

Head and Neck Trauma: Profile and Factors Associated with Severe Head Injury

Kundavaram Paul Prabhakar Abhilash, Sisha Liz Abraham¹, Darpanarayan Hazra, Ankita Chowdary Nekkanti

Department of Emergency Medicine, Christian Medical College, Vellore, Tamil Nadu,

¹Department of Surgical Oncology, Cochin Cancer Research Center, Kochi, Kerala, India

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INTRODUCTION

Trauma is a significant cause of morbidity and mortality in both the developing and the developed countries. Road traffic accidents (RTA), fall from height or on level ground, occupational injuries, and assault are the usual causes of trauma with geographical variation. RTA s are projected to be the fifth leading cause of death worldwide by the year 2030, according to the World Health Organization (WHO).^[1,2] This is perhaps a result of urbanization across in many developing countries and rapid increase in the use of automobile for travel. In India, upgrading of national highways and increase in expressways across the length and breadth of our country also perhaps has contributed to the increasing in RTAs.

ABSTRACT

Background: Head and neck trauma is an increasing cause of morbidity and mortality in India. The mode of trauma has varies with geographical progress and it is important to understand the factors associated with severe head injury among this cohort. **Methods:** This was a retrospective observational study of all adult trauma patients with head and neck trauma presenting to our emergency department (ED). Details of the incident, injuries and outcome were analyzed. **Results:** During the 3-month study, the ED attended to 16,169 patients with 2022 being trauma victims. Among them, 51.4 3% ($n = 835$) adults who sustained head, face or neck trauma and hence were included in the final analysis. Overall, RTA s were the predominant mode of injury (81.2% ($n = 678$), followed by fall on level ground (6.5%; $n = 54$), fall from height (5.1%; $n = 43$) and assault (3.7%; $n = 31$). A history of consuming alcohol prior to the incident was obtained in 16.2% (135) of the patients. Head, face, and neck injuries were seen in 74.9% ($n = 626$), 64.1% ($n = 536$), and 4.9% ($n = 41$) of patients respectively. Bivariate analysis showed male sex (90.3% vs. 76.8%; unadjusted odds ratio [OR]: 2.81, 95% confidence intervals [CI]: 1.19–6.64; $P = 0.018$) and pedestrian injuries (19.4% vs. 8.5%; unadjusted OR: 2.57, 95% CI: 1.30–5.07; $P = 0.006$) to have a statistically significant association with sustaining severe head injury. **Conclusion:** Head and neck trauma comprises a significant proportion of patients with trauma with RTA and falls being the most common causes. Among patients with head and neck trauma, males and pedestrians have an increased odds of sustaining severe head injury (Glasgow Coma Scale ≤ 8).

KEYWORDS: Accidents, emergency department, head and neck, head injury, trauma

Majority of trauma-deaths occur in the “golden hour” which refers to the prehospital care time, as a result of insufficient prehospital care where the first 60 min after trauma.^[2,3] Head and neck injuries are a major cause of concern as they are associated with significant morbidity and mortality.^[4-6] Head and neck injuries range from innocuous abrasions/lacerations to severe airway

Address for correspondence: Dr. Kundavaram Paul Prabhakar Abhilash,
Department of Emergency Medicine, Christian Medical College,
Vellore - 632 004, Tamil Nadu, India.
E-mail: kppabhilash@gmail.com

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compromise and traumatic brain injuries (TBI). This is more concerning as the mean age of trauma victims usually falls in the highly productive middle age group.^[5,7] This not only leaves long-lasting scars on the entire family of the victims but also cripples the economy of the nation. It is therefore important to understand the common modes of injury resulting in head and neck trauma and factors associated with the severity of head injury. We, therefore, conducted this study to determine the profile and severity of head, face, and neck injuries among trauma victims.

METHODOLOGY

Study design

This was a subanalysis of a large retrospective study on trauma victims conducted by Abhilash *et al.* between October 2014 and December 2014.^[7]

Study setting

The study was conducted in the emergency department (ED) of a large tertiary care hospital in South India. Our ED is a 50-bed department and usually tends to about 75,000 patients per year.

Participants

All trauma victims who presented during the study were screened.

Inclusion criteria

We included patients who presented to our ED with head and neck trauma due to RTA, fall from height or fall on level ground, assault injuries, workplace injuries, and other modes of trauma. Superficial lacerations, abrasions, and minor soft tissue injuries were considered superficial injuries while penetrating injuries, fractures, dislocations, TBIs were classified as deep injuries.

Exclusion criteria

Patients who were brought dead to the ED following trauma and charts with missing data were excluded.

