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Original Article

Demographic profile, clinical features, imaging and outcomes in patients with traumatic brain injury presenting to emergency room

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Abstract

Background: Traumatic brain injury (TBI) accounts for one-quarter to one-third of all accidental deaths, and for two-thirds of trauma deaths in hospitals. Head trauma is the cause of death in more than 50% of trauma patients which made me undertake this study.

Methods: A prospective observational study was conducted in a tertiary care teaching hospital, in South India during March 2016–July 2017. Demographic details, mode of injury, clinical features, radiological findings and outcomes were studied.

Results: Of the 247 patients studied, majority of TBIs were in the age group of 21–40 years with male preponderance of 2.67:1. The most common mechanism of injury was road traffic accident (65.5%). In the present study, patients were classified by Glasgow Coma Scale (GCS) as mild TBI 129 (52.23%) patients, moderate 71 (28.74%) and severe 47 (19.03%). The common clinical presentation includes loss of consciousness (LOC) 65%, vomiting 61%, ear, nose and throat bleed 17% and seizures 8.9%. Computed tomography scan revealed contusions 42%, fractures 21%, subdural haematoma 21% and extradural haematoma 16%. Seventy-nine per cent patients were managed conservatively and 21% managed surgically. Mean hospital stay was 4.97 ± 5.4 days. The overall mortality was 19 (7.7%), and 209 patients were discharged in healthy condition.

Conclusions: Young male adults presenting with LOC and vomiting were the common presenting features. Patients with low GCS (severe TBI) have very poor outcome. Patients with higher Rotterdam score and severe TBI had high mortality.

Keywords: Clinical profile, Glasgow Coma Scale, Rotterdam score, Traumatic brain injury

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INTRODUCTION

Traumatic brain injury (TBI), otherwise known as acquired brain injury or head injury, causes substantial disability and mortality.[1] In developing countries like India, accident rates in general and TBI in particular are showing increasing trends. Head injuries account for one-quarter to one-third of all accidental deaths, and for two-thirds of trauma deaths in hospitals.[2] TBI is a common and potentially devastating

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clinical problem imparting substantial financial burden on resources.[2] Head trauma is the cause of death in more than 50% of patients involved in trauma.[3] Worldwide, it is a major public health problem. By the year 2020, it is predicted to surpass many diseases as a major cause of death and disability.[4] In India, about 1.5–2 million persons are injured and more than a million succumb to death every year. Road traffic accidents (RTAs) are the leading cause (60%) of TBIs followed by falls (20%–25%) and violence (10%). Alcohol involvement is known to be one of the confounding factors among 15%–20% of TBIs at the time of injury.[5]

The quality of pre-hospital and emergency room (ER) care is particularly an important determinant of outcome in trauma patients. There are numerous factors that can judge the outcome in head injury patients, namely age, sex, severity of injury and intracranial pathology. In view of increasing incidences regarding TBI particularly in developing countries like India and in particular south India, there are fewer studies reporting their scenarios in TBI which made us to undertake this study.

The present study was designed to study the demographic profile, clinical characteristics, imaging and in-hospital outcome in patients presenting with TBI.

MATERIAL AND METHODS

A prospective, observational study was conducted after obtaining regulatory clearances from the Thesis Protocol Approval Committee and Institutional Ethics committee. All patients with TBI who were presented to the ER in a tertiary care teaching hospital, in South India during March 2016–July 2017 were included in the study. Exclusion criteria for this study include all patients with TBI who had been operated elsewhere and referred to our hospital only for additional management; patients or patient attendants who were not willing to participate in the study; patients with TBI who were brain dead on arrival; patients with major polytrauma (chest injury and blunt trauma abdomen) and patients under the age of 12 years. Written informed consent was taken from all study patients or responsible attendants in case patients who are unconscious.

After receiving the patients in ER, all patients were immediately taken to resuscitation room. Thorough primary and secondary survey was done in all study patients. All the necessary haematological and radiological investigations required for the patient as per the institute protocol were done, and results were noted. After initial stabilisation and observation in ER, all study patients were shifted to neurosurgery intensive care unit as per ER protocol. Based on clinical features and investigation findings, all patients were managed either medically or surgically (burr hole/craniotomy/craniectomy) as per the standard institute protocol. All the patients were followed-up until discharge from hospital or in-hospital death.

