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The Prevalence of Traumatic Head Injury and Associated Factors Among Trauma Patients Visited at Yanet Trauma and Surgery Specialized Center, Hawassa, Sidama Region, Ethiopia

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Abstract

Introduction: Head injuries are considered a serious public health problem because they are a common cause of mortality and disability in young people. However, there is little evidence on the pattern and outcome of head injuries in the study area.

Objective: The aim of this study was to determine the prevalence of traumatic head injury and its associated factors among patients visited at Yanet Trauma and Surgery Specialized Centre, 2025.

Methods and Materials: An institution-based retrospective cohort study design was conducted among 1,062 trauma patients through card review at YTSSC from June 1 to June 30, 2025. Study units were accessed using simple random sampling with computer-generated random numbers from four years of patient registration data. The checklist was designed using the KoboCollect toolbox and pre-tested for necessary amendments; daily collected data were checked for completeness by the investigator. Following data collection, data were exported to SPSS version 27. Descriptive statistical analyses were conducted, with results presented using text, tables, graphs, means, and standard deviations. Binary logistic regression was then used to assess associations between outcome of head injury and independent variables; in multivariable analysis, variables with an odds ratio estimated with 95% CI and $P < 0.05$ were considered determinant factors.

Results: The prevalence of head injury among trauma patients was 35.4%. Considering the types of head injury, the highest proportion was constituted by brain contusion

(39.1%), followed by epidural hematoma (EDH) (35.1%), skull fracture (15.8%), and intracerebral hematoma (ICH) (15.0%). Furthermore, only 4.6% and 1.7% of participants developed trauma-related complications and hospital-acquired infections, respectively. Mechanism of injury, including road traffic accident [AOR=5.5; 95% CI (2.27–13.34)] and assault [AOR=3.4; 95% CI (1.35–8.37)], and comorbidity of chronic disease [AOR=2.2; 95% CI (1.13–4.18)], were the three independent predictors of head injury. More than half (55.7%) of participants had conservative management, and the majority (79.4%) had a good discharge outcome. Only 11.7% of participants stayed more than 7 days in the treatment center.

Conclusion: The overall prevalence of head injury observed in this study indicates that head injury is a major problem in the study setting, despite generally good discharge outcomes.

Keywords: Head Injury, Trauma, Prevalence and Outcome

Introduction

Background

Head injury is defined as any trauma to the head resulting from external mechanical force, such as rapid acceleration, impact or penetration and it can be either closed or open trauma to the scalp, skull, or brain and is a primary cause of emergency presentations [1].Damage to the brain tissue associated with head injury fall into two categories , either caused by mechanical forces during the initial insult or secondary injury which occur due to further tissue tissue and cellular damages following the primary insult. The characteristic symptom of traumatic head injury is troubled cognition, which can lead to difficulties with memory, attention, learning and coordination, but the injury can influence behavior, emotion, and motor function Head injuries are a leading cause of death and disability, particularly in young adults [2]. According to the World Health Organization (WHO), road traffic accidents (RTAs) are the most common cause of traumatic brain injury (TBI) globally. In many regions, falls, violence, and sports injuries also contribute significantly to head injury incidence [3,4]. For instance ,As of year 2024 estimated that 5 million Americans are living with long term disabilities resulting from traumatic brain injury and 2.8 million American sustain TBI each year. 7.7 million people in the European Union who have suffered TBI have disabilities [5,6].The age group most affected by head trauma tends to vary based on geographical and socioeconomic factors. In developed countries, RTAs predominantly affect young adults, more likely to engage in activities that increase their risk of TBI, such as sports, motor vehicle accidents, and violence, and their brains are still developing, making them more vulnerable to the effects of injury. While in low-income regions, falls and domestic accidents are more prevalent [7]. According to the WHO report, TBI is a serious public health issue because it is a common cause of mortality and disability in young people who are more likely to be involved in activities that increase the risk of head trauma, such as motor vehicle accidents, sports, falls, and place a significant demand on health-care services [8]. On top of that it is the primary cause of mortality, particularly in low to middle income countries (LMICs) due to a combination of factors including higher rates of road traffic

accidents, inadequate prehospital and hospital care, and limited access to specialized neurosurgical services. [9]. TBI is an important cause of trauma-related mortality and morbidity in Ethiopia, with a reported prevalence of 39.7% and it is the leading reason behind mortality and disability[10] There are significant resource limitations along the entire continuum of care, and little is known about the neurosurgical activity and patient outcomes in Ethiopia including Hawassa .[11].Therefore, this study is aimed to assess the pattern and outcome of head injury among trauma patients visited YTSCC.