Variables

We collected data of head and neck trauma patients from our hospital's electronic database. The following data were extracted: demographic data, mode of injury, triage priority level, and injuries sustained. Triage of trauma victims was done at ED arrival and is summarized as follows:

- Triage priority I: Trauma victims with compromised airway, breathing or circulation and/or with Glasgow Coma Scale (GCS) ≤ 8
- Triage priority II: Trauma victims with a stable airway, breathing, and circulation. These included patients with extremity injuries, stable thoracoabdominal injuries, and mild-to-moderate head injury
- Triage priority III: Trauma victims with minor injuries without any hemodynamic instability.

Bias

This was a retrospective study, and therefore, relied on the ED team for accurate record keeping.

Statistical analysis

Data were analyzed the data by Statistical Package for Social Sciences for Windows (SPSS Inc. Released 20013, version 21.0. Armonk, New York, USA). Continuous variables were expressed as mean with standard deviation while nominal variables were expressed as numbers and percentages. Dichotomous variables were compared using Chi-square test. The factors associated with severe head injury (GCS ≤ 8) among patients with head and neck trauma were determined by bivariate analysis and their 95% confidence intervals (CI) calculated. A two-sided $P < 0.05$ was considered to be statistically significant.

Ethical considerations

We obtained approval by the Institutional Review Board and Ethics Committee (IRB Min. No. 9102 dated 12.02.2015) prior to the commencement of this study. Patient confidentiality was maintained using unique identifiers and password-protected data entry software accessible only by the primary investigators.

RESULTS

During the 3-month study, the ED attended to 16,169 patients with 2022 being trauma victims including 1624 (80.3%) adults. Among them, 51.4 3% ($n = 835$) sustained head, face or neck trauma and hence were included in the final analysis [Figure 1].

Baseline characteristics

The mean age of our cohort was 38.9 (16.69) years with three-fourths (77.8; $n = 650$) being males. Due to the tertiary nature of our ED, less than half of the patients (46.4%; $n = 388$) presented to our ED directly while 53.6% (447) were referred after being administered first aid at primary or secondary level hospitals. A history of consuming alcohol prior to the incident was obtained in 16.2% (135) of the patients. The baseline characteristics are shown in Table 1.

Mode and severity of trauma

Overall, RTA s were the predominant mode of injury (81.2% ($n = 678$), followed by fall on level ground (6.5%; $n = 54$), fall from height (5.1%; $n = 43$) and assault (3.7%; $n = 31$) [Figure 1]. Head, face, and neck injuries were seen in 74.9% ($n = 626$), 64.1% ($n = 536$), and 4.9% ($n = 41$) of patients respectively. Other associated injuries among our cohort included extremity injuries (59.6%; $n = 498$), thoracic (19.2%; $n = 160$) and abdomino-pelvic

