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Original Research Article

Evaluation of pattern and prognostic factors of head injury cases in a tertiary care centre

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ABSTRACT

Background: Head injury is a major public health problem worldwide and requires appropriate attention both regionally and globally. This study was done to find the patterns and to evaluate prognostic factors for final outcome of cranio-cerebral trauma.
Methods: A prospective study of 200 cases of head injury was conducted in a tertiary care hospital during one year duration. Apart from patient's demographic profile detailed history and examination was recorded. Final outcome of all patients was noted at discharge and during follow up, various prognostic factors were studied by taking Glasgow outcome scale (GOS) at 3 months of head injury.
Results: This study included 156 (78%) males and 44 (22%) females with average age of 35.95 years. Assault followed by RTI was the main cause of TBI. The factors which correlated with poor prognosis are presence of increasing age, less GCS at admission, alcohol intoxication and multiple lesions on CT scan.
Conclusions: Prognostication of patients with head injury will help to provide timely multimodality approach which will ultimately help in improving outcome of these patients.

Keywords: Brain injury, Glasgow outcome scale, Multimodality approach

INTRODUCTION

Head injury is gradually becoming a major issue for health services around the world. It is one of the important cause of mortality in the age group from 1 to 44 years. and third cause of death in all age groups, after malignancy and cardiovascular diseases.[1] Due to increased urbanization, motorization and economical liberation, many Asian countries have an increased risk for Traumatic Brain Injury (TBI).[2] The significant morbidities related with TBI also put a lot of burden on health care system, therefore in limited resources knowledge of the epidemiological profile of TBI and development of preventive measures plays a important role to decrease this burden.[2]

Individual patient outcome depends on multiple variables, like Glasgow Coma Scale (GCS) and age etc. specialized intensive care also plays an important role in predicting outcome. Even today a high number of the moderate and severe TBI patients are first referred to a general hospital and then to a level I trauma center (secondary referral). These multiple referrals may delay the appropriate therapy thereby leading to the increased adverse events and systemic insults during inter-hospital transport. So an efficient triage may lead to more fruitful outcome by identifying patients who requires more

specialized care. This can be facilitated by the use of prognostic modeling.

Hence current study was done to find the patterns of cranio-cerebral trauma at PGIMS Rohtak and to evaluate prognostic factors for final outcome of cranio-cerebral trauma.

METHODS

This prospective study was conducted in the Department of surgery Pt. B.D. Sharma Post Graduate Institute of Medical Sciences, Rohtak. A total of 200 subjects of both age and sex presenting with history of head injury and clinical findings were enrolled for the study in a duration of 1 year from February 2017 to January 2018.

Patients presenting with any associated injuries like chest and abdominal trauma or any other injury other than cranio-cerebral trauma and those already operated upon by other institutes were excluded.

The cases of cranio-cerebral trauma admitted to the emergency section of surgery department were enrolled for the study and informed consent was obtained from the patients or their attendants, as the case may be, for inclusion in the study. Apart from patient's demographic profile detailed history and examination was recorded. Special emphasis was laid on history of loss of consciousness, ENT bleed, vomiting and seizures. Based on history and examination, clinical diagnosis was made. Following this external wounds were managed and after stabilization of vitals and initial medication, non-contrast CT head was done. The patients with normal CT findings and GCS 15/15 were discharged from the department of surgery itself and those with CT suggestive of intracranial findings or GCS <15/15 were evaluated further. The further management of these patients was done as per advice of Neurosurgery Department. Patients were then transferred to the surgical wards for further management and evaluation of their progress. The cases presenting with a GCS score of ≤8 were subjected to emergency tracheostomy as a measure to prevent hypoxic injury on a routine basis.

Those patients who were considered/taken up for surgery by the neurosurgery department after clinic-radiological evaluation were either observed in surgery ward in the post-operative period or transferred to the neurosurgery ward. The remaining patients were admitted in the general surgery ward and were reviewed by the neurosurgery department thrice a week in the OPD, and were managed according to their advice. Detailed data was collected and it was evaluated for patterns as follows:

Clinical patterns with regards to (a) Mode of trauma (road traffic accident, assault, fall from height), (b) Injury pattern (isolated head injury, polytrauma with orthopedic injuries, polytrauma with visceral injuries, both), (c) Alcohol intoxication, (d) GCS at presentation (mild, moderate, severe). The status of pupils, presence of tracheostomy, and status of blood pressure were all evaluated. Similarly, radiological patterns were evaluated by findings of plain X-ray and NCCT head.

