

## EPIDEMIOLOGICAL STUDY OF TRAUMA IN A TERTIARY CARE CENTRE IN NORTHWEST INDIA

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### Abstract

**Objective:** Traumatic injuries are a matter of concern worldwide. However, the rapidly changing socio economical dynamics in a developing country like India deeply influence the epidemiology behind trauma. The aim of this study was to document and analyze the epidemiological parameters and characteristics behind trauma victims admitted to our tertiary care centre.

**Methods:** The observational study was carried out over a period of one year (January 2019 to December 2019) enrolling a total of 300 trauma patients. The age, sex, locality, delay in hospitalization, mechanism of injury, sites of injury and outcomes were documented.

**Results:** Injuries occurred predominantly in the 20-40 age group with males being the chief victims. There was a considerable amount of delay in hospitalization ranging from one hour to more than 24 hours while only 7 patients arrived to the emergency within one hour of trauma. Vehicular trauma (54%) was the most common mechanism of injury. Injuries to the extremities (38.6%) and head (28.6%) were the most common sites. A considerable number of patients (45.3%) required care in the intensive care unit. A total of 172 patients required surgical interventions of various kinds and there was a total mortality rate of 6%. Amongst the polytrauma cases, 54 patients (81.8%) required ICU admission, 42 patients (63.6%) required surgical intervention and 6 patients (9.1%) died after admission.

**Conclusion:** The results of this study highlight some of the problems with our existing infrastructure bringing to light the need for stricter enforcement of traffic safety laws and improvement of infrastructure particularly the roadways in rural areas as well as the referral systems. Vehicular trauma should be seen as a public health problem and appropriate interventions should be implemented.

**Keywords:** Trauma, Road Traffic Accidents, Epidemiology, Head injuries

### Introduction

Traumatic injuries are a rapidly growing public health concern in developing countries owing to major strides in industrialization, urbanization and motorization. These are now a major cause of mortality and morbidity worldwide and place an immense strain on the healthcare system draining a significant number of resources often overwhelming tertiary care centres [1]. They also result in considerable economic losses not just to individuals and families but to nations as a whole [2]. Amongst traumatic injuries, road traffic accidents (RTAs) outnumber all other causes and are a leading cause of death and injury worldwide killing more than 1.35 million globally with 90% of these casualties in developing countries as per the Global status report on Road Safety 2018. Accident-related deaths are the eighth leading cause of death worldwide and leading cause of death in adults in the age 15-29 as per the WHO [3]. In India, 467044 RTAs were reported in 2018, killing 151417 people. This accounts for almost 11% of the accident-related deaths in the world. The estimated socio-economic cost of RTAs in India in 2018 was 1.47 trillion rupees equivalent to 0.77% of the nations gross domestic product (GDP). In comparison, the United States

reported approximately 2.2 million RTAs in 2019, killing only 37461 persons [4].

The epidemiological characteristics of trauma patients as well as injuries sustained is not well understood owing to several constraints such as under reporting of cases to the authorities by victims, lack of thorough registries and unavailability of good quality information due to poor documentation by individuals not trained to gather trauma related data for research purposes. The objective of this study is to study the epidemiology of trauma in a tertiary care centre in northwest India.

### Materials and methods

#### Study Setting

Data was collected from 300 patients who were admitted from the casualty at our tertiary centre from January 2019 to December 2019. Patients who presented more than 48 hours after initial trauma were not included. Patients that suffered minor trauma not requiring admission and patients that refused admission were also excluded. All patients provided

written informed consent prior to their inclusion in the study. Ethical committee approval was taken for the study.

### Data Analysis

The data was analysed using MS Excel Sheets.

On admission to the emergency department, all resuscitative measures consistent with the ATLS 10<sup>th</sup> edition guidelines were implemented. A detailed history and physical examination along with time of injury, time of presentation, mode of injury and treatment given was documented by the on-duty doctor.

