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ORIGINAL ARTICLE

SHORT-TERM OUTCOME OF OPERATED TRAUMATIC BRAIN INJURY PATIENTS WITH INTRACRANIAL HEMORRHAGE AT TIKUR ANBESSA SPECIALIZED HOSPITAL, ADDIS ABABA, ETHIOPIA

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ABSTRACT

Background: *Traumatic brain injury is the leading cause of death and disability in people younger than 40 years of age worldwide.*

Objective: *The study primarily aims at assessing the short-term outcome of patients operated for traumatic intracranial hemorrhage.*

Patients and Methods*: This is a hospital based cross sectional study on patients with traumatic brain injury at Tikur Anbessa Specialized Teaching Hospital in Addis Ababa, Ethiopia, between February 2013 and February 2014. Standardized and structured questionnaire was used to collect sociodemographic data. All patients with traumatic brain injury operated following intracranial hemorrhage were included. Glasgow Coma Scale was used to determine the outcome. Difference in proportions was examined using Chi-square test.*

Results*: The study reviewed 91 patients with traumatic brain injury. Their age ranged from 13 to 60 years with a mean (SD) of 32.3 (±12.1). Eighty-seven (95.6%) of the cases were males and 4(4.4%) females and 34(37.4%) of them cases had mild and 30(33%) had severe traumatic brain injury. Acute Epidural Hematoma was seen in 79(86.8%), Acute Subdural hematoma had the highest proportion, 4/11(36.4%), of deaths and it was also significantly associated with unfavorable Glasgow Outcoma Scale at 3 months (p=0.03). Overall, the proportion patients who died was 18.7% with older patients (>50 years) had a significantly higher proportion of death (p=0.01). Most of the patients had favorable Glasgow Outcoma Scale ,unfavorable was seen in 22/30 (73.3%) and 17/30 (56.7%) of patients with severe traumatic brain injury at 3 and 6 months, respectively.*

Conclusion: *In conclusion, male predominance was substantially high. Acute Subdural hematoma and old patients had high death rates and unfavorable outcome. Overall the death rate was not different from global figures.*

INTRODUCTION

Traumatic brain injury (TBI) remains the leading cause of death and long-term disability among people younger than 40 years worldwide (1). The incidence of severe TBI in “developed countries" has fallen in recent years primarily because of better automobile design, seat belt and air bag use, and construction deployment, highway safety, reduced alcohol consumption, and better promotion of safety techniques at the workplace(1,2). The dramatic reduction seen in death among patients with neurotrauma is directly attributable to improved quality of trauma care systems and optimized neurocritical care; yet in the majority of cities in rapidly developing countries, such systems are next to nonexistent (1,3). Globally, 100 to 350 patients per 100,000 inhabitants are admitted per year to hospital for TBI (4).

The development of an intracranial posttraumatic hematoma complicates 25-45% of severe, 3-12% of moderate and 1-3% of mild TBI (3,5). Acute subdural hematoma (ASDH) represents a challenge for neurosurgeons due to its high mortality (76 to 90%) and morbidity rates as compared to the other types of posttraumatic hematomas (6-12). Intraparenchymal lesions have death rates close that from ASDH. The reported death rate was 50% following surgery (13) Epidural hematomas (EDH) are the most responsive to surgical treatment if intervention is dine in a timely manner. Post- operative death rate associated with epidural hematomas in recent reports from western countries ranges from 6% (in pure epidural hematomas) to 33% (cases with associated Intraparenchymal lesions) (3,14).

Many clinical factors have been shown to predict the outcome in patients with head injury. Many studies have suggested important clinical factors, including patient’s age, admission Glasgow Coma Scale score, motor responses, pupillary responses, presence of associated injuries, hypotension, hypoxia and various types of intracranial hemorrhage (ICH) (1,2,15-17). Assessment of outcome of ICH is important as it allows evaluation of the significance of neurosurgical intervention in the absence of trauma care system, urgent intervention, established neurocritical care and rehabilitation.