Final outcome of all patients was noted at discharge and during follow up, various prognostic factors were worked. Glasgow outcome scale (GOS)[3] was taken at 3 months of head injury on follow up. After completion of the study the data was analyzed using appropriate statistical methods and following observations were made.

Table 1: Depicting GOS.

Score	Rating	Definition
5	Good recovery	Resumption of normal life despite minor deficits
4	Moderate disability	Disabled but independent. Can work in sheltered setting
3	Severe disability	Conscious but disabled. Dependent for daily support
2	Persistent vegetative	Minimal responsiveness
1	Death	Non survival

RESULTS

The prospective study included 200 patients admitted in Department of General Surgery, Pt. B. D. Sharma PGIMS, Rohtak with an antecedent history of head injury extended for a duration of one year from January 2017 to December 2017.

It was found that majority of the patients were from 20 years to 50 years of age group, peaking at 20 to 30 years of age. The best prognosis was in the group of 10 to 20 years of age and the worst was in those of >60 years of age. The majority of the patients (78%) were male and 22% were females. overall prognosis of cranio-cerebral trauma was better in females than in males (Table 2).

Assault was most common mode of injury in these patients and was responsible for 58.5% of the patients. Vehicular accident was the cause in 31% cases and fall from height accounted for 9.5% of the patients. 2 patients (1%) were found having head injury under unknown circumstances. Patients with the history of Road Side Accidents had the maximum frequency of positive findings in their NCCT-head reports. Followed by those were the patients with the history of fall and then those with the history of assault.

Patients that came with the history of road side accidents had a worse prognosis than those coming with the history of assault or fall from height on an average. The 2 patients whose mode of injury could not be determined expired during their hospital stay (Table 3). The most

common presenting history was of Loss of consciousness followed by vomiting and bleed. No patient presented with the history of seizures. Patients with the history of Vomiting following craniocerebral trauma had the worst prognosis. Positive findings on NCCT - head reports were most commonly associated with the history of vomiting. This was followed by those who had history of ear and nose bleed. This is attributed to the fact that such bleeds are usually associated with maxillofacial fractures and temporal fractures.

Majority of the patients took 6-12 hours to present to the hospital, followed closely by those who were presenting within 2-6 hours. Patients who came within 6-12 hours of injury, average GOS was maximum and none of the patient presented after more than 24 hours presented from his/her injury.

A total of 70 patients (35%) had history of alcoholic intoxication during head injury. Average GOS at 3 months was better for those without the history of alcohol intake than those presenting with alcohol intoxication.

Table 2: Demographic profile of head injury patients along with their outcome.

Parameter		N (%)	GOS at 3 months
Sex	Male	156 (78)	4.86
	Female	44 (22)	4.65
Age	0 to 10	6 (3)	4.83
	10 to 20	13 (6.50)	5
	20 to 30	50 (25)	4.6
	30 to 40	48 (24)	4.81
	40 to 50	48 (24)	4.79
	50 to 60	25 (12.50)	3.91
	>60	10 (5)	3.8

Out of 200 patients enrolled in the study 101 (50.5%) patients showed positive findings in their NCCT-Head reports. No abnormalities were detected in 47.5% of the patients. 4 patients could not undergo NCCT - head as their injuries were too severe and expired before any further investigations could be done. In this group, 21.78% patients had biconvex hyperdense lesion on CT scan i.e. EDH. 23.76% had hemorrhagic contusion, 9.91% had sub-arachnoid hemorrhage, 19.80% had sub-dural hemorrhage and the majority (63.36%) had skull fractures. 6.93% patients showed midline shifts of varying degrees. The average outcome of the 10 patients that presented with GCS of <8 was the worst (1.3). 3.5% patients presented with severe anemia, 38% with Hb between 9-12 gm% and 58.5% with Hb >12 gm%. The average Glasgow Outcome Scale (GOS) score at 3 months was best for EDH (4.64) and skull fractures (4.63) and worst for the patients that presented with midline shift (Table 3).

Out of 200 patients included in this study 6 required surgical intervention and the other 194 patients were managed conservatively. 13 (6.5%) patients included in the study required tracheostomy either at presentation or during their hospital stay.

