Epidemiological profile and pattern of injuries in road traffic accidents in Moradabad: A prospective study

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Abstract

***Background*:** In many countries, motor vehicle accidents rank first among all fatal accidents. RTAs have got multi-factorial causation. It is a part of the price we pay for our technological progress. Regional differences exist in the pattern of injury sustained by different types of road users that can have significant implications in the development of prevention policies.

The objective of the Study: To understand the profile and pattern of injuries sustained and circumstances leading to RTAs in and around Moradabad, U.P.

***Materials and Methods*:** After ethical clearance for the study, all RTA victims presenting to the Casualty of TMU Moradabad, U.P. were taken for this study. All relevant details of RTIs were recorded and data collected, entered on a predesigned proforma and then tabulated, analyzed and interpreted statistically.

***Results*:** Out of 730 patients included in this study, most common victims were pedestrians (33.01%), most common site of injury was head (86.71%), most common external injury was lacerated wound (46.75%), and intoxication was seen in 24.11%, protective/safety measures used by 10.23%.

***Conclusion*:** RTAs continue to be a speedily rising problem, causing heavy loss of manpower and resources. Road users should be properly trained by authorized centers; driving licenses should be issued after strict testing of driving skills. Trauma centers with integrated facility of surgical, orthopedic, neurosurgical, anesthetic experts with modern investigative procedures like USG, CT-Scan and facility of blood-bank is the best solution for RTA victims who are severely injured.

Keywords: road traffic accidents; road traffic injuries; profile and pattern of injuries.

Introduction

Road traffic injuries (RTIs) have emerged as a highly visible cause of morbidity, disability, and mortality. In particular, injuries disproportionately affect young adults, the poor and men. Accidents have got multi-factorial causation. Interaction among the agent (vehicle), host (road user) and environment (improper roadways) are concerned including the working condition of the vehicle, awareness, attitude, and behavior of road user

and the road quality and other environmental circumstances (1). By 2020, it is projected that road traffic disability-adjusted life years lost will move from being the 9th to the 3rd leading cause of disability-adjusted life years lost in the world and the second leading cause in developing countries (2).

India is facing a serious situation involving road traffic injuries. The fast economic growth in India has boosted the number of vehicles being sold every year (around 6 million), but with that India is also one with the highest mortality rate from road traffic accidents (RTA) (3). WHO rates RTI as the 6th leading cause of deaths in India – 4,89,400 reported road accidents were there in the year 2014 leading to 4,93,474 injuries and 1,39,671 deaths as compared to 4,86,476 road accidents with 4,94,893 injuries and 1,37,572 deaths in the year 2013. The analysis shows that in the year 2014, India reported 56 road accidents with 16 lives lost every hour (4).

Around 83.5% of accidents in India have been attributed to driver's fault, followed by 6% due to various factors like cattle, fallen trees, etc., 3% due to mechanical defects, 2.4% passenger fault, 2.3% pedestrian fault, 1.1% bad roads and 0.9% due to bad weather (5). Accidents are the chief cause of death among persons aged 10-24 years. Between the ages of 5 and 14 years, death due to injuries ranks 5th among boys and 7th among girls in the developing countries. In the developed regions, 57% of male deaths and 43% of female deaths in this age group are due to injuries, mainly traffic accidents. Motor vehicle accidents account for around 23.8% of reported mortality in males and 23.2% in females. In many countries, motor vehicle accidents rank first among all fatal accidents (6).

India contributes to 6% of the global RTAs but it has only 1% of the vehicles in the world (7). The most vulnerable group comprising road accident fatalities include pedestrians, bicyclists, and two-wheeler users. They constitute 60 to 80% of total mortalities (8). Delhi constitutes the highest number of fatalities in road crashes in India as suggested by estimates (9).

RTAs are not considered merely accidental but are part of the price we pay for our technological progress. The resulting injuries may involve head, neck, chest, abdomen, and extremities resulting in death and deformity (10).

The spectrum of vehicular injuries is immense. All kinds of injuries may be caused by vehicular accidents, depending on the following factors: site of impact; the direction of impact; the force of impact; design of vehicle; behavior of vehicle after impact, *e.g.*, overturning; ejection of the victim; and supervening factor, *e.g.*, fire (11).

There are differences in the road use and pattern of road traffic injury across different countries. Regional differences exist in the pattern of injury sustained by different types of road user that can have significant implications for the development of prevention policies. The present research was conducted to understand the profile and pattern of injuries caused and circumstances leading to road traffic accidents in and around Moradabad, Uttar Pradesh.

