

## ORIGINAL ARTICLE

## HEAD INJURY ADMISSIONS AT A REFERRAL HOSPITAL IN ETHIOPIA

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## ABSTRACT

**Background:** Head Injury is one of the most common reasons for patient admission and death in a trauma setting. Trauma is one of the major burdens on our health system. Although there are some studies done on head injury patterns elsewhere in the country and in the world, there is no study done in Mekele. Anecdotal evidence shows that we are having a significant number of patients with head injury. Characterizing the pattern of head injury will help plan preventive measures. The objective of this study was to assess the burden of head injury admissions and operations in Ayder Referral Hospital.

**Methods:** Record review was conducted on charts of patients admitted to the surgical ward with a diagnosis of head injury. The study was conducted in Ayder Referral Hospital Department of Surgery and included charts of patients who were seen from January, 2011 to December, 2014 using a structured questionnaire. The collected data were analyzed using SPSS version 16.

**Results:** A total of 750 records were analyzed. The gender distribution is 598 males to 152 females, making the male to female ratio 4:1. The most commonly affected age group was from 6-25 years. A total of 422 (56.3 %) of the head injury patients came from the urban area. The causes of the head injury were fall down accident in 41.9%, interpersonal violence in 24.8%, and road traffic accident (RTA) in 24.9 %. Of the 187 RTA cases 102 were pedestrians and 84 were vehicle occupants.

**Conclusion:** Head injury is causing significant morbidity and mortality. The young and male are commonly affected. Interpersonal violence is a neglected cause of head injury that needs to be addressed.

**Key words:** head injury, road traffic accident, violence

## INTRODUCTION

Head injury and Traumatic Brain Injury (TBI) are among the most common causes of morbidity and mortality in the world (1). In USA, in 2010, about 2.5 million emergency department (ED) visits, hospitalizations, or deaths were associated with TBI-either alone or in combination with other injuries, and it has contributed to the death of more than 50,000 people (2).

Traumatic brain injury, according to the World Health Organization, will surpass many diseases as the major cause of death and disability by the year 2020. Worldwide, it is estimated that 10 million people are affected annually by TBI. TBI imposes a significant burden of mortality and morbidity on society. This makes TBI a pressing public health and medical problem (2).

Even if the burden of TBI is found throughout the world, it is especially prominent in Low and Middle Income Countries. Countries in Sub-Saharan Africa are one of the most commonly affected by traumatic brain injury. These countries lack an adequately prepared health system to address the health outcomes associated with TBI. The global rate of TBI is estimated as 106 per 100,000 and the incidence rate in sub-Saharan Africa is estimated to be 150 to 170 per 100,000 (2).

Head injury is one of the most common reasons for emergency outpatient (OPD) visits in Ethiopia too. Previous research conducted in Ethiopia and other countries of Africa has shown that trauma and specifically head injury is a major cause of death and disability (3-5). In our experience in the last four years, head injury is the commonest reason for emergency OPD visit and it is the commonest cause of death in our monthly mortality reporting sessions. We also have the experience that the majority of surgical patients admitted to intensive care unit (ICU) are head injury patients.

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It has been shown many times that head injury patients in low income countries suffer for many reasons (3, 4, 6). The pre-hospital care is poor, literally nonexistent. The Ethiopian situation of head injury is almost the same as that of any of the low income countries in the world. Anecdotal evidence has shown that most of the patients with severe head injury have often already aspirated by the time they reach the hospital and respiratory failure seems to be the common cause of death in these patients. The other factor is the lack of a well prepared setup for neurosurgical intervention. In Ethiopia, there are only two centers, both located in the capital city, that provide neurosurgical care and have neurosurgeons (7). So, the majority of head injury patients are first seen by nurses or if they are lucky by General Practitioners; and if at all they are managed, they are managed mostly by General Surgeons after referral to centers where there is General Surgery care. This can make the outcome of head injuries worse. Few studies have been conducted to show the burden of head injury in terms of epidemiology, management and outcome.

