hence patients with suspected head injury and severe injuries were referred to higher centers. Also the

extent of internal injury could not be analyzed in some of the severe accident cases due to referral to higher centers. There is a need to follow up the injured victims and find out the degree of disability in them which was not feasible in our study due to time constraint and unavailability and non-response from the patients.

CONCLUSION

To conclude, RTA's was high among the males of younger age group. Most of the victims were two wheeler riders and pillions followed by pedestrians. Environmental factors like poor visibility, obstruction in the road etc. increases the chance of accidents. Overcrowding in vehicles was associated with accidents. Alcohol consumption was seen in one third of the drivers who met with the accident. Fractures of lower limbs were the most common type of bony injury sustained.

Recommendations

It can be seen that multiple factors- human, vehicular and environmental, play major roles before, during and after an RTA. The main thrust of accident prevention and control has been on 6E's of road safety such as education, engineering (roads), engineering (vehicles), enforcement, emergency care and enactment. This can be achieved by the commitment of various relevant sectors like health, transport, education, police, legislators etc. Better trauma care facilities with training and retraining of medical officers of trauma centers to have basic skills in immediate trauma care and life support through regular workshops must be under taken. More studies with follow up of victims on this aspect should be taken up in future, so that a strong data base can be created to formulate policies and practices to prevent, control and eliminate the unacceptable health losses arising from RTAs.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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