Statement of the Problem

Globally, TBIs are a leading cause of death and disability, affecting over 69 million individuals annual, LMICs experiences a significantly higher burden of TBI than high-income countries [12,13]. Head injuries are one of the largest public health problems including in Ethiopia [14]. However, much of these estimates were based on data from developed countries with little to no representation of LMICs, particularly in the African region due to lack comprehensive trauma registries, national health databases, or reliable reporting systems [15], under diagnosis and lack of imaging and high rates of pre-hospital death. Therefore, further studies on TBI at trauma center in Ethiopia will be important to improve the accuracy of future assessments [13]. Intracranial injuries, such as epidural and subdural hemorrhages or skull fractures, can result in death or long-term damage if not treated [16].Thus, TBI is a significant global public health threat, impacting over 55 million individuals globally [17,18]. Moreover, the higher proportion of TBI was documented in low-income countries. Prevalence rates of TBI can differ between clinical and epidemiological studies, and this variation is often linked to differences in study participants, such as their age and other factors, including the diagnostic criteria used, data sources (e.g., hospital admissions, emergency room visits), and whether the study includes those who don't seek medical care [19]. Furthermore, RTA, falls, and interpersonal violence were the major risk factors for head injury [10],RTAs were considered on the agenda of the Sustainable Development Goals[20]. Consecutively, current studies did don't consider children and adolescents seeking medical care [21].Hence, the previous studies may significantly underestimate the prevalence of pediatric brain injury in traumatic patients .Therefore, understanding the outcome of head injury among all age group of traumatic patients is important to improve patient outcomes through effective interventions. Moreover, Yanet Trauma and Surgical Specialized Center(YTSSC) is the largest and only trauma center in Hawassa, Ethiopia. However, there is no previous study for assessing the pattern of TBI treatment among trauma patients in the study area. Therefore, the general objective of this study is to determine the outcome of TBI among trauma patients visited YTSCC from July 2020 to July 2024.

Significance of the Study

The effective injury prevention, patient care and rehabilitation require a prior understanding of injury pattern and associated factors in patients visiting the trauma or emergency department of health institutions. Hence, the results of this study would provide information on the outcome among patients requiring traumatic care and/or hospitalization. Consecutively, it would help in improving the prioritization of patients care in the trauma care unit. Moreover, the result from this study would also contribute inputs

for stakeholders during planning to reorganization of the emergency department in a manner that allow the hospital to deliver quality in emergency health service to the emergency medical care users in general and for head injury fatalities in particular. Finally, the result of this research would serve as a base line for other researchers working on similar topics.

Literature Review

Ahead injury is characterized as either closed or open injury to the scalp, cranium or brain and a driving cause of presentations to emergency departments. Head injury, often used interchangeably with traumatic brain injury, is defined as a brain injury that occurs as a result of sudden trauma to the brain, depending on the area of the brain affected can be either local or diffuse[22].