Table 3: Head injury related details with their outcome.

Parameter		N (%)	GOS at 3 months
Mode of injury	Road side accidents	62 (31)	4.5
	Assault	117 (58.50)	4.83
	Fall	19 (9.50)	4.95
	Unknown	2 (1)	1
Presentation	LOC	149 (74.50)	4.74
	Vomiting	70 (35)	4.64
	EN Bleed	63 (31.50)	4.78
	Seizures	0 (0)	N/A
Time since injury	<2 hours	21 (10.50)	4.52
	2-6 hours	74 (37)	4.66
	6-12 hours	80 (40)	4.88
	12-24 hours	25 (12.50)	4.36
	>24 hours	0 (0)	0
H/o alcohol intake	Present	70 (35)	4.54
	Absent	130 (65)	4.78
GCS at presentation	<8	10 (5)	1.3
	8 to 12	12 (6)	3.5
	13 to 15	178 (89)	4.97
NCCT findings	Hemorrhagic Contusion	24 (23.76)	4.17
	SAH	10 (9.91)	4.5
	SDH	20 (19.80)	3.7
	EDH	22 (21.78)	4.64
	Midline shift	7 (6.93)	3
	Skull fractures	64 (63.36)	4.63

DISCUSSION

India like many developing countries are experiencing a rapid increase in economic growth leading to increased motorization and thereby significant risk factors for head injury in the region which ultimately results in significant socioeconomic losses. This prospective study included analysis of 200 patients seen at our institute.

In the present study, patients were aged between 2 - 68 years. Mean age of head injuries were 33.4 years, 32 years and 33.47 years in similar studies conducted by Tian et al, Aykut et al and Agrawal, respectively.[4-6] The mean age was 35.95 years which is consistent with the above studies except in a study done by Hidayat where mean age was 27.1 years.[7]

Maximum number of the patients in all the studies were of younger age group probably due to reason that young

people are more involved in the outdoor activities and have a high tech lifestyle.

Higher mortality is associated with aged population from traumatic brain injury. In our study, patients younger than 30 years had a mortality rate of 6.57% whereas patients above 50 years had a mortality rate of 11.77%. Mosenthal et al observed that geriatric population had twice mortality from traumatic brain injury than that of younger patients.[8] Similarly, Munro et al and few other authors also found that patients older than 65 years had poor survival rates than patients who are less than 65 years old.[9-12] This high mortality in the older may be because of intrinsic changes of the ageing brain, pre-existing co-morbidities and adverse effects of general anesthesia and surgery.

In present study majority of the patients were males (78%). This is consistent with studies of Cheung et al, Agarwal et al, Karasu et al.[4-6,13] Females were 22% which is also at par with other studies. This is probably because males are more commonly drivers in India and are involved in outdoor activities also males are more commonly involved in assaults and violent crimes.

Assaults were the most common mode of injury in our study accounting for 58.5% cases of head injury. In studies done by Phoebe et al, Hens et al and Karasu et al accidents were the cause in 56%, 59.42% and 45.9% of cases respectively.[4,5,13] Accidents (RTA) were the commonest cause of injury comparable with many other studies. The high incidence of assaults in our study is probably due to the ever increasing population density and struggle for the limited resources available for consumption and reduced tolerance.

Abdul and others found that 45% of patients of head injury had loss of consciousness (LOC) following trauma, 39% had vomiting and 4% had seizures.[14] Keatly and others observed that 55% of patients had LOC following head injury.[15]

In present study 74.5% patients had LOC after head injury which is slightly higher as compared to above studies. It is probably due to more time lag between trauma and medical attention in our country as compared with western countries. In our study 35% patients had vomiting following head injury which is at par with the above stated studies. In present study 31.5% patients had ENT bleed which is in concordance with Gupta et al (28%) but much greater than Agarwal et al (2.17%).[6,16]

The National Institute for Health and Clinical Excellence head injury guidelines advocates for CT scan within 1 hour if there is more than one episode of vomiting in adults and three or more episodes in children post-head injury. Many more studies also found that, vomiting alone is associated with an abnormal CT head in 13-45% of cases, following head injury. Similar observation was made in our study that positive findings on NCCT - head reports were most commonly associated with the history of vomiting (75.71%), followed by those were with the history of ear and nose bleed (68.25%). This is attributed to the fact that such bleeds are usually associated with maxillofacial fractures and temporal fractures.

