

## A 2-Years Description of Traumatic Brain Injury Admissions in Tikur Anbessa Specialized Hospital.

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**Background:** Traumatic brain injury (TBI) is a nondegenerative, noncongenital insult to the brain from an external mechanical force, possibly leading to permanent or temporary impairment of cognitive, physical, and psychosocial functions, with an associated diminished or altered state of consciousness. This study was aimed at describing the pattern of TBI at TASH during the two- years period.

**Methods:** This is a hospital based retrospective study of patients with traumatic brain injury admitted to TASH in the period between September 2011 and September 2013. Patients' demographic data, type and, mechanism of injury, Glasgow Coma Scale, length of hospital stays, complications and outcomes were recorded in a pre-formed questionnaire. Data entry and analysis carried out using SPSS version 20.0. The association between categorical variables was calculated using Chi-square test.

**Results:** A total of 201 patients were included in the present study. Male-to-female ratio being 12.4:1 with and mean age  $36.1 \pm SD 16.2$  years. Fight accidents were the major contributor of neurotrauma admissions and operations (53.2%). Seventy-One (35.3%) patients had depressed skull fracture followed by acute epidural hematoma seen in 51 (25.4 %). Of the 165 operations performed for patients with head injury, 53 (26.4%) were craniotomy and evacuation of hematoma; 55 (27.4%) elevation of the depressed skull fracture, senior resident involvement as a first surgeon accounted for 79.1%. 83.1 % of the admitted patients' have shown improvement on the time of discharge and 15.4% died while under neurosurgical care and 70.1% the patients had follow- up least once

**Conclusion:** The preponderance of young patients with head injury involved in a fight injury and motor vehicle accidents has a large impact on society and on the hospital workload

**Key Words:** Traumatic Brain Injury, Tikur Anbessa Hospital

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### Introduction

Traumatic brain injury (TBI) is a critical public health problem worldwide<sup>1,2</sup>. TBI, according to the World Health Organization (WHO), will surpass many diseases as the major cause of death and disability by the year 2020. It has been estimated that TBI affects over 10 million people annually leading to either mortality or hospitalization. Available data indicate that nearly 60% of TBIs are due to road traffic injuries (RTIs) in all parts of the world; about 20–30% are due to falls; 10% due to violence, and another 10% due to combination of work place and sports related injuries<sup>2</sup>. In 1998, an NIH consensus statement was published, citing an estimated incidence rate for traumatic brain injury (TBI) at 100 per 100,000 with a peak incidence in the 15-24 and over 75 age groups<sup>3-5</sup>. Recent reviews suggest that the incidence of TBI may be closer to 200 per 100,000, with estimated incidences from different countries ranging between 9.5 and 430 per 100,000<sup>6,7</sup>.

There are no all-age incidence figures published on TBI in Africa; different rates have been published from studies focusing on either adult or childhood TBI. A hospital based cross-sectional study in Nigeria that covered all ages for patients treated for trauma in the emergency room found that 31% of all trauma deaths were due to severe TBI<sup>8</sup>. Nell et al. found that TBIs in

persons aged 15 years; annual incidence rate of traumatic brain injury is 316 per 100,000 residents of Johannesburg, South Africa <sup>9</sup>.

The leading causes of TBI in most of Africa are RTI, violence, and falls. Nell et al. found that interpersonal violence accounted for 41.5% of all nonfatal TBI, and 36.4% of fatal TBIs in persons aged 15 years and over. There was a wide variation between the races; for instance while violence caused 51% of nonfatal and 47% of fatal TBIs in African males, it only caused 10% of nonfatal and 19% of fatal TBIs in white males <sup>9</sup>. In Ethiopia, TBI is a major public health problem, especially among male adolescents and young adults. Little is known about the incidence and prevalence of TBI, there are no hospital-based or population-based studies on traumatic brain injury,

The present study aims to assess the patterns of head injury in the teaching hospitals and to describe the causes, most affected age groups, sex, and consequences of TBI in Tikur Anbessa Specialized Hospital (TASH).

### Patients and Methods

This is a retrospective data analysis of patients admitted to surgical ward and SICU, TASH. Addis Ababa University. Tikur Anbessa Specialized hospital, Addis Ababa University, is the first accredited tertiary neurosurgical training center in the country, serving the whole country with population of 90 million. Addis Ababa University.