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Most previous outcome studies on TBI have been done in places where there are neurocritical and rehabilitation centers (1,2,17). This study intends to throw light on the role of surgical intervention in settings with meager neurocritical care and absence of pre-hospital care and rehabilitation. The outcome of patients operated for TBI has not been studied in Ethiopia where neurosurgical training has been provided for less than a decade. This study aims at assessing the short-term outcome of patients operated for ICH at the major teaching hospital, TASTH in Addis Ababa, Ethiopia.

PATIENTS AND METHODS

This is a hospital based prospective study conducted at TASTH, Addis Ababa University. We enrolled all TBI patients requiring operation for ICH and admitted to TASTH between February 2013 and February 2014. A structured questionnaire was prepared and used for data collection. Consent was obtained from patients to participate in the study and the patients were contacted by phone and when they came for a follow-up visit.

Patients' level of consciousness was assessed based on their post-resuscitation Glasgow Coma Scale (GCS), a standardized, 15-point test that uses three measures -eye opening, best verbal response, and best motor response - to determine the severity of brain injury. A total score of 3 to 8 indicates severe head injury, 9 to 13 moderate head injury, and 14 to 15 mild head injury. Outcome was assessed using the Glasgow Outcome Scale (GOS) at 3 months and 6 months post-operative. GOS was classified as favorable and unfavorable.

Favorable GOS consists of patients who carry out their daily activities without assistance and those who are back to work. All patients who were severely disabled, in persistent vegetative state, or dead were put under unfavorable GOS group. Data concerning patients' sociodemographic status, GCS, complications, outcome condition on discharge and cause of TBI was collected using a structured form prepared for this purpose. The data collected was analyzed using SPSS software version 21. The data are presented using frequency distribution and summarized using point estimates, including percentages, medians or means (SD. Chi- square statistic was used test differences among categorical variables. $P < 0.05$ was considered statistically significant and odds ratio (OR) was determined to measure strength of association among variables. Ethical clearance was obtained from Departmental Research Ethics Committee.

RESULTS

One hundred and five patients were operated during the 13 months period at TASH, but 14 of them were excluded from the study since they could not be contacted after discharge. Ninety-one operated patients were included in the current study of which 87 (95.6%) were males and 4 (4.4%) females. Male to Female ratio of 9.5:1. The age of the patients ranged from 13 to 60 years. The mean age at presentation was 32.3(+12.1) years. Seventy-nine patients (86.8%) were younger than 50 years. (Fig 1). Over one-half (58.2%) the patients came from the Oromia Region one-quarter (25.3%) from Addis Ababa city.

