St. Paul's Hospital Millennium Medical College

Common causes and management outcomes of traumatic brain injury among patients presented to AaBET Hospital

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Abstract

Overview: Traumatic brain injury (TBI) is an insult to the brain caused by external forces resulting in impairments in cognitive, physical, emotional and behavioral functioning. It is responsible for high rates of morbidity and mortality, constituting an important issue of public health throughout the world. This type of trauma includes a wide spectrum of severity, from injuries that lead the patient to death even before medical attention, to lighter impacts, for which victims seek emergency services. In the European Union countries, generalized injuries are responsible for the largest number of years of life with disability and are one of three major traumatic causes for cost generation to the health system. This study would add basic information about the situation in AaBET hospital and in the country in general helps for making recommendation towards the problem.

Objective: To assess common causes and management outcomes of brain injury during discharge at AaBET hospital in Addis Ababa from July 1, 2016 till December 31, 2016.

Methods and Materials: This study was a retrospective analysis of patients diagnosed with traumatic brain injury and admitted to AaBET hospital from July 01, 2016 to December 31, 2016.Three hundred and fifty six (356) patient's charts was selected. Data was collected from charts of patients in the study population using data collection instrument. Data from charts was entered to SPSS 20.0 analyzed for different socio-demographic variables were done. The result of this research will be presented to SPHMMC department of public health. After its approval, it will be disseminated to different departments of the college and journals.

Results: For this study 356 study subjects were used after sampling methods implemented. Three common Mechanisms of injuries noticed; Road traffic accidents 168(47.2%), Interpersonal fights 145(40.7%), Falling down accidents 36(10.1%). Among study subjects 279 (78.4%) were diagnosed with mild TBI, 41 (11.5%) moderate TBI and 36 (10.1%) with severe TBI. After admission 89(25%) patients developed some of the complications. 33(37%) patients developed Increased ICP, 23(25.8%) had hypotension, 18(20.2%) complicated with hypoxia and 15(16.8%) had some of other complications like amnesia, difficulty of vision, electrolyte abnormalities etc. After admitted and managed accordingly 302(84.8%) patients improved and discharged, 29(9.6%) died, 12(3.3%) admitted to ICU.

Conclusion: From total of 4076 patients seen during the study period 474 were diagnosed with TBI making prevalence of 11.63%. Road traffic accidents, fights, falling down were found commonest causes of TBI. Severity of brain injury, additional diagnosis and other complications developed during hospital stay were found to have significant association with the outcome of TBI patients.

Recommendation: Is recommended that the administrator offices and Road traffic authority should give training to the society and drivers about RTA. It is also recommended to create awareness to the society about outcomes of TBI.

Key words: Road traffic accidents, TBI, Outcome, AaBET hospital

Acronyms and Abbreviations

TBI: Traumatic brain injury

GCS: Glasgow coma scale

ACRM: American College of Rehabilitation Medicine

MTBI: Mild traumatic brain injury

RTA: Road traffic accident

RTI: Road traffic injury

LOC: Loss of consciousness

GOS: Glasgow outcome scale

PTA: Post-traumatic amnesia

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1. Introduction

Traumatic brain injury (TBI) is an insult to the brain caused by external forces resulting in impairments in cognitive, physical, emotional and behavioral functioning [1]. Traumatic brain injury (TBI) is a major public health problem and a leading cause of death worldwide mainly in children and young adults, males sustain TBI more than females. Consistently, around 1.5 million influenced individuals kick the bucket and a few millions get crisis treatment. The vast majority of the weight (90%) is in middle and low income nations [2]. Motor vehicular accident is leading cause of head injury worldwide. World health organization‘s world health day in 2004 was dedicated to road safety. The level of attention to road safety underscores the global burden of road traffic injuries and the need for public health concern towards reducing this epidemic [3].

Glasgow Coma Scale (GCS) was introduced for clinical monitoring following TBI [4], and was subsequently used to grade TBI severity [5]. Inadequacies of GCS for this latter purpose is widely recognized [6, 7], but no clear alternative exists. PTA is an excellent prognostic marker [8], and was incorporated into the criteria for mild TBI by the American College of Rehabilitation Medicine (ACRM) (ACRM, 2013) [9]. However, there is no consensus in the literature for the selection of clinical features for TBI diagnosis and severity grading [10]. There is no standardized nomenclature of TBI subtype, which may be based on the history, clinical features and imaging findings [11].Traditionally, a score of 13-15 indicates mild injury, of 9-12 moderate injury, and a score of 8 or less severe injury [12].

In Canada, data gathered by the Ontario Neurotrauma Foundation in 1997 indicated that 12% of all acute hospital admissions involving injury included a diagnosis of brain injury [1]. Currently, brain injury is the leading cause of death and disability among Canadians under the age of 40; this is more common than heart disease, HIV/AIDS, spinal cord injury and multiple sclerosis combined [13]. In the United States (US), 3.17 million Americans are living with long-term disabilities resulting from TBI [14], and within a global context, traumatic brain injuries are reportedly the leading cause of both mortality and disability in younger individuals [15].

In United States (US), the incidence of head injury at the Emergency Department was recently reported to be 394 per 100,000 people, male: female ratio was 1.8:1 and mortality rate 19.3 per100, 000 people. The leading causes of TBI in US were reported as fall (28%), motor vehicular traffic accident (20%) and assault (11%)[16].

The highest incidence of motor vehicular traffic accident was found in the 15-19 year group, while fall was the leading etiology in the 0-4 and >75 year groups. The traffic safety law and preventive measures in the US has reduced road traffic accident whereas fall is on the increase at the extremes of ages. Every year in the month of March, Brain Injury Association of America (BIAA) will conduct a campaigning on brain awareness month and the theme for 2015 to 2017 campaigning is Not Alone [16].

Another study done in the United Kingdom (UK) population on the attendance rate of head injury at an Emergency Department showed that head injury constituted 3.4% of the total attendance and the incidence was 453 per 100,000 [17]. Nearly 11% were moderate to severe head injury, implying that mild head injury (89.1%) was the most common type. Males were found to be at a

higher risk for moderate to severe head injury than females. Thus, even in the regulated systems of the developed countries, head injury is still of special public health concern.

A Study which was conducted in Egypt at Assiut University indicated that, total number of head injured cases were 1331 out of 43,310 total number of trauma patients with an incidence of 3.07%. Head injuries due to road traffic accidents represents 60.9% (810 cases) and 35.8% of cases (290) were in age group between 20- 30 years, followed by the age group between 10-20 (22.2%) and 30- 40 (18.52%), the least affected age group was age greater than 60 (4.9%) and less than 10 (2.5%). Males affected more than females which accounts 85.7% of males and 14.3% of females with a ratio of 6:1 [18].

According to a study conducted in Nigeria, A total of 3282 patients were admitted during the study period of whom 428 (13.0%) had head injuries. There were 342 (79.9%) males and 86 (20.1%) females with males to females ratio of 3.9:1 and incidence was common in age between 21- 30 years (n=145, 33.8%), while the least were those between 71-80 years (n=3, 0.7%). Road traffic accidents (RTAs) were the most common cause of injury accounting for 307 (71.7%) patient. According to this study, severity of head injury on Glasgow coma scale indicated that majority of patients suffered mild head injury (277, 64.7%), 58 (13.6%) suffered moderate head injury, while 93 (21.7%) sustained severe head injury [19].