All patients with traumatic brain injury severe enough to warrant intensive care and or neurosurgical ward admission for either neurosurgical procedure or conservative management were included in the study. Patients with incomplete data, readmission to the ward or SICU and patients who stayed > 24 hours at ER without being admitted to the neurosurgical ward or SICU were excluded from the study. Patient's level of consciousness and neurological functioning was assessed using the *Glasgow Coma Scale*, a standardized, 15-point test that uses three measures of eye opening, best verbal response and best motor response to determine the severity of the patient's brain injury. A total score of 3 to 8 indicates a severe head injury, 9 to 13 indicate a moderate head injury, and 14 to 15 indicate a mild head injury.

Looking at master registers, patient's daily records, and clinical case notes made complete sampling of all patients with traumatic brain injury admitted into Wards/SICU.

Data concerning their socio- demographic status, diagnosis on admission, length of hospital stays, complications, condition on discharge and cause of TBI was collected using structured format prepared for this purpose. The data are presented as frequency and percentages; medians or means  $\pm$ SD. Categorical data was examined using Chi-square test with its conventional criterion for statistical significance ( $p < 0.05$ ). Odds ratios and 95% confidence intervals were calculated to identify factors that are associated with complication and among patients admitted to Ward/SICU. Data was analyzed using computer based statistical software SPSS version 20.0. Frequencies and means were computed for description of the various variables and presented in prose form and graphs. The association between categorical variables was calculated using Chi-square test. Ethical clearance was obtained from department Research ethics committee.

### Results

Of the 201 patients admitted to neurosurgical ward/ SICU, 186(92.5%) were males, with male-to-female ratio being 12.4:1. Patients' age ranged from 14 to 82 years (mean 36.1.  $\pm$  SD 16.2 years), with a peak incidence between 21 to 30 years. Seventy- six (37.8%) of the patients came from Oromia region See Table 1, followed by Addis Ababa administration, 66 (32.8%).

The most common types of head injury were found to be closed head injury constituting 116(58%) of the patients, statistically insignificant ( $p=0.887$ ) while open head injury was recorded in 85 (42.2%) patients, of which 16 patients had penetrating head injury. Seventy-One (35.3%) patients had depressed skull fracture followed by acute epidural hematoma seen in 51(25.4 %)(Table 2). In our study, the commonest cause of injury was assault accounting for 109 (54.2%) patients ( $p=0.0001$ ). Road traffic accident accounts for 38 (18.9%)of the patients, Fall down accidents in 36(17.9%) and unknown cause in 16 (8.0%). The GCS for 82 (40.8%) patients was between 14 and 15(mild head Injury), 75 (37.3%) had a moderate head injury, with a GCS between 9 and 13, and 44 (21.9%) had a GCS between 3 to 8 indicating severe head injury.

**Table 1.** Demographic Characteristics Patients with Traumatic Brain Injury.

Demographic Characteristics	Description	Number of Patients (%)
Sex	Male	186(92.5)
	Female	15(7.5)
Age	14 – 20	36(17.9)
	21 – 40	102(59.7)
	41 – 50	23(11.4)
	51 – 60	25(12.4)
	61-70	11(5.5)
	>70	4(2.0)
	Mean in years	36.1 ± (16.1 SD)
Region	Frequency	Percent
Oromia	91	45.3
A.A	66	32.8
Amhara	16	8.0
South	13	6.5
Somali	4	2.0
Benshangul- Gumuz	4	2.0
Tigray	3	1.5
Harar	2	1.0
Afar	2	1.0
Total	201	100

Figure 1. Cause of injury of patients with traumatic brain injury between September 2011 and September 2013, Tikur Anbessa Hospital, Addis Ababa, Ethiopia

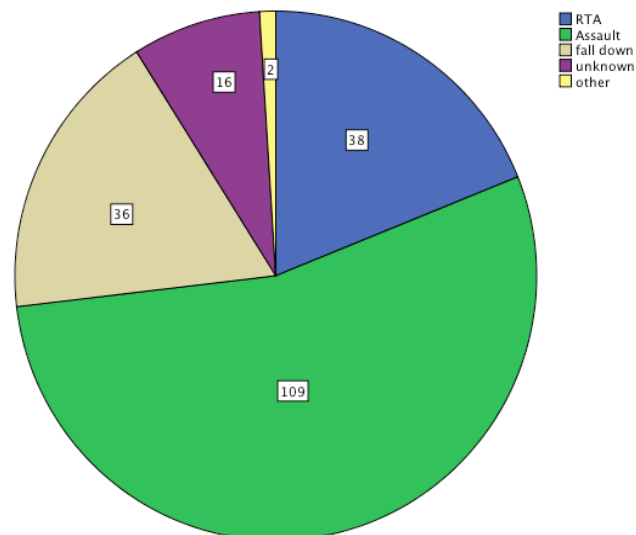


Figure 3. Level of consciousness in the ER using GCS in patients with traumatic brain injury between September 2011 and September 2013, Tikur Anbessa Hospital, Addis Ababa, Ethiopia