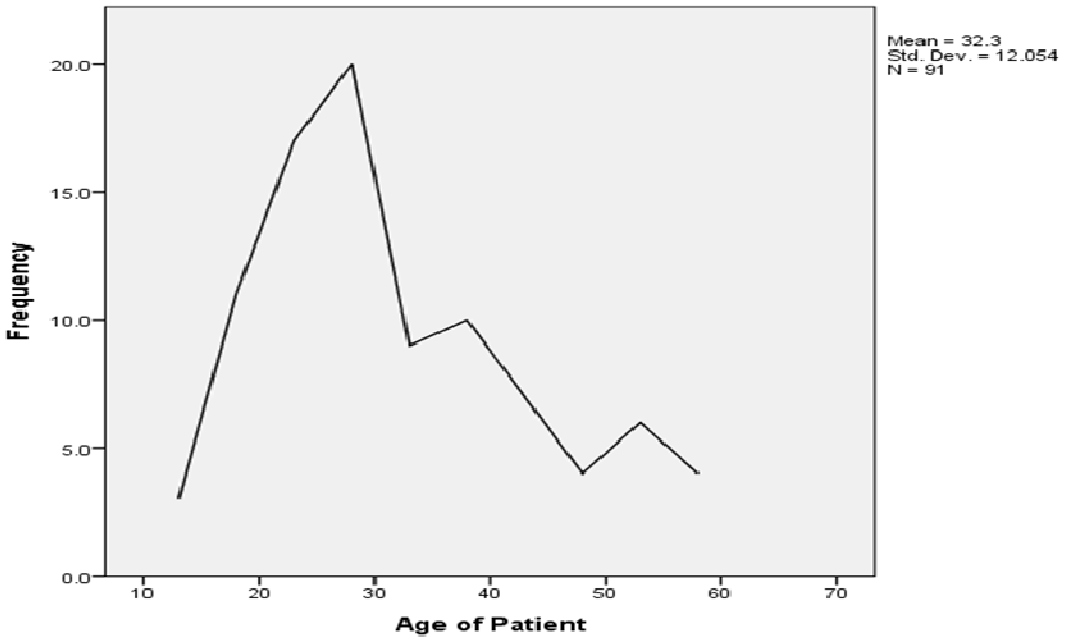

Fig 1: Age distribution of patients with traumatic brain injury between February 2013 and February 2014, Tikur Anbessa Hospital, Addis Ababa, Ethiopia

In 66/91 (72.5%) of the patients with post-traumatic ICH, the cause was assault. Stick injuries were causes of ICH in 47 (51.6%) of the patients, stones were used to assault in 14 (15.4%) of the patients and 5 (5.5%) of the patients were attacked either by axe or knife. Other causes like accidental fall and road traffic accidents (RTA) were observed in 10 (11%) and 8 (8.8%) of the patients, respectively. Four (4.4%) patients were found unconscious and cause of injury was not identified. (Fig 2)

Pre-operative GCS was 14-15 in 34 (37.4%), 9-13 in 27 (29.7%) and < 8 in 30 (33%) patients. Pupillary reaction was normal in 63 (69.2%). The rest had either asymmetric pupils in 19/91 (20.9%) or equal and fixed pupils in 7/91 (7.7%). At presentation 48 (52.7%) moved all their extremities and 8 (8.8%) had posturing.

Imaging of 79/91 (86.8%) of the patients showed AEDH and 11 (12.1%) had ASDH. Only one patient was operated for intracerebral hematoma. The proportion of death was 36.4% (4/11) for ASDH patients and 16.5% (13/79) for patients operated for AEDH. The type of ICH and death did not show significant statistical association. Complications seen were mainly pulmonary-14/91 (15.4%) patients had aspiration pneumonia and one patient had hospital acquired pneumonia.