In Ethiopia, a prospective study was conducted in Jimma University Specialized Hospital. All head injury patients presented to Jimma University Specialized Hospital between March and June 2010 were included in this prospective research. Out of 52 patients, 47 were males. The median age was 20.0 years (SD=13.3). Fights (n=20, 38.5%) and road traffic accidents (n=19, 36.5%) were the most common causes of head injury. Half of the patients sustained mild and 36.5% sustained severe head injury. The initial GCS had a significant correlation with the outcome. The mortality rate was 21.2%. Of all patients 76.9% were managed conservatively [20].

Another study was conducted at JUTH, Jimma town, South West Ethiopia, from January 01, 2014 to December 30, 2014. Out of 135 patients, 121 (89.6%) were males and the remaining 14 (10.4%) were females. The mean age was 30.34 years (SD=14.01). Interpersonal violence 73 (54.1%) and road traffic accidents 42 (31.1%) were the most common causes of head injury. More than half of the patients sustained mild head injury which accounts 87 (64.4%) and 20 (14.8%) sustained severe head injury. The initial GCS had a significant correlation with the outcome and of all patients 98 (73%) were managed conservatively [21].

TBI is a major public health problem worldwide, any measure that would reduce mortality or morbidity associated with this injury even slightly could translate into very significant benefit in human and economic term [22].

TBI is responsible for high rates of morbidity and mortality, constituting an important issue of public health throughout the world. This type of trauma includes a wide spectrum of severity, from injuries that lead the patient to death even before medical attention, to lighter impacts, for which victims seek emergency services [23].

Only in the United States, there is a registered average of 1.7 million annual calls related to general trauma, causing 15% of all hospitalizations in the country and 30% of deaths by external causes.

In the European Union countries, generalized injuries are responsible for the largest number of years of life with disability and are one of three major traumatic causes for cost generation to the health system [24].

The World Health Organization (WHO) global burden of injury estimate ranks injury among the top ten leading causes of death, with an estimated **5** million deaths annually of which men in Africa have the highest injury-related mortality rates in the world. Among African nations the rate of injury mortality in 2004 was the highest in Nigeria and the lowest in Egypt. South Africa and Ethiopia were second and third, respectively [25].

In Ethiopia, retrospective, cross sectional study was conducted at JUTH, Jimma town from January 01, 2014 to December 30, 2014. Out of 135 patients, 121 (89.6%) were males and the remaining 14 (10.4%) were females. More than half of the patients sustained mild head injury which accounts 87 (64.4%) and 20 (14.8%) sustained severe head injury [21].

1.1 Significance of the study

Traumatic brain injury (TBI) is one of the most common reasons for emergency department care. Head injuries which are generally unintended and preventable are the common risk health problem to every life that can happen almost to everyone, anywhere. After sustaining the injuries patients could have complications from simple confusion till death, from acute as within minutes till chronic as in life long disabilities.

The study would add understanding on magnitude and factor associated with the outcome of brain injury in the country at large which helps concerned body for planning how to prevent the accident and allocate available resources towards managing best when it occurs.

In addition, the study would provide base line information on magnitude and factor associated with the outcomes of brain injury cases.

The recommendation which would be given after data analysis and interpretation could benefit the public at large in preventing brain injury accidents if due consideration is given.

2. Literature review

2.1 Worldwide situation

Traumatic brain injury (TBI) is an important global public health problem as a major cause of traumatic death and disability. The spectrum of severity of TBI varies, but most TBI is classified as mild traumatic brain injury (MTBI) followed by moderate and severe head injury, based on clinical and surveillance definitions. From a public health perspective, it is important to know the incidence of a condition in order appropriately to plan healthcare policy and provision. Furthermore, determining what factors increase the risk of MTBI is necessary to develop public health programs to prevent the problem and lessen the likelihood of disability [26].

According to a study which was conducted in Korea, a total of 349621 people were injured per year in which 9057 people died within 72 hours after accident and the mortality rate due to MVA is 28 per 100,000 people and from total injury, 68414 victims were head injuries. The mortality rate of the head injury was 9.5% and the total number of death due to head injury was calculated to be 8976 per year and the annual death rate due to head injury was to be 19 per 100,000 populations. According to this study, skull fracture was found in 43% in which operative intervention was required in 28% and the operative mortality rate was 6%. The severity of head injury based on GCS was mild in 73.4%, moderate in 11.4%, and severe in 16.3% [27].

According to study which was conducted in Norway, of 585 head injury patients which were included in the study after evaluation in emergency room, 446(76%) were admitted for hospitalization giving an admission rate of 157 per 100,000 population. This study classifies the distribution of head injury based on GCS and presence or absence of consciousness at time of examination to 492 (84%) mild, 16 (3%) moderate and 77 (13%) severe head injury. Sex specific incidence rates were 258 per 100,000 for males and 156 per 100,000 for females and high age specific incidence rates for men were found in the age group 10-24 years with the peak (428 per 100,000 among teenagers between 15- 19 years). According to this study the causes of head injury were falls in 299 (51%), RTA in 126 (21%), assaults in 81(14%) and other in 79 (14%) cases and male to female ratio was highest for head injury caused by assaults (2.9:1) and lowest for by RTA (1.4:1) [28].

A Study which was conducted on hospitalized and fatal head injuries in Viti Levu, Fiji, during the 12-month injury surveillance period indicated that Out of 2,233 individuals admitted to hospital as a result of injury, 276 cases (12.4%) had a primary diagnosis of head injury. The overall rate of head injuries was 42.4/100,000 and over three quarters of cases were male and the age-standardized rate for males for all head injuries (60.5/100,000 (95% CI 52.1, 68.8)) was more than three times of the female rate (18.4/100,000 (95% CI 13.7, 23.1); p! 0.001). Head injuries are most commonly occurred among those aged 15–29 years, followed by children aged 0–14 years and least common among older adults (45 years and older). Of the three leading causes of injury, road traffic crashes had the highest rate of head injury (16.1/100,000 (95% CI 13.1, 19.2)), followed by falls (12.0/100,000 (95% CI 9.3, 14.6)) and „hit by person or object“ (10.6/100,000 (95% CI 8.1, 13.1)) [29].

A prospective study which was conducted at Tertiary Care Hospital in India during period between 2011- 2013 on 500 head injury patients indicated that the majority of head injuries are due to Road Traffic Accident 298 (59.60%) cases followed by fall from Height 101 (20.20%) cases. Assault 21 (4.20%) and occupational head injury 79 (15.80%) cases, whereas other like gunshot comprised of 1 (0.20%) cases. The peak incidence of head injury was observed in the age group 21-30 years comprising 45% of the cases and it was also observed that 21% belonged to the age group 31-40 years. Out of 500 cases 383 (76.6%) were males while 117 (23.4%) were females, thus a male to female ratio of 3.27:1 was observed and head injury commonest lesion was Scalp laceration which accounts 251 (50.2%) cases, followed by fractures of skull 83 (16.6%) cases, contusion 53 (10.6%) which is commonest in intra-cranial lesions. SDH 61 (12.2%) was commonest intra- cranial hemorrhage followed by SAH 52 (10.4%) cases. This study also showed that most commonly involved skull fracture in head injury cases were temporal bone 22 cases (26.51%) followed by frontal bone which was 21 cases (25.30%), multiple bone 24 cases (28.92%), parietal bone 12 cases (14.46%) and occipital bone 4 cases (4.82%) [30].