Head injury usually affects males more than females and young adults are usually affected. This is true in both developed countries (8-11) and resource limited countries like ours. Some studies done in the West have found out that TBI are associated with low socio economic status (9).

Even though there is some research done in Ethiopia on head injury, no such study has ever been done in this part of the country. Ayder referral hospital is a university hospital with 400 beds. The surgical department has 70 beds. At the time of the study there were 10 General surgeons who also operated on head injuries. This study was conducted to determine the pattern of head injuries (traumatic brain injuries) in patients admitted to surgical wards.

## PATIENTS AND METHODS

A record review was conducted on patients who were admitted to the surgical wards and ICU of Ayder referral Hospital during the study period, which is from January 1, 2011 up to December 31, 2014. A structured questionnaire containing parts for demographic data (age, ethnic background, education) and data pertinent to head injury (duration, cause, diagnosis, Severity, type of intervention done, length of hospital stay, and outcome of treatment: death or survival) was used to gather the data from medical records. All patients who were listed in the admission log book with a diagnosis of head injury were in-

cluded in the study and patients with incomplete medical record lacking information about the cause and type of trauma and management plan and patients who consulted more than once for the same complaint were excluded.

All research instruments were pre-tested in non-study area (Mekele Hospital). Based on the results of the pretest, the materials were revised. Data collectors received training on data collection techniques and information gathering from medical records. Data were collected under the supervision of the investigators. Prior to analysis, accuracy of data was verified by entering data twice. Some outliers and missing values were cross checked and data were cleaned. Data were entered using Epi-info 2008 version 3.5 and data cleaning, recoding and analysis were done using SPSS (version 16.0).

**Ethical Considerations:** Ethical clearance to conduct the study was obtained from the Research and Community Service Council Ethical review board, College of Health Sciences, Mekele University. Permission was secured from the hospital where study subjects were recruited. The hospital administration was informed about the purpose of the study, anticipated benefits, selection criteria, and data collection procedures.

The information from the medical record was kept confidential, only the data collectors had access to patient information pertaining to the topic of interest. When labeling information exists within the data collected, it was made anonymous by removing the labels and coding during transcribing the data.

## RESULTS

A total of 750 records were analyzed. The gender distribution is 598 male to 152 female, making the male to female ratio 4:1. The most commonly affected age group was from 6-25 years (43.2 %) (Figure 1). A total of 422/750 (56.3 %) of the head injury patients came from the urban area. Among these, 26.2% (196/750) were from Mekelle, the city where the referral hospital is found; 22.4% (168/750) were from the eastern zone). (Table 1) There was no significant association between place of residence and head injury. On presentation, 62.1% of the patients had mild head injury, 24.3% moderate and 13.6% had severe head injury. The mean time taken for the patient to arrive for intervention was found to be 96 hours, and the median was 24 hours. But the mean time taken for the patient to arrive to the hospital in severe head injury was 54.7 hours, and the median was 10 hours.