### Results

A total of 300 patients were admitted from emergency during the 12-month study duration. Of these, 126 patients (42%) were referred from other health care facilities and 174 patients (58%) were direct admissions. Roughly three-fourths of the study population were male (77.3%). Patients ranged from three years to 88 years of age with the highest number of cases ranging 20-39 years (40%) followed by 40-59 years (26%) with a mean age of  $38.7 \pm 20$  years (Table 1). Patients from a rural background formed a slight majority (52%). There was a delay in hospitalisation of 6-12 hours in 115 patients (38.3%) of which 24 patients were referred from other centres. Only 7 patients (2.3%) presented to the emergency department within 1 hour of injury (Table 2).

Vehicular trauma was the predominant mode of injury accounting for 162 admissions (54%) followed by non-vehicular accidents (7.3%) and assault (5.6%) after

excluding trivial trauma (26%) (Table 3). A large proportion of patients presented with injuries only to the extremities accounting for 116 admissions (38.6%) and injuries to the head accounting for 86 admissions (28.6%) with 66 patients (22%) suffering multiple concomitant injuries to multiple organ systems (Table 4).

Primary admission was predominantly under the neurosurgery department (45.3%) followed by the orthopaedic department (33.3%). A total of 136 patients (45%) required intensive care unit (ICU) admission (Table 5).

Among the 300 trauma patients, a total number of 172 patients (57.3%) required surgical intervention with the large majority being performed by the orthopaedic (n=80, 46.5%) and neurosurgical teams (n=59, 34.3%), out of which a total of 10 (3.3%) patients died even after intervention. Also, a total number of 8 patients (2.7%) died before any surgical or procedural intervention could be performed. Thus, the total mortality was 18 patients out of 300 amounting to approximately 6%.

Out of the 66 patients that had suffered polytrauma, 54 patients (81.8%) required ICU admission, 42 patients (63.6%) required some form of surgical intervention and 6 patients (9.1%) died after admission (Table 6).

Out of 300, 244 patients (81.3%) survived and were discharged in a stable condition. 38 patients (12.7%) took leave against medical advice (LAMA) and 18 patients (6%) died (Table 7).

**Table 1: patient distribution according to age**

Age distribution	No. of Patients	Percentage
0-9	10	3.3
10-19	36	12
20-39	120	40
40-59	78	25.9
60-89	56	18.6
TOTAL	300	100

**Table 2: Delay in Hospitalisation at our centre**

Time (in hours)	No. of Patients	Percentage	No. of referred patients
<1	7	2.3	0
1-6	78	26	42
6-12	115	38.3	24
12-18	77	25.6	10
18-24	16	5.3	8
>24	7	2.3	42
Total	300	100	126

**Table 3: Mechanism of injury**

Mechanism	No. Of patients	Percentage
Vehicular	162	54
Non-vehicular accidents	22	7.3
Assault	17	5.6
Trivial	78	26
Others	21	7
<b>Total</b>	<b>300</b>	<b>100</b>

**Table 4: Site of injury**

Site	No. Of Patients	Percentage
Head and neck	86	28.6
Extremities	116	38.7
Torso	28	9.3
Pelvis	4	1.3
Multiple	66	22
<b>Total</b>	<b>300</b>	<b>100</b>

**Table 5: Primary admission under department**

Department	No. Of Patients	Percentage
Neurosurgery	138	46
Orthopedics	100	33.3
General Surgery	24	8
Plastic Surgery	22	7.3
Pediatrics	6	2
Urology	2	0.7
Cardiothoracic and Vascular Surgery	8	2.7
<b>Total</b>	<b>300</b>	<b>100</b>

**Table 6: Outcome**

Outcome	No. Of Patients	Percentage
Survival	244	81.3
LAMA	38	12.7
Mortality	18	6
<b>Total</b>	<b>300</b>	<b>100</b>

**Table 7: polytrauma cases**

Multiple injury (out of 66)	No of patients	Percentage
ICU Requirement	54	81.8
Intervention done	42	63.6
Death	6	9.1

## Discussion

India is a developing nation which is making rapid strides in economic growth. This has led to a growing number of automobiles on the road owing to a growing middle class and a young population [5]. This is probably why the majority of patients admitted in our centre had suffered vehicular trauma.