According to another study which was conducted in India on 2850 head injury in which age of the victims varied from 15 – 80 years indicated that the peak incidence was observed in the age group 15 - 24 years comprising 34.46 % of the cases, 22.15 % belonged to the age group 25- 34 years, 56.61 % of cases comprised of age group of 15 - 34 years. Individuals in the age group 65 years and above were the least affected that is 4.21 % of total cases. Out of total cases 2442 (85.68%) were males while 408 (14.31%) were females which shows a male to female ratio of 6:1 and the majority of victims are of road traffic accident 1568 (55.02%) cases followed by assault 646 (22.67%) cases. Fall from height 361 (12.67%) and gunshot were 245 (8.59%) cases, whereas occupational comprised of 30 (1.05%) cases. Skull fracture was seen in 969 (34.0%) individuals out of total 2850 cases and among the intracranial injuries, epidural hemorrhage was the commonest, present in 495 (17.36%) cases and subdural hemorrhage present in 217 (7.6%) cases, followed by subarachnoid hemorrhage in 102 (3.50%) cases and Contusions of the brain parenchyma were present in 325 (11.4%) cases [31].

2.2 Africa situation

A Study which was conducted in Egypt at Assiut University indicated that, total number of head injured cases were 1331 out of 43,310 total number of trauma patients with an incidence of 3.07%. Head injuries due to road traffic accidents represents 60.9% (810 cases) and 35.8% of cases (290) were in age group between 20- 30 years, followed by the age group between 10-20 (22.2%) and 30- 40 (18.52%), the least affected age group was age greater than 60 (4.9%) and less than 10 (2.5%). Males affected more than females which accounts 85.7% of males and 14.3% of females with a ratio of 6:1 [18].

In 1100 (83%) patients out of 1331, head injury was associated with major bone fracture in other body regions and 231 (17%) were pure head injuries. 182 (79%) of patients with pure head injuries were due to road traffic accidents, 43 (24%) of them had lacerated wounds in the scalp and the radiological examination revealed nothing. The remaining patients 139 (64%), the radiological findings varied from skull fracture (36.7%), brain contusion (28.7%), and hematoma (23%) and diffuse brain injury (33.1%). Patients with radiological findings (139) were classified according to

Glasgow Coma Scale (GCS) into: severe (GCS < 8) which accounts (32%), moderate (GCS 9-12) accounts 22% and mild (GCS 13-15) accounts 46%. Complete recovery occurred in 93.7% of cases with GCS 13-15 while recovery was not recorded among patients with GCS < 8. Death occurred in 66.6% of patients with GCS < 8 and 3.3% in GCS 9-12 [18].

According to a study conducted in Nigeria, A total of 3282 patients were admitted during the study period of whom 428 (13.0%) had head injuries. There were 342 (79.9%) males and 86 (20.1%) females with males to females ratio of 3.9:1 and incidence was common in age between 21- 30 years (n=145, 33.8%), while the least were those between 71-80 years (n=3, 0.7%). Road traffic accidents (RTAs) were the most common cause of injury accounting for 307 (71.7%) patient. 244 (57.0%) had associated injuries along with head injury of which fractures were the majority (n=93, 21.7%) and with skull fracture being the most common (n=27, 26.5%). Lacerations, abrasions and other blunt injuries also made up a significant portion of injuries (n=52, 12.1%), followed by intra cerebral/ subdural hemorrhages (n=13, 3.0%) (18). According to this study, severity of head injury on Glasgow coma scale indicated that majority of patients suffered mild head injury (277, 64.7%), 58 (13.6%) suffered moderate head injury, while 93 (21.7%) sustained severe head injury. A total of 194 (45.3%) patients presented with history of loss of consciousness (LOC) with duration of less than 1 hour in 46 (23.6%) patients, 1 hour to 24 hours in 62 (31.8%) patients and greater than 24 hours in 87 (44.6%) [19].

2.3 Ethiopia situation

According to the study which was conducted at JUSH which is Four (4) month Prospective study, on 52 head injury patients indicated, female to male ratio was 1:9 and Interpersonal fight (n=20, 38.5%) and traffic Accidents (n=19, 36.5%) accounted for most of the injuries. Of all injuries, 15.4% (n=8) were due to falling accidents mainly in children and distribution of the severity of injury measured with the initial Glasgow Coma Score (GCS) indicates that 37 (71%) of all patients were discharged with a good recovery Glasgow Outcome Scale (GOS) 5, 7.7% with a disability and 21.2% died and All patients with initial GCS greater than 6 survived where as almost all patients with initial GCS 6 and less were died and Patients with both non-reactive pupils at the initial examination died in 87.5% of cases [20].

This study also showed patients who sustained injury from fight or fall were more likely to have an outcome with good recovery (GOS 5) compared to patients with road traffic injury (RTI) or other causes. Only 10% of the patients who sustained injury from interpersonal fight had an initial GCS below 9 compared to 52.6% in RTI patients. In this study, 40 (77%) of all patients were managed conservatively. Twenty-seven (27) patients had a skull x-ray which showed a fracture in 15 cases and nineteen (19) patients had no skull x-ray done. Median initial GCS of the patients that had visible skull fractures on the x-rays was 13 and patients who underwent no skull x-ray had a median initial GCS of 10 [20].

3. Objectives of the study

3.1 General objective

To assess common cause and management outcomes of traumatic brain injury during discharge at AaBET hospital in Addis Ababa from July 1, 2016 till December 31, 2016.

3.2 Specific objectives

-To determine common causes of traumatic brain injury among patients presented to AaBET hospital.

-To evaluate management outcomes of patients with traumatic brain injury during discharge or referral among patients presented to AaBET hospital.

4. Research methods and materials

4.1 Study area

The study was conducted at AaBET hospital found in Arada subcity, Addis Ababa Town, Ethiopia. AaBET stands for Addis Ababa burn emergency and trauma center. It's one of many semi-independent institutions under St, paul's Hospital Millennium Medical College parenthood. AaBET provide comprehensive emergency care in emergency medicine, critical care, orthopedics, neurosurgery and forensic medical services. It also has physiotherapy and other supportive functions including 24 hour high quality laboratory and imaging support. At a total capacity of 250 beds, they can serve 50-60 emergency patients at a time at the emergency plus 12 ICU bed capacity.

AaBET is led by a CEO, with four main chiefs i.e. chief of academic affairs, chief of patient flow and quality, chief of hospital affairs and chief of business and development.

Figure 1: Google map of AaBET Hospital route

4.2 Study period

The data was collected from patient charts sampled in the period from January 01 to December 31 2016.

4.3 Source Population

Source Population: All patients who were seen at AaBET hospital, from July 01, 2016 to December 31, 2016.
Study Population: All patients diagnosed to have brain injury after coming to AaBET hospital that fulfilled inclusion criteria, from July 01, 2016 to December 31, 2016.

4.4 Study Design

A retrospective descriptive chart review was conducted.