The following parameters were recorded from all the patients: age; gender; mechanism of injury; presenting features; influence of alcohol; initial Glasgow Coma Scale (GCS) score;[6] imaging findings; Rotterdam computed tomography (CT) score;[7] mode of management; Glasgow Outcome Score (GOS),[8] outcomes either discharge from the hospital or in-hospital death and duration of hospital stay.

Statistical analysis

Data were recorded on a pre-designed structured pro forma and managed using Microsoft Excel 2007 (Microsoft Corp, Redmond, WA). Data were double-checked for accuracy. Descriptive statistical data were presented as mean ± standard deviation or median (interquartile range) for continuous variables, and as percentages for categorical variables. 'Worst case scenario' analysis was undertaken where all patients who have gone LAMA will be considered to have died.[9]

RESULTS

Two hundred and forty seven patients were included in the study [Figure 1]. Their mean age was 38 ± 14.4 years. The majority of TBIs were in the age group of 21–40 years (47.4%), followed by 41–60 years (35.6%),

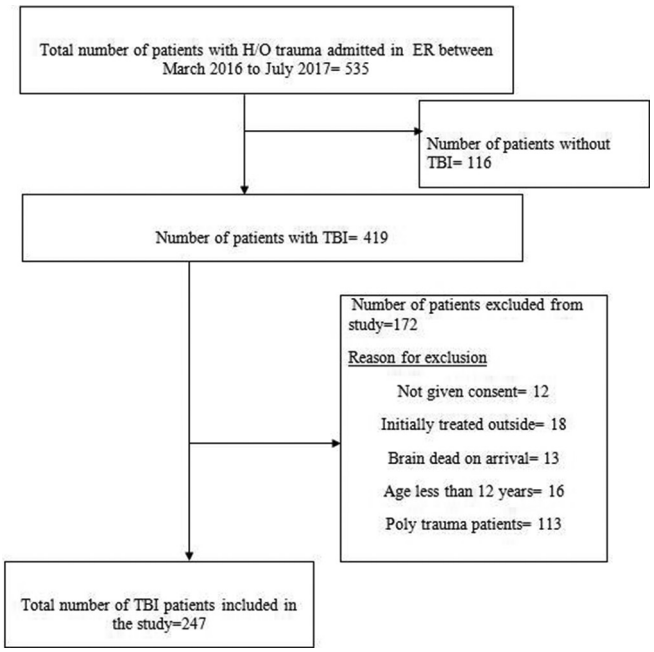

Figure 1: Study plan. H/O = History of; ER = Emergency room; TBI = Traumatic brain injury

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0–20 years (11.3%), 61–80 years (5.3%) and 81–100 years (0.4%) [Table 1]. Of 247 patients, 179 were males (72.3%; M:F=2.7:1).

Table 1: Age-wise distribution

Age (years)	No. (%)
0-20	28 (11.3)
21-40	117 (47.4)
41-60	88 (35.6)
61-80	13 (5.3)
81-100	1 (0.40)

Overall, the leading mechanism for all TBI was road traffic injuries (96.8%; n = 239) followed by assault (1.6%; n = 4) and others (1.62%; n = 4). The leading cause of road traffic injury was motorcycle accidents (62.35%; n = 154) followed by pedestrians (19.84%; n = 49) and car accidents (14.57%; n = 36).

The mean GCS at presentation was 11.9 ± 4.1 (range 3–15). In the present study, patients were classified by GCS as mild TBI in 129 (52.2%) patients; moderate in 71 (28.7%) and severe in 47 (19.0%) patients. In our study, 15% (n = 37) of patients had alcohol consumption before TBI, and only males are involved with an alcohol-related injury.

Patients history analysis and clinical examination revealed that 161 (65%) patients experienced loss of consciousness (LOC); 150 (61%) had one or more episodes of vomiting and 41 (17%) patients presented with bleeding from ear, nose or throat. Seizures were noted in 22 (8.9%) patients.

Regarding CT findings [Figure 2], contusions (40.1%; n = 99), fractures (21.1%; n = 52) and subdural haematoma (SDH) (21.1%; n = 52) were the most common findings followed by extradural haematoma (EDH) (16.2%; n = 40), pneumocephalus (10.1%; n = 25) and subarachnoid haemorrhage (SAH) (7.7%; n = 19).