Materials and methods

This study was conducted in the Casualty at Teerthanker Mahaveer Medical College/Hospital and Research Centre, Moradabad, Uttar Pradesh. All road traffic accident victims presenting to the Casualty of TMU Hospital over a period of one year from September 2015 to August 2016 were taken for this study. Ethical clearance for the study was taken from the Institutional Ethics Committee and informed consent was taken from the population of the study. Cases of trauma other than road traffic accidents, patients referred to the higher centers and patients who absconded/left against medical advice were excluded from the study.

A detailed history of the events preceding, during and after the accident; name, gender, age, address and occupation of the victim were taken. Particular attention was paid towards the symptoms like loss of consciousness, vomiting, seizures, ENT bleed, pain chest, breathlessness, pain abdomen, hematuria, pain anywhere in the limbs and loss of or impaired movements of the limbs. Also, the mechanism of injury was asked for and history of intake of alcohol or any other drug abuse was taken. The detailed physical examination was done and all relevant details regarding the pattern, size, site, number and severity of the injuries were assessed. The basic standard protocol of ABC *i.e.* to check the airways, breathing and circulation were followed. Parameters assessed were level of consciousness, bony crepitus over the rib cage, Glasgow coma scale, tenderness/distention of abdomen, movements of the limbs, status of pupils, power grade of limbs, pulse rate and volume, pelvic

compression test, respiratory rate, spinal tenderness, any cyanosis, blood pressure.

Routine tests like hemogram, renal function tests, blood grouping, urine routine examination followed by X-ray skull, NCCT head, X-ray chest (PA view), CT chest (wherever required), X-ray abdomen standing (AP view), four quadrants peritoneal tap, ultrasound abdomen, CECT abdomen to look for grade of solid organ injury (wherever required), X-ray pelvis (AP view), X-ray spine, CT spine (wherever required) and X-ray of limbs were done.

Data collected were entered on a predesigned proforma and then tabulated, analyzed and interpreted statistically. Microsoft Excel Windows was used for analysis. Interpretation of the data collected was done by using appropriate statistical methods like percentage mean and proportions in tabulated form.

Results

This prospective study was carried out over a one-year period on 800 patients of road traffic accidents with multiple injuries in the Casualty of Teerthanker Mahaveer Medical College and Research Centre, Moradabad, Uttar Pradesh. A total of 70 patients were excluded from the study as 14 patients left against medical advice, while 56 patients were referred to higher health institutions. Out of 730 patients who fulfilled inclusion criteria, the majority were males 600 (82.19%) while 130 (17.81%) were females. Majority of RTA patients 537 (73.56%) were young and in their productive age group of 16 to 45 years, 456 (76%) males & 81 (62.30%) females. 296 (49.33%) male patients were seen in age group 16-30 years, followed by 160 (26.67%) in 31-45 years, 74 (12.33%) in 46-60 years, 52 (8.67%) in < 15 years, 13 (2.17%) in 61-75 years and 5 (0.83%) in >76 years' age group. Similarly, 41 (31.54%) female patients were seen in age group 16-30 years, followed by 40 (30.77%) in 31-45 years, 20 (15.38%) in 46-60 years, 17 (13.08%) in <15 years, 10 (7.69%) in 61-75 years and 2 (1.54%) in > 6 years' age group. Youngest RTA patient was a 9-month old male child, and eldest, a 90-year-old male. Distribution of accidental victims is given in Table 1, while the site of injury is given in Table 2.

Majority of RTA victims had head injury 633 (86.71%), followed by chest 174 (23.83%), abdomen 118 (16.16%), limbs 80 (10.96%) and spine 8 (1.09%). Mild head injury (GCS 13/15 – 15/15) was seen in 412 (65.09%) patients, moderate (GCS 8/15 – 12/15) in 163 (25.75%) and severe (GCS 3/15 – 7/15) in 58 (9.16%) patients. Intoxication was present in 176 (24.11%) patients, absent in 383 (68.52%), while 241 injured pedestrians were excluded because presence/absence of intoxication did not have any effect on RTA. Use of protective means (helmet/seatbelt) was present only in 50 (10.23%) RTA victims and absent in 439 (89.77%) victims. 241 victims (pedestrians) were excluded for this parameter. Table 3 shows the distribution of patients according to the type of external injuries. The lacerated wound was seen in 340 (46.75%) patients, hematomas in 278 (38.08%), abrasion in 171 (23.42%) and others like a black eye, tenderness over the site of injury, bony crepitus in 42 (5.75%) patients. Focused assessment with Sonography in trauma (FAST) was found positive in 110 (15.07%) patients.