4.5 Sample size determination

Using the standard formula for determination of sample size the sample size is calculated.

$$n=\frac{Z_{1/2}^2 p(1-p)}{d^2}$$

Where p-prevalence (Taking 50% prevalence)

$Z_{1/2}$-Confidence interval (95%)

d= Margin of error (5%)

Using the data above the sample size will be 384. Since the population size of this study subjects are less than 10000 adjustment are made. The total sample size during the study period was 4076.

$$n_f = \frac{n}{[1+ n/N]} = \frac{384}{[1+384/4076]} = 356.$$

4.6 Sampling methods

Simple random sampling technique was used. Sample frame was made from logbook ,then numerical code was given for their card number then computer generated random sample selection were done to get a total sample size of 356. The researcher retrieved files of the randomly selected patients with TBI from record unit of AaBET hospital.

4.7 Variables

4.7.1 Dependent variables

- Management outcomes of the brain injury
- Sequel of traumatic brain injury

4.7.2 Independent variable

- Socio demographic variables

✓ Age

✓ Sex

✓ Residence

- Mechanism of head injury
- Severity of brain injury
- Complications of brain injury
- Management of brain injury

4.8 Data Management

4.8.1 Data collection

Data were collected from charts of patients selected from the study population. Data were collected by the primary investigator and collaborators.

4.8.2 Data quality

Questionnaire was first prepared in English language by the investigator and later data collected from patient charts accordingly. Prior to the actual data collection questionnaire was tested on five percent of similar population.

Data collectors were the investigator and two other health professionals who were oriented on the research before the data collection.

During the actual data collection process investigator was cross checking the data on randomly selected patient charts every day for validity and reliability of data.

4.8.3 Data entry and analysis

Completeness and accuracy of raw data from charts was checked every day before entry. Data from charts entered to SPSS 20.0. Descriptive analysis was done for different socio-demographic variables was done. Cross tabulation and chi square analysis for possible association for different possible risk factors with TBI was done. A p-value less than 0.05 was considered statistically significant.

4.9 Inclusion and Exclusion criteria

Inclusion criteria

All selected head injury records of patients visited AaBET hospital whose age is above 12 years will be included in the study.

Exclusion criteria

-Brain injury Patients chart that has inadequate data (greater than 20% incomplete) were excluded.
-Brain injury patient's charts which are lost from record office due to consultation, transfer or any other medical reason at the time of data collection were excluded.

-Brain injury patients who are died at arrival were excluded

4.10 Operational definitions and definition of terms

Head injury- physical damage/ structural change to the scalp or skull due to any type of external

Traumatic brain injury (TBI) - alteration in brain function which is manifest as confusion, altered level of consciousness, coma, seizure, and etc.

GCS- Glasgow coma scale used for assessing the neurological status of the patient.

Trauma- any serious injury to the body often resulting from violence or an accident.

Mild brain injury- an injury to the head when Glasgow coma scale is between 13 and 15.

Moderate brain injury- an injury to the head when Glasgow coma scales between 9 and 13.

Severe brain injury- an injury to the head when Glasgow coma scale is less than or equal to 8.

4.11 Ethical considerations

The data collection of this research proposal was started after it get permission from SPHMMC department of public health. Data was, then, be collected from the record office by showing the letter of permission. Since taking the patients chart outside record office was difficult data collection was done by staying there after being told charts may be needed anytime due to medicolegal cases. The data was seen only by the researcher and collaborators which are also medical professionals. The charts will be used only for the purpose of this research and not for any other use.

4.12 Dissemination plan

The result of this study will be defended to St. Paul hospital millennium medical college, department of Public health, and the finding will be disseminated to concerned bodies such as service providers, policy makers and other concerned stake holders

5. Results

5.1 Socio-demographic data

From total of 4076 patients admitted to Aabet hospital in period from July 01, 2016 to December 31, 2016, 474 are Traumatic brain injury patients with prevalence rate of 11.63%. From total, 356 Traumatic brain injury patients were included in this study of which 306 (86%) were males and 50 (14%) were females. The mean age in years was 28.5 and standard deviation was 11.077. Male to female ratio was 6.12:1. The highest numbers of patients were in the age interval of 13-25 years which comprises 176 (49.4%) followed by 26-38 years which comprises 131 (36.8%), 39-51 years comprises 25 (7%), 52-65 years comprises 11 (3.1%) and above 65 years comprises only 6 (1.7%) head injury patients. Most of the brain injury patients were from Regional states which accounts 208 (58.4%) and the capital city Addis Ababa counts the rest, 148 (41.6%).

Table 1: Socio-demographic data of Traumatic brain injury patients for study of Magnitude and factors associated with the outcome of traumatic brain injury during discharge at AaBET hospital from July 01, 2016 to December 31, 2016.

Variables		Frequency	Percent
Age	13-25	176	49.4
	26-38	131	36.8
	39-51	25	7
	52-65	11	3.1
	Above 65	51.7	1.7
Sex	Male	306	86
	Female	50	14
Region	Regional states	208	58.4
	Addis Ababa	148	41.6

Variable	Mean	Median	Mode
Age	28.50	26.00	22

5.2 Mechanism of injury

Regarding mechanism of injury, most of the patients sustained brain injury from RTA comprising 168 (47.2%) of which 121 (72.02%) were mild, 17 (10.11%) were moderate, and 30 (17.85%) were severe head injury followed by Interpersonal fights comprising 145 (40.73%) of which 129 (88.96%) were mild, 14 (9.65%) were moderate and 2 (1.3%) were severe brain injury and falling down comprising 36 (10.1%) of which 22 (61.1%) were mild, 10 (27.7%) were moderate and only 4 (11.1%) was severe brain injury and only 7 (1.96%) patients were sustaining head injury from other mechanism i.e. kicked by animal and hit by the wood or machine injuries.

Table 2: Mechanism of injury for study of Magnitude and factors associated with the outcome of traumatic brain injury during discharge at AaBET hospital from July 01, 2016 to December 31, 2016.

Causes of injury	Frequency	Percent
RTA	168	47.2
Fights	145	40.7
Falling down accidents	36	10.1
Others	7	2.0
Total	356	100.0

5.3 Diagnosis at presentation

At presentation to the AaBET hospital, Traumatic brain injury patients were diagnosed as follows: 172(48.3%) were diagnosed with mild TBI, 34 (9.5%) with mild TBI plus scalp laceration, 25(7%) mild TBI plus depressed skull fracture, 16(4.5%) mild TBI plus basal skull fracture, 16(4.5%) mild TBI plus epidural hemorrhage, 15(4.2%) moderate TBI, 12(3.3%) Severe TBI, 11(3%) mild TBI plus intracerebral hemorrhage and 5(1.4%) with Severe TBI plus subarachinoid hemorrhage.

Table 3: Showing diagnosis at presentation of Traumatic brain injury among patients presented to AaBET hospital from July 01, 2016 to December 31, 2016.