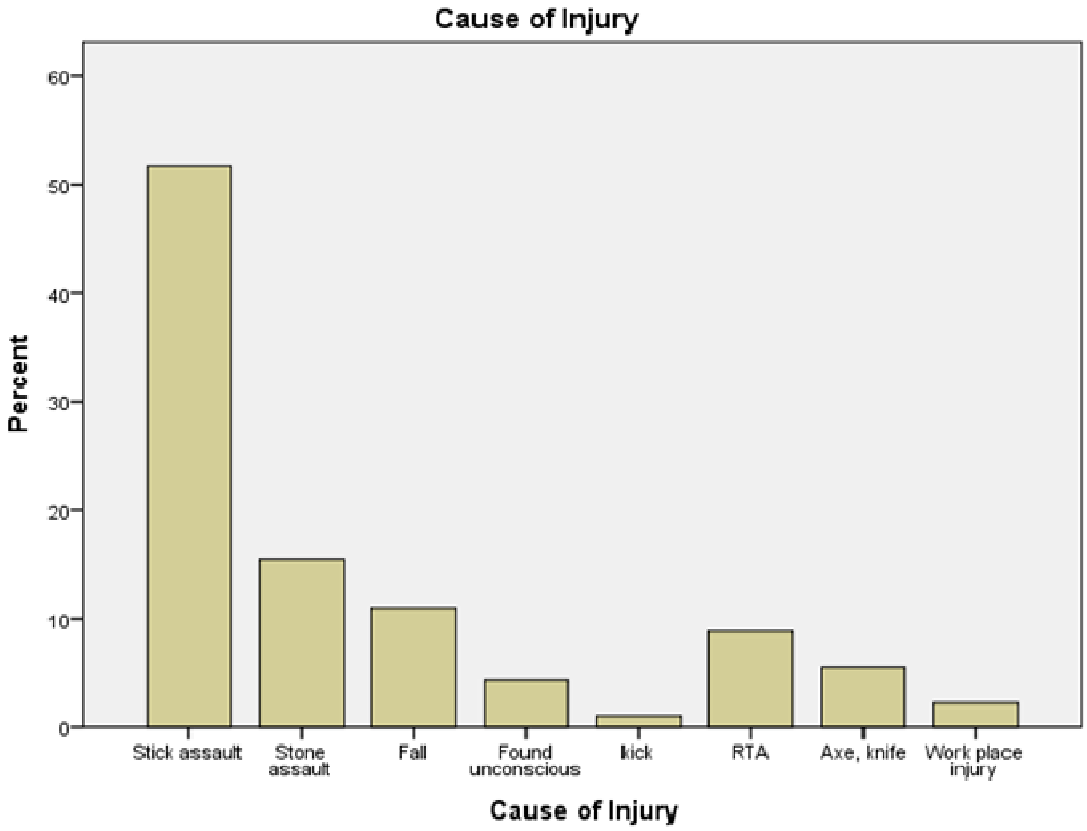

Fig 2: Causes of Injury in patients with traumatic brain injury between February 2013 and February 2014, Tikur Anbessa Specialized Teaching Hospital, Addis Ababa, Ethiopia

Imaging of 79/91 (86.8%) of the patients showed AEDH and 11 (12.1%) had ASDH. Only one patient was operated for intracerebral hematoma. The proportion of death was 36.4% (4/11) for ASDH patients and 16.5% (13/79) for patients operated for AEDH. The type of ICH and death did not show significant statistical association. Complications seen were mainly pulmonary-14/91 (15.4%) patients had aspiration pneumonia and one patient had hospital acquired pneumonia. Post-operative hospital death rate was 18.7% [n=17]. Eleven patients had stick injury, 3 patients had accidental and 2 were found unconscious. Of the 17 patients who died, 9 had aspiration pneumonia and all had severe TBI. On discharge most patients had a GCS of 15 [n=58 (63.7%)] and 14 [n=11 (12.1%)]. Five patients (5.5%) had motor aphasia on discharge. No patient died after discharge.

When mortalities are compared based on the pre-operative GCS, patients with severe head injury had a mortality of 50% (15/30) and those with moderate head injury had mortality of 7.4% (2/27). Even though, the association of pre-operative GCS and death was not statistically significant (p=0.25). No patient in the mild head injury class died (Table 1). Patients who are 50 years of age and older had higher chance of death (p=0.01) with an OR of 3.6 (95% CI: 1.63, 7.89). Older patients (>50 years of age) had unfavorable GOS at 3 months (p=0.001) and 6 months (p=0.001) with OR of 2.9 (95% CI: 1.87, 4.39) and 3.51 (95% CI 1.92, 6.44). The type of Intraparenchymal lesion was associated with GOS at 3 months (p=0.03) and 6 months (p=0.05); ASDH had worse prognosis. Most patients were at least able to carry out their daily activities at 3 months after discharge [n=58 (63.8%)] and at 6 months after discharge 68 (74%) patients were able to do daily activities independently (Table 2) and (Fig 3).

Table 1: GCS compared to survival of patients with traumatic brain injury between February 2013 and February 2014, TASH, Addis Ababa, Ethiopia.

GOS	At 3 months	At 6 months
1	17(18.7%)	17(18.7%)
2	1(1.1%)	1(1.1%)
3	15(16.5%)	5(5.5%)
4	44(48.4%)	23(25.3%)
5	14(15.4%)	45(49.5%)
Total	91(100%)	91(100%)

Table 2: GOS at 3 months and 6 months of patients with traumatic brain injury between February 2013 and February 2014, TASH, Addis Ababa, Ethiopia.