Table 1: Distribution of accidental victims

Type of victim	No. of patients (%)
Pedestrian	241 (33.01)
Rider	220 (30.14)
Passenger	171 (23.42)
Pillion	53 (7.26)
Driver	45 (6.16)
Total	**730 (100.00)**

Table 2: Site of injury

Sites of injury	No. of patients (%)
Head	415 (56.85)
Head + chest	88 (12.05)
Head + limbs	57 (7.81)
Head + abdomen	43 (5.89)
Abdomen	41 (5.62)
Abdomen + chest	27 (3.70)
Head + chest + limbs	23 (3.15)
Chest	21 (2.88)
Chest + spine	8 (1.09)
Head + chest + abdomen	7 (0.96)
Total	**730 (100.00)**

Distribution of patients according to NCCT head findings is given in Table 4 and according to other CT findings is given in Table 5, while the distribution of patients according to X-ray findings are given in Table 6.

Conservative management was followed in 634 (86.85%) patients and operative management in 96 (13.15%) patients. During the study period, 617

Table 3: Distribution of patients according to type of external injuries (n=730)

Type of external injuries	No. of patients (%)
Lacerated wound	195 (26.71)
hematoma	186 (25.48)
Lacerated wound + abrasion	82 (11.23)
Hematomas + lacerated wound	63 (8.63)
Abrasion	60 (8.22)
hematoma + abrasion	29 (3.97)
Others (black eye, tenderness over the site of injury, bony crepitus)	42 (5.75)
No external injury	73 (10.00)
Total	**730 (100.00)**

Table 4: Distribution of patients according to NCCT head findings (n=633)

NCCT head findings	No. of patients (%)
Fracture (head and facial bones)	241 (38.07)
Cerebral contusions	184 (29.07)
Subdural hematoma (SDH)	147 (23.22)
Subarachnoid hemorrhage (SAH)	81 (12.79)
Extradural hematoma (EDH)	37 (5.84)
Intracranial aerocoele	19 (3.00)
Ventricular bleed	15 (2.36)
Diffuse brain edema	13 (2.05)

Table 5: Distribution of patients according to other CT findings (n=11)

Site	CT findings	No. of patients
Abdomen	Free fluid in peritoneal cavity was seen in 3 patients, whereas 2 had solid organ injury	3
Spine	All fractures	4
Chest	Free fluid in pleural cavity was seen in 4 patients, whereas 2 had lung contusion	4

(84.52%) patients recovered and 28 (3.83%) were discharged on request. A total of 85 (11.64%) patients expired. Most of them were those having a severe head injury (GCS 3/15 – 7/15) and others were those who had polytrauma with irreversible shock.

Table 6: Distribution of patients according to X-ray findings (n=730)

X-ray findings	No. of patients (%)
No abnormality detected (NAD)	263 (36.2) 241(33.01)
Fracture head & facial bones	
Fracture ribs	78 (10.68)
Fracture limb bones	68 (9.32)
Haemothorax	22 (3.01)
Fracture nasal bone	20 (2.74)
Fracture clavicle + limb bones	9 (1.23)
Fracture clavicle + fracture ribs	8 (1.10)
Haemothorax + fracture limb bones	8 (1.10)
Fracture ribs + fracture spine	7 (0.96)
Fracture clavicle	3 (0.41)
Free air under diaphragm	3 (0.41)
Total	**730 (100.00)**

Discussion

Road traffic accident in India is one of the highest, resulting in substantial disability, morbidity, and mortality. Fatal accidents are twenty times more in India as compared to those reported in other parts of the world. Bad driving, alcohol use, bad roads, vehicle defects are frequent factors responsible for RTAs. In the present study, out of 730 victims of RTAs, 82.19% were males and 17.81% were females with a male to female ratio of 4.61:1. Jha G *et al.* (12), Ganveer and Tiwari (13), Khajuria *et al.* (14) and Moharamzad *et al.* (15) also reported similar results in their respective studies.

Most commonly affected patients in the present study were males 296 (49.33%) between 16-30 years. Ganveer and Tiwari (13) found the majority of victims (75%) in the age group of 18-37 years. Khajuria *et al.* (14) observed 53.01% victims of RTA were between 20-40 years of age. Costanzo *et al.* (16) observed that 15-29 years old males accounted for most of the cases. Pande (17) also found males in the age group of 15-40 years were the most affected by trauma.

Most common victims involved in the present study were pedestrians 241 (33.01%), followed by riders and passengers. This is in agreement with previous studies (18),(19),(20),(21).

In the present study, most common site of injury was head 633 (86.71%), followed by chest 174 (23.83%) and abdomen 118 (16.16%). Jha *et al.*(12) reported head injuries in one-third of victims, followed by injuries to the lower limbs and face in

their one year study on 726 victims of RTAs. Singh *et al.* (18) in their study found that when counted together, extremity injuries were present in 78.5%, head in 77.6%, and chest in 44% and abdomen in 31.8%.