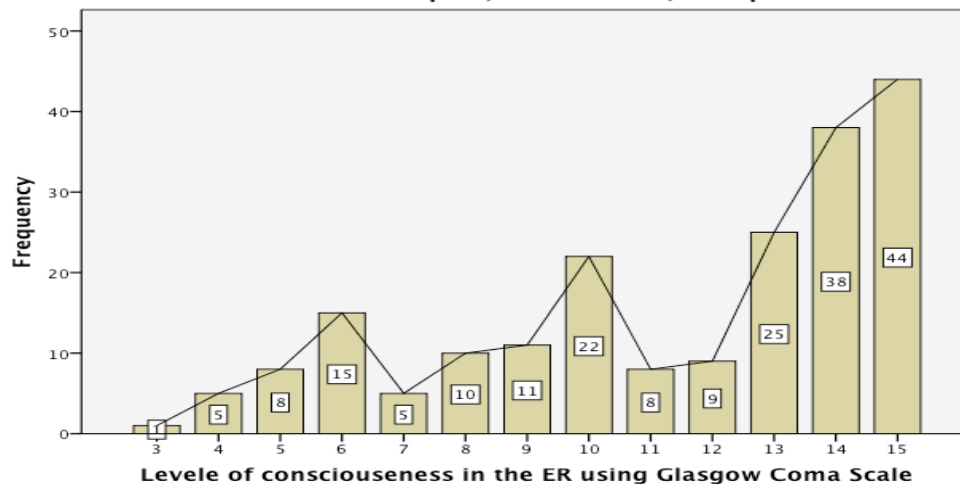


Table 2. Diagnosis by ER Physician of Patients with Traumatic Brain Injury.

Diagnosis	Frequency	Percent
CSDH	41	20.4
AEDH	56	27.9
ASDH	13	6.5
DSF	71	35.3
Brain Contusion	51	25.4
DAI	10	5.0
Brain Concussion	1	0.5
STI	12	6.0
Others	11	5.5

**Table 3.** Treatment plan Surgical vs. Non-surgical Treatment of Patients with Traumatic Brain Injury.

Procedures done	Frequency	Percent
Burr hole and evacuation of hematoma	43	21.4
Craniotomy and evacuation of hematoma	53	26.4
Elevation and of depressed skull fracture	55	27.4
Elevation evacuation of hematoma	5	2.5
Other surgical treatment	9	4.5
<b>Total</b>	<b>165</b>	<b>82.1</b>
Non-surgical treatment	36	17.9

**Table 4.** Complications of Patients with Traumatic Brain Injury

Complication	Frequency	Percent
Aspiration pneumonia	7	3.5
Hospital Acquired Pneumonia + Sepsis	1	0.5
Infection	2	1.0
Seizure	6	3.0
Uneventful	185	92

Among patients admitted to ward and SICU, 82.1% were operated, whilst 17.9% were managed conservatively. Fifty-five percent of the patients with TBIs had intracranial hematomas (table 2). Craniotomy and Elevation of the depressed fracture for DSF and intracranial hematoma were the most common surgical procedures in 53(27.4%) and 101(50%) respectively (Table 3).

In this study complications occurred only in 16(8%) patients, Pneumonia and seizure were the most common ones. It was uneventful in 185(92%) of the patients (Table 3).

The mean and median hospital stay was 19.61( $\pm$ 19.739) and 13 days respectively with range being from 1 -114 days, 40.8% of the patients stayed from 8 to 14 days. Average hospital stay of mild, moderate and severe TBIs was 18.5, 19.7 and 41.9 days respectively.

The overall rate of in- hospital deaths were 6.5%, 22, 5% and 70.9% among patients with mild, moderate, and severe injured patients respectively. The majority (83.1 %) of the admitted patients showed improvement at the time of discharge and 15.4% died. In 70% of the cases, the patient had at least one follow up visit within a month of discharge from the hospital.

## Discussion

The patterns of patients admitted to neurosurgical wards were evaluated retrospectively. Of 201 patients with traumatic brain injury admitted to our hospital, 92 % were male presumably this could be partly due to males are the dominant players in social and economic activity in most Ethiopian societies. So males tend more than female to engage in risky activities. Similar reports have been shown in a study done in South Tunisia <sup>10,11</sup>, but different from Europe, with male-to-male ratio of 1.5:1 to 3:1 <sup>7</sup>. The young constitute more than the elders. Majority of the patients were residents of Oromia region. This could be due to the proximity of TASH to Oromia region.