Additional Diagnosis	Severity of TBI diagnosis			Total	Percent
	Mild TBI	Moderate TBI	Severe TBI		
scalp laceration	34	2	4	40	11.2
Basal skull fracture	16	8	4	28	7.9
Depressed skull fracture	25	2	0	27	7.6
Epidural hemorrhage	16	4	1	21	5.9
Subdural hemorrhage	4	4	2	10	2.8
Subarachinoid hemorrhage	1	2	5	8	2.2
Intracerebral hemorrhage	11	4	8	23	6.5
None or none stated	172	15	12	199	55.9
Total	279	41	36	356	100.0

As Regards to sign and symptom of Traumatic brain injury at presentation to Aabet hospital 141(39.6%) were presented with bleeding from head ears and/nose, 130(36.5%) with loss of consciousness, 62(17.4%) with headache, 10(2.8%) with nausea and/or vomiting, 7(2%) with confusion and/abnormal behavior. Few patients were presented with different sign and symptoms which accounts 6(1.7%) of traumatic brain injury patients.

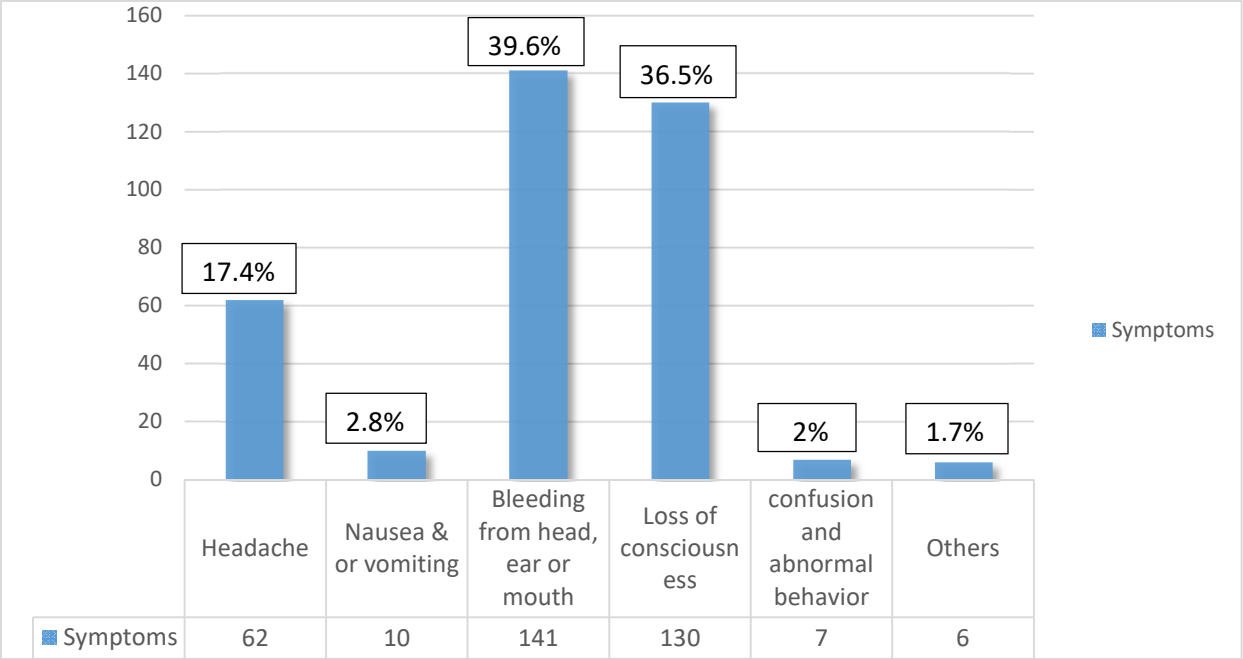

Figure 2**:** Sign and symptom at presentation to AaBET hospital of traumatic brain injury among patients presented to AaBET hospital from July 01, 2016 to December 31, 2016.

5.4 Severity of head injury

The severity of head injury were classified based on GCS score, Out of total 356 traumatic brain injury patients 279 (78.4%) were mild TBI with GCS score of 13-15 of which 244 (87.4%) were males and 35 (12.6%) were females, 41 (11.5%) were moderate TBI with GCS score of 9-12 of which 34 (82.9%) were males and 7 (17.1%) were females and the remaining 36 (10.1%) were severe TBI with GCS of 8 and less of which 28 (77.7%) were males and 8 (22.3%) were females.

Table 4: Severity of brain injury based on GCS score for study of Magnitude and factors associated with the outcome of traumatic brain injury during discharge at AaBET hospital from July 01, 2016 to December 31, 2016

Categories	Diagnosis at admission				
Sex	Mild TBI	Moderate TBI	Severe TBI	Total	Percent
Male	244	34	28	306	86
Female	35	7	8	50	14
Total	279	41	36	356	100
Percent	78.4	11.5	10.1	100	

During stay at the hospital some patients also had secondary diagnosis. From total of 356 brain injury patients, 42 (11.8%) were diagnosed with fracture of other site than the head on the top of TBI, 15(4.2%) were diagnosed with Hemopneumothorax, 14(3.9%) spinal injury, 5(1.4%) Hospital acquired pneumonia, 4(1.1%) with Aspiration pneumonia, 1(0.3%) others. The rest 275(77.2%) had no secondary diagnosis.

Table 5: Showing secondary diagnosis of patients initially diagnosed with TBI among patients presented to AaBET hospital from July 01, 2016 to December 31, 2016.

Secondary diagnosis	Frequency	percent
Fracture	42	11.8
Aspiration pneumonia	4	1.1
Hospiatl acquired Pneumonia	5	1.4
Spinal injury	14	3.9
Hemopneumothorax	15	4.2
Others	1	0.3
None	275	77.2

5.5 Complication of head injury

From the total of 356 brain injury patients, 89 (25%) developed complications. Among those 33(37%) developed increased ICP, 23(25.8%) developed hypotension, 18(20.2%) developed hypoxia, 15(16.8%) developed other complications. But the rest 267(75%) patients did not develop complication.

Table 6: Complications of brain injury in the study of magnitude and factors associated with the outcome brain injury among patients presented to AaBET hospital from July 01, 2016 to December 31, 2016.

Complications	Frequency	Percent
Increased intracranial pressure	33	9.3
Hypotension	23	6.5
Hypoxia	18	5.1
Others	15	4.2
Not developed	267	75.0

5.6 Management of head injury

All of brain injury diagnosed patients were managed accordingly. Among those 343(96.7%) were managed only conservatively while the rest 13(3.7%) were also managed surgically. All patients were managed with analgesics, 126(35.4%) were managed with fluid/crystalloid. 118(33.1%) were managed with antibiotics, 20(5.6%) were transfused with blood, 39(11%) were managed with mannitol and 128(36%) were managed with anticonvulsants.

5.7 Outcomes of head injury

Most of brain injury patients were improved and discharged consisting 302 (84.8%) brain injury patients. Among this 271(89.7%) were diagnosed with mild TBI, 26(8.6%) moderate TBI, and 5(1.6%) severe TBI. From improved & discharged patients 263 (87%) were males and 39 (13%)

were females. 29(9.6%) of TBI patients died in the hospital out of which 22(75.8%) were diagnosed with severe TBI and the rest 7(24.1%) with moderate TBI. In the regard of sex among died patients 20(68.9%) were males and 9(31%) females. A total of 12(3.3%) were transferred to ICU of which 8(66.6%) were diagnosed initially with severe TBI and the rest 4(33.3%) with moderate TBI. From those transferred to ICU 11(91.7%) were males and 1(8.3%) female. 6(1.6%) patients went against medical advice after started on treatment. All of whom were diagnosed with mild TBI and were males. A total of 7(1.9%) patients referred to other health centers for various reasons among which 6(85.7%) were males and 1(14.3%). From transferred patients to other health centers 2(28.5%) were diagnosed with mild TBI,4(57.1%) as moderate TBI and 1(14.2%) as severe TBI.