According to the severity of head injuries, most of the patients 412 (65.09%) in the present study were having a mild injury (GCS – 13/15 to 15/15), followed by moderate and severe. Xing *et al.* (19) also found the majority of the patients (62%) were having a mild head injury. Dulal and Khadka (20) and Norio and Akihiro (21) reported 84.05% and 72% respectively cases of mild head injuries.

In the present study, intoxication (patient under the influence of alcohol) was present in 176 (24.11%) of patients. Odero *et al* (22) reported the presence of alcohol between 30 to 53% in their study. Guru Raj (23) reported in his study that 29% of nighttime crashes were directly related to alcohol. All these results are in consonance with our study.

The increase in direct or indirect health risk associated with alcohol usage has been well documented in recent years. With the recognition that road safety needs to focus on reducing drinking and driving, many high-income countries have formulated and implemented a number of coordinated, integrated and sustainable programmes based on scientific research (23).

In the present study, only 50 (10.23%) of the road traffic victims were observed to be using safety measures like helmets/seatbelts. Singh *et al.* (18) in their study found that of 104 motorcyclists who met with accidents, only one was wearing a helmet and none of the vehicle occupants had used protective seat belts. Wickram Anayake *et al.* (24) also reported only 11% of the victims were using safety measures.

The most common type of external injury in the present study was lacerated wounds (46.75%), followed by hematomas and abrasions. Singh *et al.* (18) also observed laceration as a most common type of external injury (88%), which is much higher than the findings of the present study.

In the present study, FAST was positive in 110 (15.07%) patients. However, no study in the review was found to have reported FAST as a means of diagnosis of the severity of injuries. In the emergency set-up, FAST is one of the most important investigations to assess the severity of intra-abdominal/intra-thoracic injury in RTA patients. If FAST is negative, then it is presumed that most of the patients will be having no intra-abdominal/intra-thoracic injury. If a patient with FAST positive is hemodynamically unstable, surgery needs to be immediately resorted to. If the patient with FAST positive is hemodynamically stable, he can be observed and managed conservatively. In addition, in such patients CECT of the abdomen should be done to definitely rule out any solid organ injury.

In the present study, most common NCCT head finding was a fracture of the skull and facial bones 241 (38.07%), followed by cerebral contusions 184 (29.07%), SDH 147 (22.22%), SAH 81 (12.79%) and EDH 37 (5.84%). NCCT head is a most useful investigation to assess the severity of traumatic brain injury and to decide whether the patient is to be subjected to surgery or managed conservatively. In the present study, most of the patients showed no abnormality on X-ray findings 263 (36.2%). Most common abnormality seen was fractures of the bones, followed by haemothorax/pneumothorax. In the emergency set-up, X-ray is the basic investigation which is done to access the severity of injuries in a patient of RTA. While reviewing, however, no such study was found, wherein NCCT head findings and X-ray findings were discussed. Unlike the present study, all these studies dealt with the epidemiology of RTA injuries only and did not discuss the investigation part of their respective cases.

In the present study, most of the patients 634 (86.85%) were managed conservatively, only 96 (13.15%) underwent operative management. Jude-Kennedy *et al.* (25) and Rajendra *et al.* (26) also reported that majority of the RTA patients were managed conservatively in their series.

In the present study, 617 (84.52%) patients recovered, 85 (11.64%) expired and 28 (3.83%) were discharged on request. Most of the patients who died were those having a severe head injury (GCS 3/15 – 7/15) and others were those who had polytrauma with irreversible shock. Singh *et al.* (18) found crash injury overhead and neck, immediate hemorrhage, reflex vagal inhibition and shock as causes of death in their RTAs subjects. Jude-Kennedy *et al.* (25) quoted 17.7% as mortality rate in their study on motorcyclists.

Conclusion

Road traffic accidents continue to be a speedily rising problem, causing heavy loss of manpower and resources, along with equivalent drain of potential economic growth, so a multi-dimensional approach is the need of the hour to reduce the burden of the RTA and associated injuries. This includes maintaining existing roads, improving road surfaces, removing obstacles, constructing proper signs and widening of the narrow sections of the roads. Hospitals along the highways should be equipped with the experienced surgical team. Trauma centers with the integrated facility of surgical, orthopedic, neurosurgical and anesthetic experts with modern investigative procedures like USG and CT scan and facility of blood bank is the best solution for RTA victims who are severely injured. Modern rehabilitation measures for the injured victims form an essential part of casualty service.

Conflict of interest

Nil

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