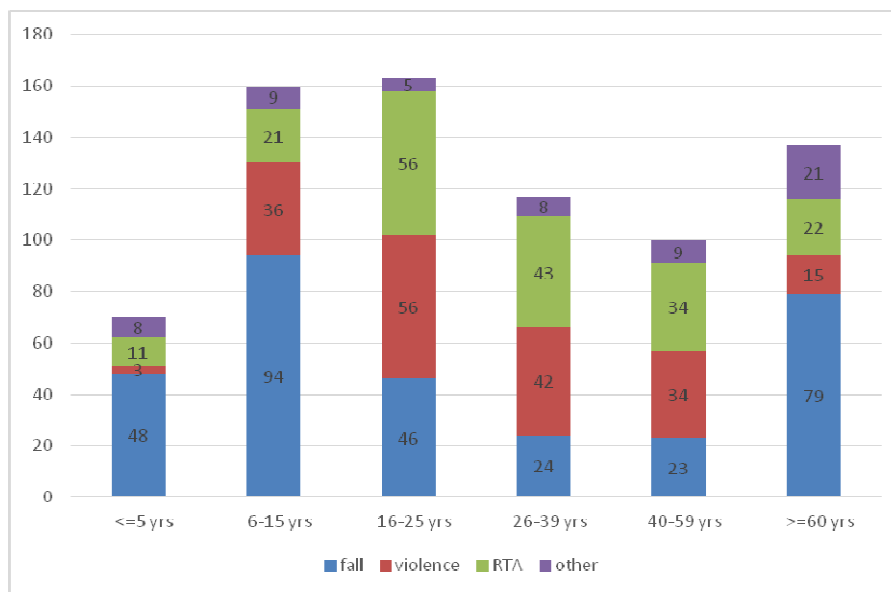


Figure 1. Distribution of admissions due to head injury by age and cause, Ayder Hospital (2011-2014)

Table 1a: Characteristics of the patients admitted to Ayder Hospital due to head injury (2011-2014)

Variable	Number (%)
<b>Residence</b>	
Rural	328(43.7)
Urban	422(56.3)
<b>Sex</b>	
Female	152(20.3)
Male	598(79.7)
<b>Age group</b>	
≤5 yrs	70(9.4)
6-15 yrs	160(21.4)
16-25 yrs	163(21.8)
26-39 yrs	117(15.7)
40-59 yrs	100(13.4)
≥60 yrs	137(18.3)
<b>Diagnosis at the time of admission</b>	
Concussion	17(2.3)
Cerebral laceration and contusion	210(28.0)
Subdural Hematoma	159(21.2)
Epidural Hematoma	69(9.2)
Intracerebral Bleeding	11(1.5)
fracture of vault of skull	81(10.8)
Depressed Skull Fracture	149(19.9)
Basal skull Fracture	91(12.1)
Compound skull fracture	31(4.1)
<b>Glasgow Coma Scale (GCS) on admission</b>	
Mild	466 (62.1)
Moderate	182 (24.3)
Severe	102 (13.6)

Table 1b

Variable	Number (%)
Causes of the Head injury	
Fall down Accident	313(41.7)
Interpersonal violence	186(24.8)
No history of trauma	27(3.6)
Other	37(4.9)
Road Traffic Accident	187(24.9)
Road traffic accident	
Pedestrian	102(54.5)
Vehicle occupant	85(45.5)
Skull X-ray was done	
Yes	500(66.8)
No	249(33.2)
CT scan done	
No	296(39.5)
Yes	453(60.5)
Where was the patient first admitted	
ICU	94(12.5)
Ward	656(87.5)
Type of surgery	
Burr Hole	138(18.4)
Craniotomy	24(3.2)
DSF Elevation	77(10.3)
Not Done	499(66.5)
Other	12(1.6)
Outcome	
Died	62(8.3)
Discharged	605(80.7)
Left against medical advice	62(8.3)
Absconded (left without signing on chart)	21(2.8)

A total of 12.5% patients were admitted to the ICU, and the average length of ICU stay was 6 days. The rest 87.5% were admitted to the wards, and the average length of stay in the wards was 7 days. The causes of the head injury could be fall down accident 41.9%, Interpersonal violence 24.8%, road traffic accident (RTA) 24.9%, and the other causes of injury which include firearm, object falling on the head, and those with no history of trauma comprises 4.9%. (Table 2; Figure 2). Of the 187 RTA cases 102 were pedestrians and 84 were vehicle occupants.

Depressed skull fracture was observed to occur more in interpersonal violence (72 of 186 which is 48%) than RTA (10.7%) and Fall down accident (36.2%). Fracture of the vault of the skull was found more in fall down accidents (56.8%) than in interpersonal violence (27.2%) and RTA (16%). Epidural hematoma was found in fall down accident, RTA and interpersonal violence in 36.2%, 24.6% and 34.8%, respectively. The majority of the subdural hematoma were caused by fall down accident (48.4 %) than in Interpersonal violence (15.1 %) or RTA (16.4 %) (Table 2).