Tian et al in 2008 showed in their study that 54.54% patients came to Accident and Emergency within 4 hours.[4] Karasu et al done a prospective study in 2010 and showed that 26.54% reached in 4 hours but 73.45% patients reached in more than 4 hours.[5] In present study 37% patients reported to hospital within 4 hours of injury while 63% came after 4 hours.

Lag period is the time interval after which patient was shifted from trauma site to hospital. It plays important role in outcome of head injury patients. Majority of patients in this study come from surrounding areas of Rohtak and classified as rural population. The reasons for delay may be ignorance, less awareness, poor mode of transportation, lack of proper first aid at nearby health center, distance to reach to the tertiary health care facility etc. The outcome largely depends upon prompt and quality care to such patient which is deficit in rural areas. Seelig and colleagues found those patients who were operated in the first four hours that there was considerable decline in the rates of mortality and morbidity (mortality 30%) after the trauma as compared to those operated after 4 hours (mortality 85%).[17] Haselberger and colleagues also found that mortality rate rose from 47% to 80%. When gap between admission and operation was more than two hours.[18] Howard and colleagues found significant increase in mortality (36.7%) for the patient operated in first four hours than mortality of (63.8%) in those operated four hours after trauma.[19] Our study shows that the prognosis peaked for those presenting at the Emergency after a delay of 6 - 12 hours. This can be attributed to the fact that the patients with more serious injuries are usually rushed to the higher centres of critical care. In our study it was found to be 35% which is more than reported by Bordingnon and others (7.9%) and Agarwal et al respectively (9.42%).[6,20]

Alcoholic intoxication raises chances of road side accidents reason being poor judgment, ataxia, lack of co-ordination etc. Further alcoholic intake was most common finding (42.85%) in younger age group of (21-30 years). This may be because of urbanization of population, lack of surveillance of parents on young generation, high tech life style etc. Most of these young adults were riding their bikes after alcoholic intoxication, when they met with accident. Alcohol can also be implicated in the rising number of assault cases presenting to the emergency department mainly for the medicolegal purposes. It was observed a significantly higher mortality rate in the patients with GCS scores of 3 to 8. In this study, the mortality rates were 92.31% in patients with GCS <8 while 11.11% in patients with GCS between 9-12 at the time of admission. There was a strong correlation between the GCS score on admission

and outcome of head injury patients.[21] Phuenpathom and colleagues reported that the GCS score is one of the most critical factors.[12] Furthermore, we also stressed that the initial GCS score combined with neuroradiology and clinical details significantly improves the predictive accuracy as compared to that of GCS alone.

Our study showed the average Glasgow Outcome Scale (GOS) score at 3 months was best for EDH (4.64) and skull fractures (4.63) and worst for the patients who presented with midline shift. The incidence of abnormalities on CT increases with severity of head injury. Patients with minor head injuries (GCS = 13-15) had an abnormal CT rate of 2.5-8% when compared with 68-94% in patients with severe TBI (GCS <8).[22,23] Various abnormalities on CT have been linked to outcome. The most consistent individual abnormalities which are associated with a worse prognosis are traumatic subarachnoid hemorrhage, compression of the basal cisterns and mid-line shift.[22,24]

Majority of patients in our study were managed conservatively because even the patients without any abnormalities shown on their NCCT Head were included in the study. Such patients constituted 47.5% all patients and thus almost half of the patients did not require any active management of their head injuries. Of the remaining patients only 6 required surgical treatment or were deemed recoverable enough by the neurosurgeon after initial assessment to be considered for surgery. Four patients expired before any investigations could be done and any intervention could be planned.

CONCLUSION

Head injury is a frequently encountered injury in emergency departments of most hospitals. The incidence is rising day by day and the mortality and morbidity is high in cases of head injury. In India injury patterns/modes are different from the developed nations. It is concluded from this study that age of the patient, GCS score at admission and CT scan findings are strong predictors of outcome in head injury patients. Increasing age, less GCS at admission and multiple lesions on CT scan are associated with poor outcome.

By improving our system with better reporting and documentation of cases, we will be able to make a better plan to decrease the incidence of TBI and their timely appropriate multimodality approaches to achieve better outcome of these cases within our limited resources.

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