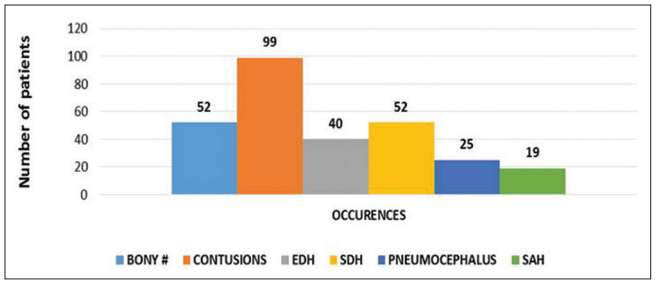

Figure 2: CT findings
CT = Computed tomography; # = Fracture; EDH = extradural haemorrhage; SDH = Subdural haemorrhage; SAH = Subarachnoid haemorrhage

In this study, of 247, 79% (n = 196) patients were managed conservatively while 21% (n = 51) patients were managed surgically. In cases with mild TBI, majority, i.e., 93% (n = 120) were managed conservatively and only 7% (n = 9) were treated surgically. In cases with moderate TBI, 64.8% (n = 46) were managed conservatively and remaining 35.2% (n = 25) cases were treated surgically. In severe TBI cases, 63.8% (n = 30) were managed conservatively and remaining 36.2% (n = 17) were treated surgically [Figure 3].

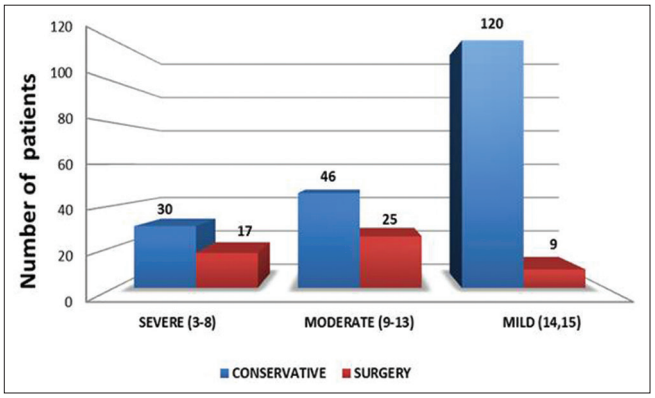

Figure 3: Treatment categorisation according to Glasgow Coma Score

The mortality in the patient with Rotterdam Scores 1 and 2 is 0%, for Score 3 was 9.67%, for Score 4 was 29.4%, for Score 5 was 63.6% and for Score 6 was 100% [Table 2]. This proves that higher Rotterdam score in patients with TBI had added risk of mortality.

Table 2: Relationship between Rotterdam score and mortality

Rotterdam score	Mortality		Mortality (%)
	No	Yes	
1	12	0	0.00
2	169	0	0.00
3	31	3	10
4	12	5	29.4
5	4	7	63.6
6	0	4	100

The GOS [Figure 4] applies to patients with brain damage allowing the objective assessment of their recovery in five

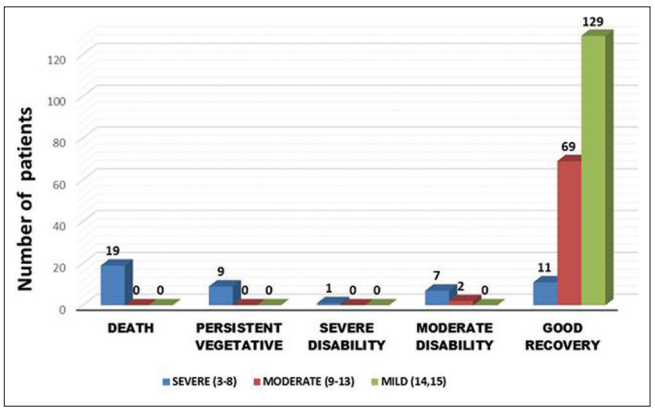

Figure 4: Glasgow Outcome Scale of the TBI patients.
TBI = Traumatic brain injury

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categories at the time of discharge, and categories include death (7.7%), persistently vegetative (3.6%), severely disability (0.4%), moderately disability (3.6%) and low disability (84.6%). The overall mortality was 19 (7.7%), and 209 patients were discharged in healthy condition. The average duration of stay for the patients presenting with TBI was 5 days.