TBI can result from a closed head injury or a penetrating head injury. Closed injury was high compared to penetrating head injury. This could be explained by the fact that, in Ethiopia, illegal

weapons are prohibited and civilians are not entitled to hold weapons. Contrary to what has been described in most developed countries<sup>7,12,13</sup> in the current study assault was statistically significant cause of traumatic brain injury, this might be due to wide spread use of sticks in most parts of the country as personal protection tools. The commonest cause of TBI is road traffic accidents in many series.

Doctors assess the patient's level of consciousness and neurological functioning using the Glasgow Coma Scale to determine the severity of the patient's brain injury. GCS is used to predict the outcome of brain injuries, 44(22%) of the patients had GCS between 3-8. The GCS score less than 8 is referred to "severe traumatic brain injury" which is associated with less favorable outcome and poor recovery<sup>14</sup>. In the present study, over half of the patients with traumatic brain injury had mild head injury; which was associated with favorable outcome and good functional recovery. The remaining, 54 (26.9%) had a moderate head injury, this indicated that the degree of injuries was significant which require urgent treatment, and majority has modest outcome and functional recovery.

A retrospective review of patients with TBIs was done in academically affiliated hospital with a Level I Trauma Center in USA, 79% of admitted patients had mild TBI (GCS 13-15) and 401 (21%) had severe/moderate TBI (GCS 3-12) at presentation. The severe/moderate TBI group was younger than the mild TBI group and more likely to be male<sup>15</sup>, in the current study age was constant with the level of consciousness, but male preponderance was significantly demonstrated.

In total agreement with Mebrahtu-Ghebrehiwot et al<sup>22</sup>, intracranial haematoma was the most common CT scan finding and craniotomy (Falconers flap) was done accordingly.

In a study done in Johannesburg, South Africa, 20% of TBIs resulted death. Similarly, our finding was satisfactory with mortality rate of 15.1%<sup>9</sup> but much higher than most developed countries<sup>9,16</sup>. The overall rate of death in hospital was low among patients with mild (6.5%) but much higher among moderately (22.5%), and severely (70.9%) injured patients. Increasing pattern of deaths as the severity increases is similar to multihospital database study done in USA by McGarry et al<sup>17</sup> who concluded that the overall rate of in-patient deaths was relatively low among patients with moderate (1.3%), serious (5.7%), and severe (8.7%) TBIs, but much higher among the most critically injured patients (52.0%).

The mean length of hospital stay (19.61 days) with range being from 1 -114 days was higher than the report by McGarry et al<sup>17</sup> who reported an average length of stay in hospital from 6.7 days for moderate TBI to 17.5 days for critical TBI. According to Zachary Il'Giovine and colleagues, the mean length of stay for patients with a mild TBI was 5.20 days, while, severe/moderate TBI group had longer mean hospital length of stay (14.4,  $p < 0.001$ ) compared to mild TBIs<sup>15</sup>, but in the current study, severity of TBI was not significantly associated with duration of hospitalization ( $p=0.86$ ).

Pulmonary complications are common after TBI, occurring in up to 80% of patients<sup>18</sup>. Pneumonia is the commonest non-neurological complication of severe TBI, occurring in 40–65% of patients<sup>18-20</sup>, with those with the lowest GCS being most at risk<sup>20</sup>. TBI is strongly associated with several neurologic disorders 6 months or more after injury<sup>11</sup>. *Seizures* are associated with most types of TBI. About 25 percent of patients with brain contusions or hematomas and about 50 percent of patients with penetrating head injuries will develop seizures within the first 24 hours of the injury<sup>21</sup>. Similarly we noted that pneumonia and seizure were most frequent complications observed in our study, but it seems that it is under reported.



## Conclusion

- TBI more often occurred among young adults, which are economically active and productive groups of the society,
- TBI was significantly commoner in males compared to females.
- Depressed skull fracture and acute epidural hematoma were the leading diagnosis in patients with TBI.
- The commonest mechanism of the head injury was assaults or fight accident,
- Seizure was the most common complication followed by aspiration pneumonia.
- Lower GCS scores were predictive for mortality.

## Recommendation

Unlike most neurological disorders, head injuries can be prevented. Hence we believe that policies need to be formulated at the national level to enhance injury prevention, establish better rehabilitation programs and facilities optimize the allocation of scarce healthcare resources.

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