GCS	Dead	Alive	Total
14-15	0(0%)	34(100%)	34(100%)
9-13	2(7.4%)	25(92.6%)	27(100%)
3-8	15(50%)	15(50%)	30(100%)

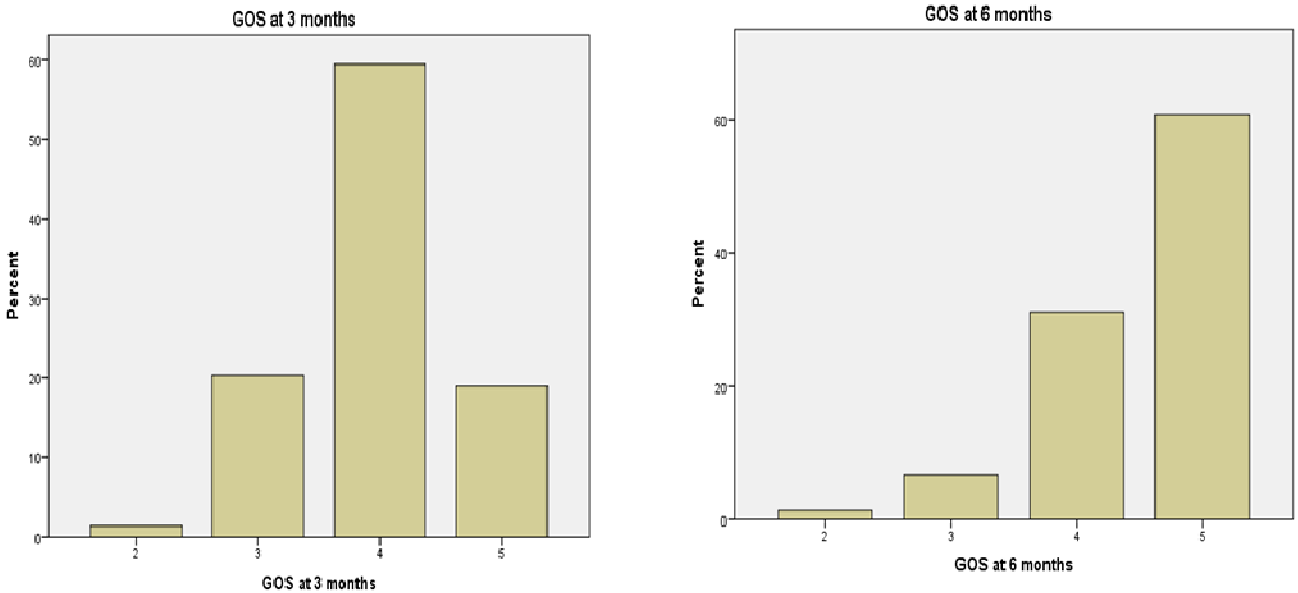

Fig 3: Comparison of GOS at 3 months and 6 months of patients with traumatic brain injury between February 2013 and February 2014,TASH, Addis Ababa, Ethiopia

DISCUSSION

TASTH is one of the few government hospitals in Ethiopia providing emergency neurosurgical services. The expected number of head injuries is approximately 90,000 to 315,000 per year for the 90,000,000 population of Ethiopia and only 105 patients with ICH following TBI were operated in a year (4). This small number is due to lack of access to emergency neurosurgical services and lack of awareness on availability of treatment for such patients.

Our study has shown that TBI is the problem of the young adult; the mean age was 32.3 (±12.1) years. This is due to susceptibility of this age group to risky behavior like fighting and involvement in job with out safety precautions. Most patients came from Oromia (58.2%) and Addis Ababa (25.3%). The hospital is located in the city of Addis Ababa and the Oromia region surrounds the city.

According to Tagliaferri, et al. (4) male to female ratio of head injured patients' ranges between 1.5:1 and 3:1, in Europe. Bahloul et al. (20) showed male predominance of 9:1 in a study done in Southern Tunisia. The male to female ratio was 9.5:1 in our study which is similar to the report from Tunisia. High risk behaviors, like fighting using sticks and stones contribute for this high preponderance of young males.