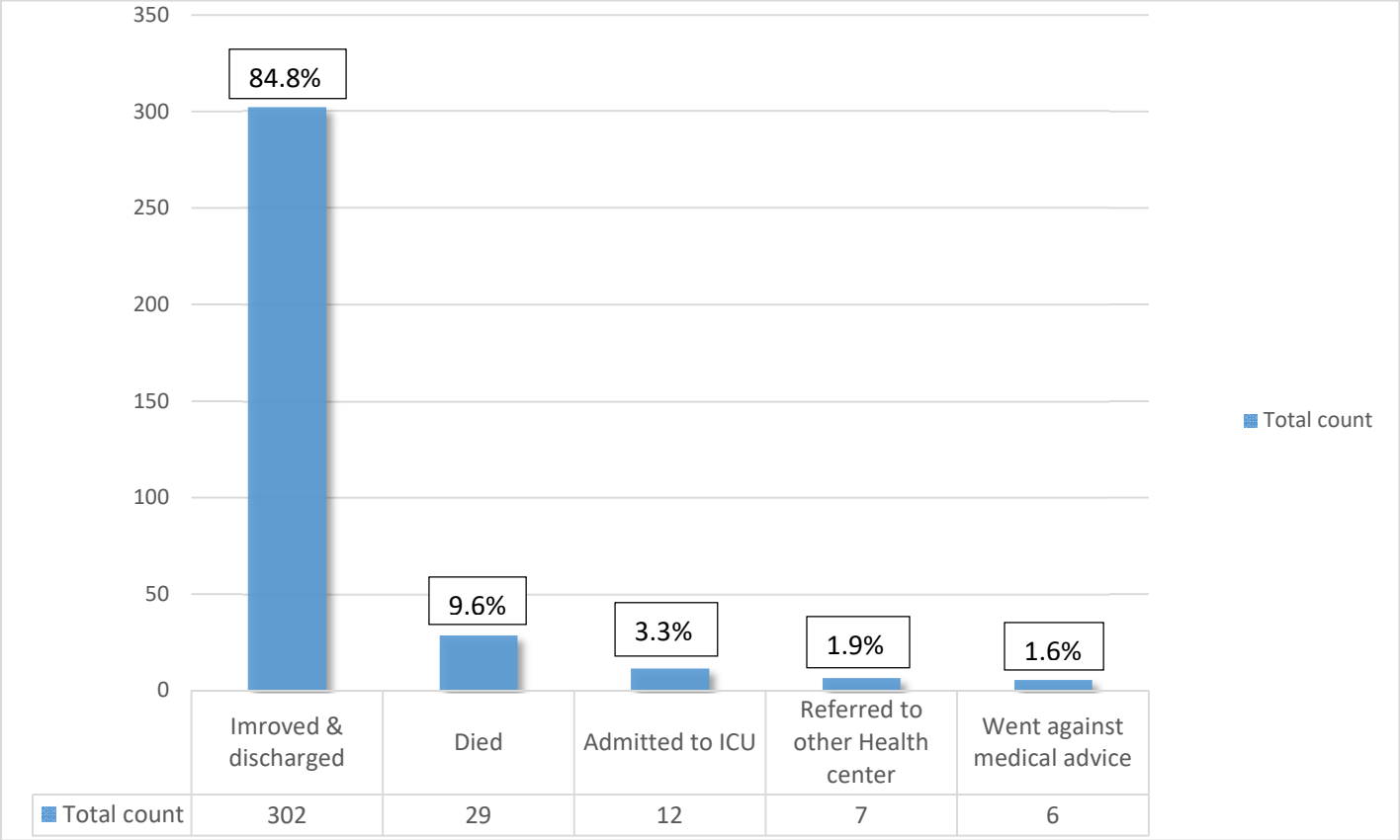

Figure 3: Outcomes of TBI in the study of magnitude and factors associated with the outcome of TBI among patients presented to Aabet hospital from July 01, 2016 to December 30, 2016

5.8 Sequelae Associated with TBI

Some of TBI patients were discharged with different kinds of sequelae. Most common being limb weakness comprising 30(8.4%) patients. Among these 27(90%) were males & 3(10%) were females. Initial diagnosis from discharged patients with limb weakness comprise 14(46.6%) of

mild TBI, 13(43.3%) moderate TBI & 3(10%) severe TBI. 25(7%) were discharged with aphasia and all of them were males & from those 11(44%) were diagnosed with mild TBI, 11(44%) with moderate TBI, and 3(12%) with severe TBI. 9(2.5%) TBI patients were discharged with visual impairment from which all of them were males and 5(55.6%) were admitted with the diagnosis of moderate TBI and 4(44.4%) with severe TBI. 1(0.3%) male patient was discharged with balance disorder. Most of the patients 262(73.6%) had no sequels during discharge associated with TBI from those 224(85.4%) were males and 38(14.6%) were females of which 254(96.9%) of them were admitted with mild TBI, 5(1.9%) of them with moderate TBI and 3(1.1%) with severe TBI. The rest 29(8.1%) died in the hospital out of which 20(68.9%) were males and 9(31.1%) females. Among died patients 22(75.8%) were admitted with severe TBI and the rest 7(24.1%) were admitted with moderate TBI.