Skull X-ray was used for 33.2% (249) patients; while CT scan was done for 60.5% (453) patients. Skull vault fracture was found in 10.8% of patients (81),

19.9 % (149) of patients had depressed skull fracture, 12.1% (91) had basal skull fracture, 28% (210) had cerebral laceration and contusion. The median time of arrival to the hospital for all injuries was 24 hours. In 21.8% (164) of patients, no imaging result was found. In 44.9% (337) of patients, only CT scan was done, and for 15.5% (116) both X-ray and CT scan was done.

Trauma incidence was found to have no association with seasons and months. Out of the 102 severe head injury patients, 39 were diagnosed to have aspiration pneumonia. In addition, 33.1% (248) of patients had an associated injury and 12.8% (96) had fracture of the limbs; 29.1% (223) of patients had focal neurological deficit, out of whom 13.3 % (100) had hemiparesis, 7.5%(56) speech disorder, and 5.9%(44) seizure disorder.

No significant relationship was observed between GCS level and occurrence of focal neurological deficits. Time of intervention was tried to be documented, but 505 (67.3%) of the records did not document the time of intervention. Two hundred fifty-one patients (33.5%) had undergone surgery; no surgical intervention was done on the remaining 66.5% (499) of patients. Burr hole was done in 18.4% (138), DSF elevation in 10.4% (78), Craniotomy in 3.2% (24).

Table 2: Cause of head injury versus background characteristics, Ayder Hospital (2011-2014)

	Cause of head injury-N (%)				p-value
	Fall down	Interpersonal	RTA	Other	
<b>Residence</b>					
Rural	143(43.6)	93(28.4)	67(20.4)	25(7.6)	0.036
Urban	171(40.5)	93(22.0)	120(28.4)	38(9.0)	
<b>Sex</b>					
Female	89(58.6)	17(11.2)	33(21.7)	13(8.5)	0.000
Male	225(37.6)	169(28.3)	154(25.8)	50(8.4)	
<b>Age group</b>					
<=5 yrs	48(68.6)	3(4.3)	11(15.7)	8(11.4)	0.000
6-15 yrs	94(58.8)	36(22.5)	21(13.1)	9(5.6)	
16-25 yrs	46(28.2)	56(34.4)	56(34.4)	5(3.1)	
26-39 yrs	24(20.5)	42(35.9)	43(36.8)	8(6.8)	
40-59 yrs	23(23.0)	34(34.0)	34(34.0)	9(9.0)	
>=60 yrs	79(57.7)	15(10.9)	22(16.1)	21(15.3)	
<b>Diagnosis</b>					
Skull Vault Fracture	46 (56.8)	22 (27.2)	13 (16)	0	0.003
Depressed skull fracture	54 (36.2)	73 (49.1)	16 (10.7)	6 (4)	0.000
Basal Skull fracture	41 (45.1)	12 (13.2)	34 (37.4)	4 (4.4)	0.003
Compound skull fracture	8 (25.8)	20 (64.5)	2 (6.5)	1 (3.2)	0.000
Cerebral Contusion	75 (35.7)	68 (32.4)	59 (28.1)	8 (3.8)	0.001
Subdural hematoma	77 (48.4)	24 (15.1)	16 (16.4)	32(20.1)	0.000
Epidural hematoma	25 (36.2)	24 (34.8)	17 (24.6)	3 (4.3)	0.233
<b>Where was the patient admitted to</b>					
ICU	38(40.4)	16(17.0)	33(35.1)	7(7.4)	0.064
Ward	276(42.1)	170(25.9)	154(23.5)	56(8.5)	
<b>Type of surgery done</b>					
Burr Hole	71(51.4)	22(15.9)	16(11.6)	29(21.0)	0.000
Craniotomy	12(50.0)	6(25.0)	5(20.8)	1(4.2)	
DSF Elevation	36(46.2)	36(46.2)	5(6.4)	1(1.3)	
Not Done	190(38.1)	122(24.4)	158(31.7)	29(5.8)	
Other	4(44.4)	0(0.0)	2(24.9)	3(33.3)	
<b>Outcome</b>					
Died	15(24.2)	7(11.3)	37(59.7)	3(4.8)	0.000
Discharged	254(42.0)	162(26.8)	137(22.6)	52(8.6)	
Left against advice	33(53.2)	14(22.6)	7(11.3)	8(12.9)	
Absconded	12(57.1)	3(14.3)	6(28.6)	0(0.0)	
<b>Severity (GCS)</b>					
Severe	35 (34.3)	19 (18.6%)	42(41.2%)	6 (5.8)	
Moderate	93 (51.1)	28 (15.4)	42 (23.1)	19 (10.4)	
Mild	185 (39.7)	139 (29.8)	103 (22.1)	39 (8.3)	