The commonest cause of TBI is road traffic accidents in many settings (1,2,4,20), but the incidence of assault as a cause of TBI increases in developing nations (4). In our series assaults with sticks predominated (72.5%) and sticks (51.6%); road traffic accidents accounted only for 11% of the cases. This is related to the wide spread use of sticks in most areas of Ethiopia as a personal protection tool. Road traffic accident associated TBI presents with diffuse and fatal injuries, not focal hematomas. There was no statistically significant correlation between cause of injury and outcome.

According to Cheung et al. in the Hong Kong (21), EDH outcome series, 6/7 patients with fixed pupils expired. And Heiden et al (17) observed 91% of their patients with fixed pupils either died or were in persistent vegetative state. Both of these reports were form developed countries. In comparison, in our study found all patients with fixed pupils died. This could be the due to lack of proper post-operative ICU care.

AEDH is the commonest lesion that required surgery in our study. In most studies, subdural hematomas (13,22) were more frequent, especially in patients with severe head injury. AEDH was seen in young patients as the dura tends to be adherent to the skull as a person ages leaving no space for epidural hematomas. Intracerebral hematomas are usually treated conservatively unless they exceed 50 cc in size, hence, only one patient was operated for intracerebral hematoma.

Gomez et al. (22) reported a death rate of 41.3% among patients with severe head injury. Cheung et al. (21) reported death rate of 10% for patients with EDH. Gennarelli, et al. (13) had death rate of 41% among patients with severe head injury. These were done in developed countries. In India, a developing nation, Shameem et al. (23) reported overall death rate of 22% with 36% death rate among patients with severe head injury. In the present study, overall mortality was 18.7%, but 50% among those with severe head injury. The most frequent cause of death in TBI was aspiration (52.9%).

According to adult TBI studies conducted in Europe, the US and India unfavorable GOS (GOS of 1, 2 or 3) was seen in 50%, 64% and 9% of head injury cases, respectively (4) In our study 36.3% of patients had unfavorable GOS at 3 months and 25.3% of patients unfavorable GOS at 6 months. In an outcome study conducted in the Netherlands (17), 3 months and 6 months unfavorable GOS was seen in 76% and 67% of severe TBI patients, respectively. In our study a comparable proportion of patients had unfavorable GOS, 73.3% and 56.7% at 3 and 6 months, respectively.

Limitations: TASTH is one of the few government hospitals in Ethiopia that deals with emergency TBI cases and is not easily accessible by most of the country's population. The expected number of TBI cases per year is from 100 to 350 patients per 100,000 (6) and hence the expected number of injuries is 90,000 to 315,000. Many patients with TBI who live far from Addis Ababa are treated at a hospital in their vicinity. Others with significant injury do not make it to the hospital.

The study does not demonstrate outcome in those patients who are managed non-operatively, and these constitute a major proportion of patients treated for TBI at any center.
Conclusion: In Ethiopia, ICH following TBI is most common in young males who are victims of assault. Patients with low pre-operative GCS had higher fatality. Among those who deceased, aspiration pneumonia was the commonest complication. Old age (> 50) years and presence of ASDH had significant negative effect on the short-term outcome of TBI patients. Outcome of patients with severe TBI was comparable to outcome in the developed countries. Hence, the role of surgical intervention is significant in the outcome of TBI patients even in the absence of prehospital care, proper ICU care or rehabilitation facilities.

Recommendation: TBI is a current epidemic globally, especially in the developing countries. We have observed from the study that a very small segment of patients with TBI seeks medical attention. The government needs to improve accessibility of neurosurgical care and raise awareness of the population and health workers on the dire consequences of TBI unless treated urgently.

Care for the injured patient starts at the scene of the injury. Hence, there should be focus on implementing prehospital care for the injured. To improve outcome of patients, proper ICU care at hospitals with emergency neurosurgical services is essential and rehabilitation helps patients return to work sooner. More neurosurgeons or trauma surgeons are needed in proximity to the location of the injury if we are to deal with the TBI epidemic.

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