DISCUSSION

India being one of the developing nations in the world with a high population density, the road traffic incidents are showing increasing trend.[10] About 10% of worldwide RTA fatalities were accounted to India. Head injury was defined as 'a morbid state, produced by mechanical forces resulting in gross or subtle structural changes in the scalp, skull and/or the contents of the skull'.[11] Till date, TBI remains the leading cause of death and severe disability in young adults which contributes to significant traumatic mortality and morbidity.[12,13] In a large study of patients involved in trauma, it was found that the presence of head injury resulted in a 1.5 times increase in death when compared with mortality due to other injuries.[14]

In present study on 247 patients, the range of age distribution in the study population is 13–98 years. The mean age in the study population is 38 ± 14 years. Majority of patients in our study were young adults. Common age group involved is 21–40 years. It was observed that there was a preponderance of males over females and maximum number of victims was young adults, as they are active in day-to-day outdoor life and hence exposed to greater risk as compared to persons belongs to other age groups. These findings also correlate with various studies.[15-18]

In our study, the leading mechanism for all TBI was RTAs followed by assault. The leading cause of RTAs was motorcycle accidents, and these observations were similar to other studies[15,16,19-21] Road accidents are the result of the interaction between road users, vehicles and the road environment. As multiple factors may be responsible for causing accidents and the problem requires a multidirectional approach to reduce the rate of incidence and subsequently reducing the death rate and sufferings of the injured victims.

In this study, LOC and vomiting were most common clinical features followed by ear, nose and throat (ENT) bleed. Of total 247, 161 (65%) patients experienced LOC; 150 (61%) had one or more episodes of vomiting and 41 (17%) patients presented with bleeding from ear, nose or throat. Observations in the present study were similar to that reports in another study[20] findings of LOC (65%), vomiting (61%) and ENT bleed (17%). Whereas Bhole *et al*.[16] in their study found headache and vomiting were most common clinical features followed by LOC. The incidence of post-traumatic seizures (8.9%) in the present study was similar to another[16] study where seizures were noted in 22 (8.5%) patients whereas in another study,[20] occurrence was 16.46%.

The most common CT findings in the present study were contusions (40%), cranial bone fractures (21%) and SDH (21%) followed by EDH (16.19%), pneumocephalus (10.12%) and SAH (7.69%). Contusions are the common findings in some studies[15,16,18] while in some studies[15,18,22] scalp injuries were the common findings.

In the present study, majority (79%) of the patients were managed conservatively and only 21% were managed surgically (burr hole/craniotomy/craniectomy). Regarding GCS scores, majority (93%) of mild TBI cases were managed conservatively and only 7% were treated surgically and cases with moderate and severe TBI 64% were managed conservatively and remaining 36% cases were treated surgically. Our observations were similar to that reported other studies.[15,16,18,20]

In the present study, mortality in patients with Rotterdam Scores 1 and 2 was 0%, for Score 3 was 9.67%, for Score 4 was 29%, for Score 5 was 63% and for Score 6 was 100%. In another,[7] the highest mortality rate was observed in patients with absent or compressed basal cisterns and a midline shift larger than 5 mm (Score 4). Similar trend was observed in another study.[23] This proves that higher Rotterdam score in patients with TBI has added risk of mortality.

In the present study, mortality was mainly seen in patients with severe head injuries, and there was no mortality in patients with minor head injuries. Mortality increases with the increase in the severity of TBI. Similar trends were seen in another study.[16] In a study done by Munakomi,[23] the mortality was 1.4% in patients with mild head injury; 14.6% in patients with moderate head injury; and 65.6% in patients with severe head injury. While in another study,[24] the mortality rate was >50% if the patient's GCS was <5.

In the present study, mortality is highest in the patients of age group of 41–60 years (52.6%) followed by patients in age group of 21–40 years (31.6%), age group of 0–20 years (10.5%) and age group of 61–80 (5.3%) which were in contrast to other studies[15,23] where the most

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common age group being 31–40 and 30–50, respectively. The GOS scores in the present study were comparable with another study.[20] which showed a similar trend which includes death (7.7%), persistently vegetative (3.6%), severely disability (0.4%), moderately disability (3.6%) and low disability (84.6%) when compared to another study.[20] constituting 8.2%, 3.1%, 2.1%, 1.2% and 84.8%, respectively.

Our study is not without limitations and the main limitations of the study are we have not collected the data regarding time taken to reach hospital from incident of trauma which might influence the outcome of patients; we have not included patients with polytrauma which influence the outcome of patients and we have not followed the discharged patients further after their discharge from the hospital with disability.

Young male adults were the most common victims of TBI with common presenting features such as LOC and vomiting. The leading mechanism for all TBI was RTAs. Mortality risk was higher in patients with severe TBI and higher Rotterdam score. Patients with low GCS (severe TBI) had very poor outcome. Patients with higher Rotterdam score had added risk of mortality.

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Conflicts of interest
There are no conflicts of interest.

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