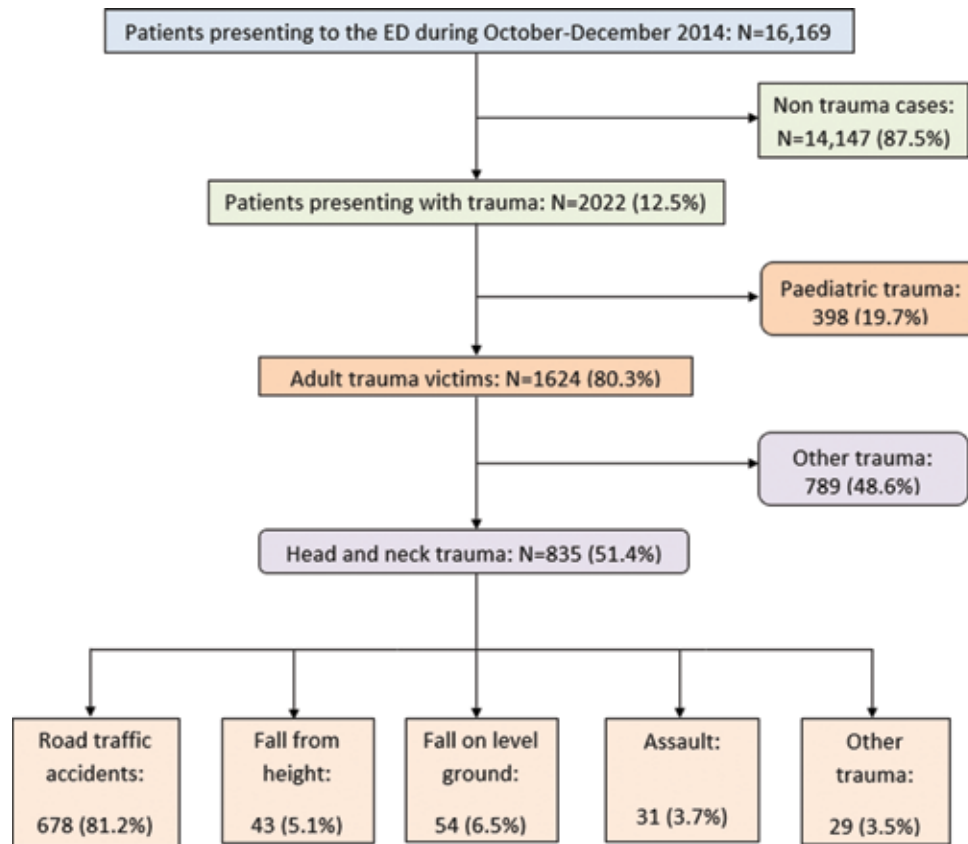


Figure 1: STROBE diagram

Table 1: Baseline characteristics (n=835)

Characteristic	n (%)
Mean age in years (SD)	38.9 (16.69)
Age distribution (years)	
18-40	501 (60)
41-59	226 (27)
≥60	108 (13)
Sex distribution	
Males	650 (77.8)
Females	185 (22.2)
Triage priority level	
Priority 1	181 (21.7)
Priority 2	510 (61)
Priority 3	144 (17.3)
Preadmission characteristics	
Direct admissions	388 (46.4)
Referred from elsewhere	447 (53.6)
History of alcohol consumption	135 (16.2)

injuries (10.3%; $n = 86$). Severe head injury (GCS ≤ 8) was sustained by 7.4% ($n = 62$) of our study cohort [Table 2]. Details of the mode of trauma of head, face and neck injuries is shown in Table 3.

Factors associated with severe head injury

We performed a bivariate analysis of factors associated with severe head injury (GCS ≤ 8) among our study

cohort [Table 4]. Male sex (90.3% versus 76.8%; unadjusted odds ratio [OR]: 2.81, 95% CI: 1.19–6.64; $P = 0.018$) and pedestrian injuries (19.4% versus 8.5%; unadjusted OR: 2.57, 95% CI: 1.30–5.07; $P = 0.006$) were found to have a statistically significant chance of sustaining severe head injury. The ED mortality rate among our study cohort was 0.47% ($n = 4$).

DISCUSSION

Our study of a cohort of head and neck trauma victims showed the profile, common modes of injury, and factors associated with the severity of TBI. The head and region is an extremely vital area that includes the brain, sense organs, large vessels, and the airway. Hence, we focused our study on a broad epidemiological profile of trauma to this vital region of the body.

The mean age of trauma victims in our study was 38.9 years, 9 years higher than a similar but large cohort of patients studied in the United States in 2011.^[8] We noticed a male preponderance in our study, a consistent factor in all trauma profiles.^[7,9,10] This is due to the fact that in most developing countries like India, males are predominantly engaged in outdoor activities and travel in automobiles and hence are more prone to injuries.

RTAs was the predominant mode of trauma resulting in head and neck injuries. This finding of ours is consistent with other studies from India and abroad on the mode of trauma.^[8-11] According to the WHO report on road safety, more than 1.2 million people die on the roads every year with a further 50 million being injured.^[1] These figures are alarming and calls for the authorities

in both the developing and the developed Worlds to wake up and take cognizance of the impact of RTAs. Beyond the enormous physical damage, they cause, RTAs, especially if it involves breadwinners, can drive families into poverty as crash survivors and their family often struggle to deal with long term morbidity and consequences of loss of livelihood. RTAs also place an enormous burden on the country's health system, with many of them ill-equipped to handle the load.

The mode of trauma is an important factor in predicting the severity of injuries. In our study, 2-wheeler incidents comprised two-thirds of RTAs causing head and neck trauma. Poor compliance to helmet use and to road regulations in India are worrying factors. We urge law makers, police, and other government authorities to strictly enforce the use of helmets on the road to decrease the incidence of TBI. Unsafe and poorly maintained roads are other grave concerns that contribute to increased incidents of RTA and hence need to be addressed on a priority basis by the concerned authorities. Unlike 2 wheelers, 4-wheel vehicles offer reasonable protection to its occupants from mild to moderate impacts on the road. In contrast, pedestrians are directly exposed to the elements with

Table 2: Examination findings at presentation (n=835)

Characteristic	n (%)
Injury pattern	
Head injury	626 (74.9)
Facial injury	536 (64.1)
Neck injury	41 (4.9)
Associated injuries	
Thoracic injuries	160 (19.2)
Abdomen and pelvis injuries	86 (10.3)
Extremity injuries	498 (59.6)
Spine injuries	27 (3.2)
Examination findings	
Mild head injury (GCS: 14, 15)	695 (83.3)
Moderate head injury (GCS: 9-13)	78 (9.3)
Severe head injury (GCS: ≤8)	62 (7.4)
Hypotension (SBP: <100 mm Hg)	68 (8.1)