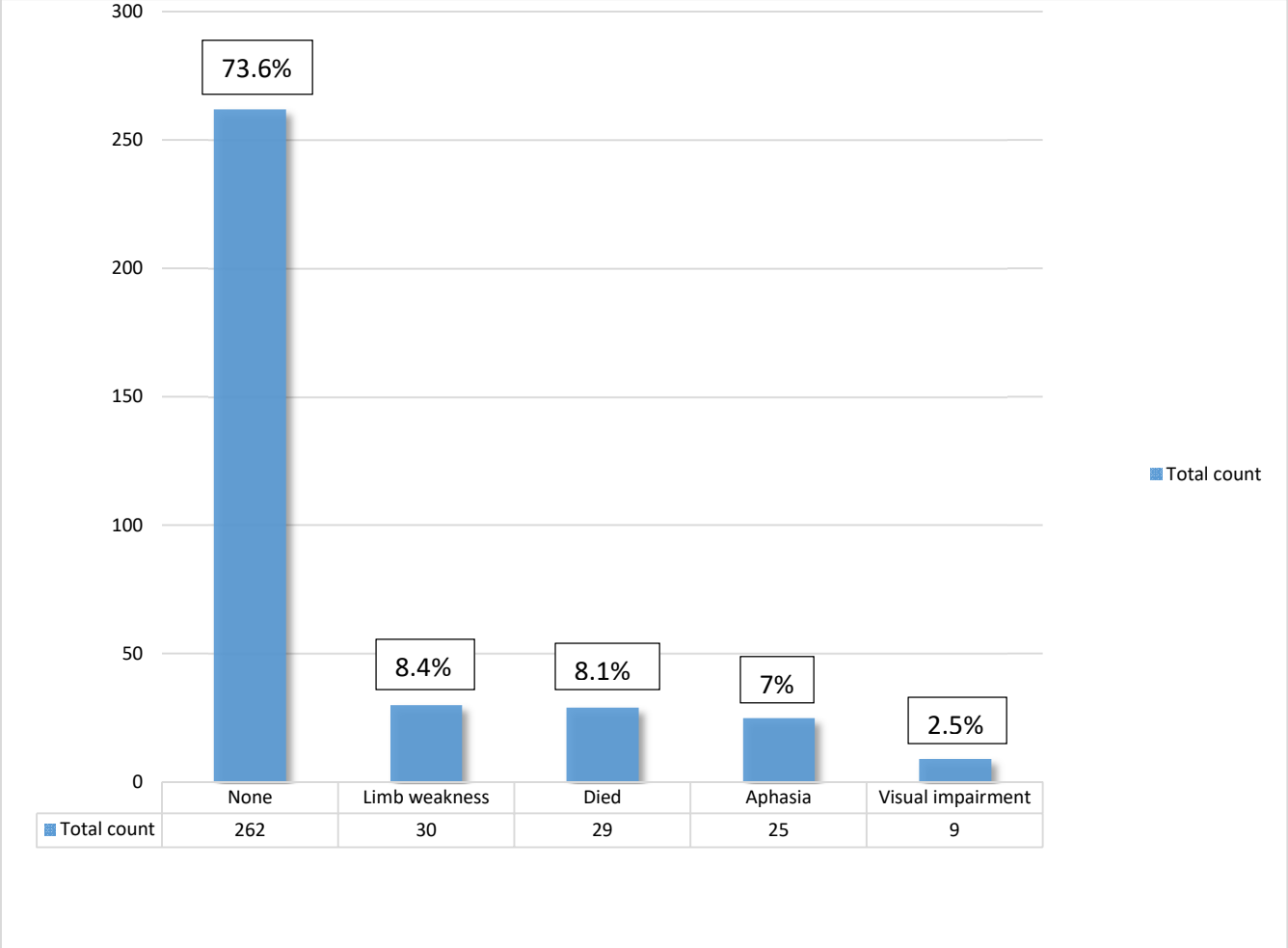

Figure 4: Sequelae of brain injury in the study of magnitude and factors associated with the outcome of brain injury among patients presented to AaBET hospital from July 01, 2016 to December 31, 2016.

Variables	Category	Outcome of TBI		P value	COR (95 % CI)	AOR (95 % CI)
		Improved & discharged	Not improved			
Age	13-25	81.9%	18.1%	0.01	0.04(0.01, 0.39)	3.39(0.16,70.8)
	26-38	93.2%	6.7%		0.01(0.01, 0.13)	0.33(0.02,5.25)
	39-51	74%	26%		0.07(0.01, 0.70)	4.92(0.18,128)
	52-65	91.6%	8.4%		0.01(0.01,0.35)	0.68(0.01,39.0)
	>65	16.6%	83.4%			
Sex	Male	85.9%	14.1%	0.14		
	Female	78%	22%			
Residence	Regional	82.7%	17.3%	0.18		
	A.A	87.8%	12.2%			
Mechanism of Injury	RTA	81.0%	19.0%	0.13		
	Other	88.1%	11.9%			
Diagnosis at admission	Mild TBI	97.1%	2.9%	0.01	0.01(0.01,0.01)	0.02(0.01, 0.24)
	Moderate TBI	63.4%	36.6%		0.09(0.03-0.29)	0.62(0.08 ,4.8)
	Severe TBI	13.9%	86.1%		1	1
Secondary diagnosis	Fracture	62.8%	37.2%	0.01	957483716E	(0.001,E)
	Pneumonia	12.5%	87.5%		11310276403E	(0.001,E)
	Hemopneumothorax	76.9%	23.1%		484726131E	(0.001,E)
	Others	42.9%	57.1%		2154338362E	(0.001,E)
	None	92.8%	7.2%		1	
Complications developed	Hypotension	78.3%	21.7%	0.01	3.84(1.27-11.5)	2.16(0.38,12.2)
	Hypoxia	94.4%	5.6%		0.81(0.10,6.46)	0.27(0.02,2.64)
	Increased ICP	9.1%	90.9%		138.3(38.4,497.3)	15.7(1.41,176.2)
	Others	100.0%	0.0%		0.01(0.01, -L)	0.01(0.01,E)
	None	93.3%	6.7%		1	1

Table 7: Risk factors association with outcome among patients admitted to AaBET hospital with the assessment of TBI from July 01, 2016 - December 31, 2016[Bivariate and multivariate analysis].

6. Discussion

According to a study conducted in Nigeria, A total of 3282 patients were admitted during the study period of whom 428 were had head injuries with the prevalence rate of 13%. This is nearly similar to this study that the total numbers of brain injury cases were 474 out of 4076 total number of patients admitted to AaBET hospital with prevalence rate of 11.63%. According to study done in Nigeria on 3282 head injury patients, Males were more affected than females which accounts 342(79.9%) of males and 86(20.1%) of females with a ratio of 3.9:1 (33). This is nearly similar to this study which was done on 356 brain injury patients in which males were more affected than females, i.e. male accounts 306(86%) and female accounts 50(14%) with ratio of 6.12:1. This is also similar to the finding of Egypt at Assiut University on 1331 head injury patients, Males were more affected than females which accounts 85.7% of males and 14.3% of females with a ratio of 6:1 (24). Different study also shows young part of the population were mostly sustained head injury which are productive age groups. According to study done in Norway on 585 head injury patients, high age specific incidence rates were found in the age group 10-24 years with the peak incidence among teenagers between 15- 19 years (28).This is nearly similar to this study in which high age specific incidence rates were found in the age interval of 13-25 years which comprises 176 (49.4%) followed by 26-38 years which accounts 30.4% head injury patients which are productive age group of the country. In this study the least affected age group is age above 65 which accounts only 6(1.7%). The mean was 28.5, median 26 & mode 22.A study done in India showed nearly the same result in which individuals in the age group 65 years and above were the least affected with only 4.21 % of total cases (19).Age as factor has shown significant association with the outcome of TBI(P=0.01).

According to the study which was conducted in India on 2850 head injury patients the majority of victims are of road traffic accident 1568 (55.02%) cases followed by assault/fights 646 (22.67%) cases followed by Falling accidents 361 (12.67%) (31). Which is relatively similar to this study, in this study which was conducted on 356 brain injury patients, the cause of head injury were mostly from road traffic accidents which accounts 168(47.2%) followed by interpersonal fights which accounts 145 (40.7%) followed by falling down accidents which accounts 36(10.1%). Mechanism of injury has no statistically significant association with the outcome of TBI (P=0.13).

A prospective study which was conducted at Tertiary Care Hospital in India during period between 2011- 2013 on 500 head injury patients showed commonest lesion associated was Scalp laceration which accounts 251 (50.2%) cases, followed by fractures of skull 83 (16.6%) cases, contusion 53 (10.6%) which is commonest in intra-cranial lesions (19). This study rather showed 40(11.2%) patients had scalp laceration, 62(17.4%) one of intracranial hemorrhages and 35(15.2%) with either depressed skull or basal skull fractures.