In developing nations, RTAs have been seen to more commonly affect the younger age groups. In our study, the highest number of patients admitted were in the 20-29 age group with a mean age of  $38.7 \pm 20$ . Injuries were also seen to be suffered by males predominantly. These findings are consistent with studies from developing nations where younger males have been seen to suffer from traumatic injuries the most [1,6,7,8,9]. This may be due to the fact that young males are the principal earners of a household in developing nations and are subsequently more exposed. Young adult males are also key contributors to the rapid economic growth of India and other developing nations and a higher number of traumatic injuries to this key demographic results in decreased household income as well as loss to the nations GDP.

Our study showed that despite our institution being set in an urban area, admissions from rural areas were slightly more than those from urban areas. This may be due to poor infrastructure in the far flung interiors where despite low traffic volume, the unpaved roads lead to a higher rate of accidents. Also, due to job opportunities presenting in urban areas there is a large daily influx of workers from the peripheries which combined with the lack of proper transportation services may lead to more RTA in rural areas [9]. This brings to light the fact that the rapid rate of growth in the nation is not being matched by the rate of development of infrastructure especially in the field of public transportation and road safety measures.

A delay in hospitalisation was noted in a large majority of patients with the highest number of patients being admitted 6-12 hours post injury. A higher mortality rate was also noted in patients presenting 6 hours after trauma. This time lag is an alarming finding as it sheds light on the shortcomings of our existing emergency services and referral system. Cowley, in 1975, stressed the importance of the golden hour of resuscitation where in the early resuscitation of the patient post trauma led to better outcomes [10,11]. Post traumatic mortality follows the trimodal distribution of death which implies that death after trauma occurs in three peaks. The first peak is immediately after injury within seconds to minutes. The second peak is within minutes to several hours. The third peak occurs several days to hours after injury [12]. Prevention is key to lowering the first peak. It was observed in our study that quite a few patients being referred from primary and secondary care centres were not adequately resuscitated and were referred without proper documentation of history, physical examination and treatment received. Thus, a well drilled emergency response setup with well-equipped ambulances and rapid assessment and resuscitation

at primary and secondary care centres along with referral is needed to lower the second peak. The optimum implementation of emergency care particularly in rural areas is lacking and this contributed to a delay in presentation of patients to our centre.

Our study shows that orthopaedic injuries to the extremities as well as traumatic brain injuries were the chief causes of admission which explain why majority patients were admitted under the neurosurgical and orthopaedic teams post emergency resuscitative care. Majority of the patients (75.3%) admitted with head injuries due to vehicular accidents were noted to have been riding two-wheelers. A large majority of patients from rural areas were also riding two wheelers. Most of these patients were documented to have been not wearing safety helmets at the time of accident. This reinforces the need to strictly enforce safety helmet laws at a ground level for two-wheeler riders [13].

A large number of patients required some form of surgical or procedural intervention (60.6%). There was a total mortality rate of approximately six percent which highlights the significant step-up in standard of care received at a tertiary care centre. Further reduction in mortality rates could occur if patients are referred from primary and secondary care centres after being adequately resuscitated in a short amount of time.

A considerable number of patients were admitted in the ICU (45%). A much larger number of polytrauma patients required intensive care in an ICU (73%). Polytrauma has been defined as injury suffered to multiple organ systems causing physiological compromise and potential dysfunction of uninjured organs [14]. A much higher intervention rate (63%) and mortality rate (9.1%) were seen in polytrauma cases. Out of the 66 patients of polytrauma, 53 patients presented to the emergency department after 6 hours of sustaining trauma. The reason behind the higher mortality rate could be attributed to the severity of trauma and damage to multiple organ systems. Out of the 6 mortalities, 4 patients died before planned intervention could be carried out. This reinforces the necessity to revamp the emergency services in the peripheries so serious patients of trauma can be adequately resuscitated and referred to trauma centres in a timely manner.

## Conclusion

The most common cause of admission due to trauma is RTA with young adult males being the chief victims. There was a delay in presentation to our institute in the majority of patients highlighting the need for enhanced response and better referral systems. Injuries to the extremities and head were the most common presentation. The severity of head injuries can be lowered by implementing road safety measures as well as safety helmet laws strictly. Higher mortality rates are seen in patients of polytrauma stressing the need for timely intervention as well as establishment of dedicated trauma centres.

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