GCS: Glasgow Coma Scale, SBP: Systolic blood pressure

Table 3: Mode of trauma of head, face and neck injuries

Mode of injury	Head injury (n=626), n (%)	Facial injuries (n=536), n (%)	Neck injuries (n=41), n (%)
RTA	519 (82.8)	459 (85.6)	20 (48.8)
Fall from height	33 (5.3)	23 (4.3)	3 (7.3)
Fall on level ground	38 (6.1)	27 (5)	5 (12.2)
Assault	23 (3.7)	14 (2.7)	8 (19.5)
Work place related	3 (0.5)	5 (0.9)	2 (4.8)
Other modes	10 (1.6)	8 (1.5)	3 (7.3)
Mode of RTA	N=519	N=459	N=20
2-wheeler	381 (73.4)	344 (74.9)	13 (65)
4-wheeler	47 (9)	49 (10.7)	3 (15)
Pedestrian	65 (12.5)	46 (10)	3 (15)
Auto	20 (3.8)	17 (3.7)	0
Other vehicular accidents	6 (1.1)	3 (0.7)	1 (5)

RTAs: Road traffic accidents

Table 4: Bivariate analysis of predictors of severe head injury (Glasgow Coma Scale ≤8) among patients with head and neck trauma

Variable	Severe head injury (n=62), n (%)	Nonsevere/no head injury (n=773), n (%)	Unadjusted OR	95% CI	P
Age <40 years	35 (56.5)	466 (60.3)	1.17	0.69-1.97	0.55
Male sex	56 (90.3)	594 (76.8)	2.81	1.19-6.64	0.018
2-wheeler incident	42 (67.7)	456 (59)	1.46	0.84-2.53	0.18
4-wheeler incident	1 (1.6)	68 (8.8)	5.88	0.80-43.11	0.08
Pedestrian injury	12 (19.4)	66 (8.5)	2.57	1.30-5.07	0.006
Fall from height	3 (4.8)	40 (5.2)	1.07	0.32-3.57	0.91
Alcohol consumption	13 (21)	122 (15.8)	0.71	0.37-1.34	0.29

OR: Odds ratio, CI: Confidence interval

little protective gear and hence more prone for severe injuries.^[12-14] In our study, we found pedestrians to have 2.57 times increased risk of sustaining severe head injury compared to other modes of trauma. Brainard *et al.* reported increased likelihood of mortality with increasing age of pedestrians.^[12]

Falls on level ground and from height comprised a tenth of the mode of injuries in our cohort, which is similar to findings of other studies related to trauma.^[9,11] Teo *et al.* described the characteristics of falls-related TBI in the elderly and it to be associated with significant functional decline, requiring recurrent admissions, thus increasing the burden on already stretched health care systems.^[15] Similar revisit rates for TBIs were described by Hsia *et al.* and Taylor *et al.*, thus highlighting the gravity of the long-term consequences of head and neck trauma.^[16,17]

Alcohol is a perennial evil that significantly impacts vigilance and concentration of motorists and is known to be a significant factor in 15%–30% of RTA s.^[18,19] In our study too, a significant percentage of people (16.2%) gave a history of consumption of alcohol prior to the incident and hence contributed not only to their injuries but also perhaps caused significant harm to other vehicular passengers and pedestrians. This again calls for strict law enforcement to decrease the incidence of alcohol-related trauma incidents.

Our study highlights the burden of head and neck trauma in the ED. More than half of our patients were referred after receiving first aid from local physicians and primary/secondary health centers. This fact emphasizes the importance of all primary and secondary level care physicians being trained in the acute management of trauma and have well-equipped medical centres to provide optimal care to trauma victims, as their early intervention could potentially save many lives.

Strengths and limitations

A strength of our study is the large sample size, thus adding substantial weightage to existing literature on head and neck trauma. However, our study has certain limitations. Being a single tertiary care hospital study, there may have been a referral pattern and patient selection bias. Although a positive history of alcohol consumption was obtained in a significant proportion of patients, it could not be corroborated with blood alcohol levels as the test was not available in our ED in 2014. Nonetheless, our study provides an insight into the profile, mode, and factors associated with severe head injury among a cohort of patients with head and neck trauma.

CONCLUSION

Head and neck trauma comprises a significant proportion of patients with trauma with RTA and falls being the most common causes. Among patients with head and neck trauma, males and pedestrians have an increased odds of sustaining severe head injury (GCS ≤ 8).

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Conflicts of interest

There are no conflicts of interest.

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