According to study conducted in Nigeria on 428 head injury patients, based on Glasgow coma scale majority of the patients suffered mild head injury (277, 64.7%), 58 (13.6%) suffered moderate head injury, while 93 (21.7%) sustained severe head injury (18). This is nearly similar to the finding of this study which was conducted on 356 head injury patients, the severity of head injury based on Glasgow coma scale, majority of the patients were sustained mild head injury 279 (78.4%) with GCS score of 13-15, moderate head injury 41 (11.5%) with GCS score of 9-12 and the remaining 36(10.1%) were severe head injury with GCS of 8.

According to a study conducted in Nigeria among 3282 patients. A total of 194 (45.3%) patients presented with history of loss of consciousness (33). The finding of this study showed 141(39.6%) were presented with bleeding from head ears and/nose, 130(36.5%) with loss of consciousness, 62(17.4%) with headache, 10(2.8%) with nausea and/or vomiting, 7(2%) with confusion and/abnormal behaviors.

Different study indicates that most of head injury patients were managed conservatively as study conducted in JUTH on 52 head injury patients, 77% of all patients were managed conservatively with fluid resuscitation and antibiotics administration (34). which is somewhat different to this study in which almost all head injury patients, 343(96.7%) of all patients were managed conservatively with IV fluid/crystalloid resuscitation, analgesics and antibiotics administration and mannitol was given for 39 (11%) head injury patients and only 20(5.6%) head injury patients were transfused with blood.

In this study, concerning the outcomes at ED, almost all mild head injury patients 271 (97.1%) with GCS score of 13-15 were improved and discharged from AaBET hospital with good recovery and 22(61.1%) of all severe head injury patients with GCS score of 8 & less were died in the hospital and 7 (1.9%) were referred to another hospital for further investigations and treatments of which 2 (28.5%) were mild with GCS score of 9-12 and 4 (57.1%) were moderate head injury and 1(14.2%) severe brain injury patients. This is nearly similar to the study conducted in Egypt, Assuit University on 1331 head injury patients in which complete recovery occurred in 93.7% of mild head injury cases with GCS 13-15 while recovery was not recorded among patients with GCS < 8 and Death occurred in 66.6% of patients with GCS < 8 and 3.3% in GCS 9-12 head injury patients (30). Another study which was done in JUTH on 52 head injury patients revealed that severity of head injury measured with the initial Glasgow Coma Score (GCS) indicates that 71% of all patients were improved & discharged with a good recovery and 21.2% of all patients were died and all patients with initial GCS greater than 6 were survived where as almost all patients with initial GCS 6 and less were died (34) which is almost similar to this study. According to this study Severity of TBI has statistically significant association with outcome of TBI (P=0.01).

In regard of sequel associated to TBI the most common was found to be limb weakness comprising 30(8.4%) patients. The next common sequel was aphasia comprising 25(7%). The third is visual impairment consisting 9(2.5%) TBI patients and the fourth being balance disorder. Most of the patients 262(73.6%) had no sequels during discharge associated with TBI.

7. Conclusion

In this study, from over all trauma admission a significant number is accounted for road traffic accident followed by interpersonal violence victims indicating the public health importance. In this study economically active age group of the population was main victims of the accident and males are six (6) times affected than females. Most of the populations that sustained accident are those from rural part of the country. Many patients were seen develop complications both acute and chronic. Some were also discharged with sequels which are assumed to have significant impairment in their functionality. During the study some factors were found to have significant association to the outcome of TBI i.e Age, Sex, Diagnosis at admission, Secondary diagnosis, Complications develop during stay.

Challenges and limitations of the study

- The study was conducted in a short period of time and study population sampled due to lack of resources that could somehow affect the results.
- Limitation of knowledge in analyzing data and using SPSS.
- Since all information were taken from patient profile, there were incompleteness of data in some of the charts rather than giving full information.
- In general the poor documentation and attachment of the results of investigation of victims was also the other challenge

8. Recommendation

From this study results, I have the following recommendations:

In this study, since RTA is the major mechanism for brain injury occurrences, I would like to recommend the respective administration offices to give awareness for the community and individual about RTA.

I also would like recommend road traffic authorities to give awareness to the community and giving training for the drivers about road traffic rules to reduce effect of this problems.

Next major mechanism is interpersonal fights so I would like to recommend capital and especially regional zone administration to give awareness for the community and individual about consequence of this injury on individual and community.

There is need for an in-depth study on the TBI patients among patients coming to AaBET hospital and additional study on long term sequela to see the progress.

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Annex I

Questionnaire for collection of data about Magnitude and factors associated with the outcome of traumatic brain injury during discharge at Aabet hospital from patients seen on July, 01 2016 till December, 01 2016.

1. Socio demographic characterstics

SN	Questions	Coding categories
101	What is the patient's age during admission?	13-25……..1 26-38……2 39-51……3 52-65……4 Above 65……5 Not stated……6
102	Gender	Male……1 Female……2 Not stated……3
103	Residence	Regional……1 Addis Ababa……..2 Not stated……3

2. Magnitude & Factors associated with TBI

SN	Questions	Coding categories
201	What was the mechanism of injury?	RTA……..1 Fights……2 Falling down accident……..3 Others……4 Not stated……..5
202	What was symptoms at presentation?	Headache……..1 Nausea &/or vomiting…….2 Bleeding from head, ears or nose……..3 Loss of consciousness……..4 Confusion and/or abnormal behavior……5 Others……6 No symptoms stated…….7
203	Diagnosis at admission	Mild TBI……..1

		Moderate TBI……..2 Severe TBI……..…3 Others……..4 Not stated…….5
204	Additional diagnosis	Scalp laceration……..1 Basal skull fracture……..2 Depressed skull fracture….3 Epidural hemorrhage…….4 Subdural hemorrhage……..5 Subarachinoid hemorrhage……6 Intracerebral hemorrhage……..7 Others……..8 None/ Not stated……9
205	Secondary Diagnosis	Fracture……1 Aspiration pneumonia…….2 Hospital acqired Pneumonia……3 Injury to eye……4 Spinal injury……..5 Hemo/pneumotorax…….6 Others……7 None……8

3. Outcome of traumatic brain injury

SN	Questions	Coding categories
301	What are Complications developed after TBI was diagnosed?	Hypotension……..1 Hypoxia……2 Hypothermia……3 Increased ICP……..4 Seizures……..5 None……6
302	Did the patient get any kind of management?	Yes……1 No……2
303	Was the patient managed with Analgesics?	Yes……1 No……2
304	Was the patient managed with Fluids?	Yes……1 No……2
305	Was the patient managed with Antibiotic?	Yes……1 No……2

306	Was the patient managed with Blood?	Yes……..1 No……2
307	Was the patient managed with mannitol?	Yes……..1 No……2
308	Was the patient managed with anticonvulsants?	Yes……..1 No……2
309	Was the patient managed surgically?	Yes……..1 No……2
310	What is the condition of patient at discharge who was diagnosed with TBI?	Improved……..1 Admitted to ward……2 Admitted to ICU……3 Transferred to other center……4 Died……..5 Went against medical advice……6 Not stated……..7
311	What are sequels at discharge among patients diagnosed with TBI?	Limb weakness……1 Post traumatic psychiatric disorder.. ……2 Aphasia……..3 Balance disorder……..4 Visual impairment……5 Not stated……6