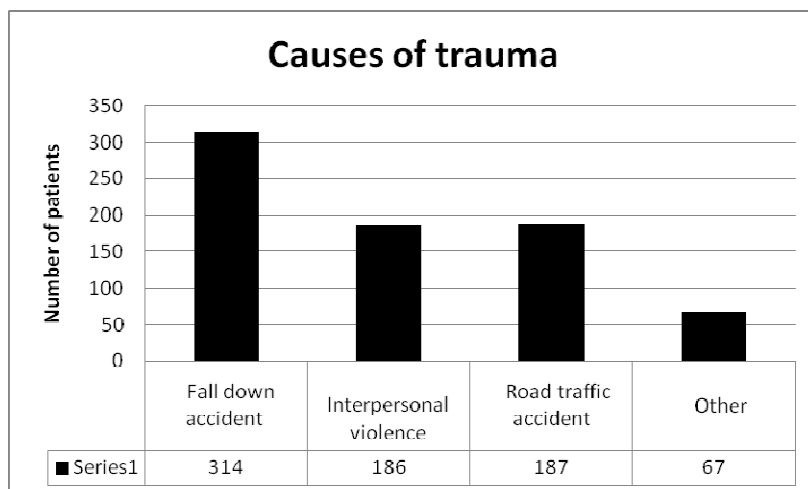


Figure 2: Causes of trauma

When we see the outcomes of injury and treatment, 80.7% (605) were discharged improved, 8.3% (62) left against medical advice, and 8.3% (62) died. Of the 62 who died 90% (56) were males. With regard to the specific causes; 37(19.8%) out of the 187 RTA had died, 15 of the 313 (4.8%) who sustained fall down accidents had died, and 7 of the 186 (3.8%)

interpersonal violence died. (Table 3 & 4) RTA contributed to 60% of the total deaths. Of all the 62 who died, 2(<1%) had mild head injury, 12(6.6%) had moderate head injury and 42 (47%) had severe head injury. Aspiration pneumonia was diagnosed in 31 of the 62 (50%) patients who died of head injury.

Table 3. Cause and severity of the injury

GCS	Fall down	Interpersonal	RTA	Other	Total
14 & 15	185 39.70 %	139 29.83%	103 22.10%	39 8.37%	466 100.00
9-13	93 51.10%	28 15.38 %	42 23.08%	19 10.44%	182 100.00
<=8	35 34.31 %	19 18.63%	42 41.18 %	6 5.88 %	102 100.00
Total	313 41.73 %	186 24.80 %	187 24.93 %	64 8.53%	750 100.00

Pearson  $\chi^2(6) = 32.6282$  Pr = 0.000

GCS = Glasgow Coma Scale, RTA = road traffic accident.

Table 4. Outcome versus severity of injury

GCS	Outcome (number and %)				
	Died	Discharged	Left AMA	absconded	Total
14 & 15	(N) 2	410	37	17	466
	(%) 0.43	87.98	7.94	3.65	100.00
9-13	(N) 12	151	16	3	182
	(%) 6.59	82.97	8.79	1.65	100.00
<=8	(N) 48	44	9	1	102
	(%) 47.06	43.14	8.82	0.98	100.00
Total	(N) 62	605	62	21	750
	(%) 8.27	80.67	8.27	2.80	100.00

Pearson  $\chi^2(6) = 245.3649$  Pr = 0.000 Left AMA = Left against medical advice

## DISCUSSION

The study has revealed that there is significant burden of head injury in the study area. Young males were found to be affected more often. A similar finding has been reported in many previous studies (2, 3, 6, 12). This might be attributed to the existing culture that males are mainly engaged in outdoor activities including work and social gathering while the women spend most of their time indoors, and may have limited outdoor activity. Males may travel more and show more aggressive behavior which leads them to be involved in fighting and road traffic accidents. The commonest cause for head injury was found to be fall down accident. Previous studies in other countries had shown similar observations (13). Fall down has been identified as the main cause of head injury in children under 15 and above 60 years of age. Other studies also showed that fall down accidents are associated with the extreme age groups (less than 4 and more than 65 years) most of which are domestic accidents (14, 15,16). Fall down accident can also be work related. Though much focus is given to Road Traffic accident, as interpersonal violence and fall down accidents have also been found to be the causes for head injury attention should be given to them by the government.

The second most common cause for head injury in this study was found to be interpersonal violence. Violence has been related to poverty and substance abuse including alcohol. This needs further study as it turns out to be another important cause of injury. In the study done in Jimma, the two most common causes of injury were fighting (38.5%) and RTA (36.5%) (4). A study in South Africa showed that interpersonal violence was a more common cause of injury in blacks than among whites (6). Even if RTA has been identified as an important cause of injury, interpersonal violence is seemingly neglected although it is contributing to a significant amount of head injury in Africa, and also in Ethiopia.

The time required for a trauma patient to arrive to the health facility for intervention was very long. The mean cannot be taken as a good indicator since the graph of distribution is negatively skewed with 3 or 4 outliers. But still, the median which is 24 hours for a

trauma patient to arrive to the hospital is too long to intervene. Even the patients with severe head trauma took 10 hours to arrive to the hospital. That is probably why aspiration pneumonia was found to be significantly high in patients with severe head injury. With nonexistent pre-hospital care, this can tell us that many preventable deaths from head injury are occurring in the field. This delay can be explained by the distance to the health care facility, as there is only one such facility in 500 km diameter, the other can be because of the limited availability of transport.

The severity of the head injury in the admitted patients was 62.1%, 24.3% and 13.6% ( in the ratio of 4.6: 1.8:1). In Europe, the ratio is found to be 22: 1.5: 1 for mild vs. moderate vs. severe cases, respectively (8). This shows that we are having a significantly high proportion of severe head injury patients among our admissions. The proportion of incidence of severe head injury can be higher than this as many more may have died before coming to this hospital given the nonexistent pre-hospital care, and this study reported only those who arrived at this hospital alive and were admitted. Road traffic accident was found to cause the majority of the severe head injuries, followed by fall accident.

Mortality is associated with the severity of the head injury. Road traffic accident is also found to contribute to most of the deaths. This is also the case in other studies conducted previously (13). Overall mortality was found to be 21.2% and mortality in severe head injury was 57.9% in a study done in Jimma (5), and this is comparable with reports from different countries (12, 17, 18, 19).

**Conclusions:** Head injury is one of the most common preventable ailments affecting our society. It is causing significant mortality and morbidity, mostly to the young and productive members of the society. Due attention should be paid by all responsible bodies including physicians, and the government at large. Establishing a trauma registry would help us have a better summary of events for best decisions and judgment. Solving the documentation problem is a priority considering the increasing incidence of trauma and despite the overwhelming load of work on the few surgeons we have. Future studies should explore the neglected causes of head injury such as interpersonal violence and fall accident.

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