Magnitude of Traumatic Head Injury

Across all ages, TBI accounts for 30 to 40% of all injury-related deaths, and neurological injury is expected to remain the leading cause of disability from neurological diseases two to three times higher than that for Alzheimer's disease or cerebrovascular disorders. [23] A study from Fiji found a lower prevalence of head injuries (12.4%) on the island likely due to a combination of factors including variations in socioeconomic status, lifestyle, and potential differences in research design or patient demographics compared to other studies.[23] LMICs experience a TBI burden three times greater than that of high-income countries. More than 90% of trauma mortality occurs in LMICs, especially in sub-Saharan Africa . The majority of TBI cases in Africa occur among young individuals aged 19 to 40 years, with men being the most affected In Ethiopia, there are 659 TBI cases per 100,000 people, accounting for approximately 10.8% of TBI cases in sub-Saharan Africa and 28% in eastern sub-Saharan Africa Head injuries can be classified based on the mechanism of injury into primary and secondary categories [24,25]. Primary injuries result from the direct impact to the skull and brain tissue, leading to contusions, lacerations, and diffuse axonal injury. Secondary injuries occur as a result of processes such as brain swelling, ischemia, and increased intracranial pressure (ICP), which exacerbate the initial damage [15]. Primary brain injury can be classified in to four categories: Diffuse Axonal Injury (DAI), which occurs when the brain experiences rapid deceleration, leading to widespread damage to the white matter and is often associated with high-impact trauma and can result in long-term cognitive and motor deficits [1]; Concussion, a mild form of head injury that typically resolves without permanent damage, though repeated concussions can lead to cumulative neurodegenerative effects such as chronic traumatic encephalopathy (CTE) [7]; Contusion and Hematoma, more severe than concussions, contusions (bruises on the brain) and hematomas (collections of blood) can cause significant neurological impairment and often require surgical intervention [6]; and Skull Fractures, which can be open or closed and vary in severity, with open fractures resulting in direct contamination of the brain, while closed fractures may lead to complications like raised ICP [14]. Head injuries can be categorized into mild, moderate, and severe based on the Glasgow Coma Scale (GCS) score, a common tool used to assess the level of consciousness. The GCS ranges from 3 to 15, with scores of 13-15 indicating mild injury, 9-12 indicating moderate injury, and 3- 8 indicating severe injury[26].

Outcome of Traumatic Head Injury

The outcome of head injuries depends on several variables, including the initial severity of the injury, timely medical intervention, and the presence of comorbid conditions. Patients who present with mild head injuries often recover fully with minimal intervention. However, the prognosis for patients with severe injuries can vary greatly and is influenced by factors such as age, gender, and pre-existing health conditions. The outcome of head injury can be categorized in to immediate morbidity and mortality, long term outcome and prognostic factors. Mortality and Morbidity: Mortality rates for severe TBI vary but remain significant. According to a meta-analysis [9], mortality rates for severe head injuries can range from 30% to 40%, depending on the location and quality of healthcare. Survivors often face long-term disabilities, including cognitive impairments, motor deficits, and psychiatric conditions such as depression and anxiety [6]. Long-term Outcomes: Severe head injuries can lead to chronic neuropsychological conditions such as memory loss, attention deficits, and personality changes. Studies reports indicate that individuals who survive severe TBI may experience progressive cognitive decline over the years. Rehabilitation and long-term care are often required to address the physical, emotional, and cognitive aftermath.[5] Prognostic Factors: Several prognostic factors are used to predict outcomes after a head injury. These include the GCS score at presentation, the presence of intracranial hemorrhage, age, and the time to treatment. A lower GCS score and the presence of midline shifts or hematomas are associated with worse outcomes [2]. The role of biomarkers, such as glial fibrillary acidic protein (GFAP) and S100B, in predicting outcomes is also an emerging area of research [12]. No single prognostic factor demonstrated convincing and conclusive results. However, age, sex, and multiple concussions showed an affirmatory association with persistent post-concussion outcomes[27]. A cross-sectional study conducted in Gondar, Ethiopia revealed that the occurrence of head injury was associated with inter-personal violence, which accounts for 46.7%, followed by RTA(26.7%) and fall down accident (12.4%)[28]. Similarly, a study conducted in Jimma, Ethiopia show that interpersonal fights (38.5%) and road traffic (36.5%) were the most common factors associated with traumatic head injury[24]. RTA are the leading cause of TBI in Ethiopia ,at AaBET Hospital RTAs accounted for 45%of TBI case with pedestrian injuries compromising 52.2%of these incidents. Assults and falls are also significant contributors in TBI Cases across various regions.[29] According to the study done in Jimma GCS score of <8 on admission , hyperthermia and lack of prehospital care were predictors of mortality in patients with TBI[30].

Conceptual Framework

A conceptual framework for the determinants of head injury outcome was adapted from the literature to guide the analysis of this study [32]. The framework proposes that the outcome of head injury is shaped by four domains of determinants: socio-demographic factors (age, sex); physical factors (fall from objects, burns, fall-down accidents, and road traffic accidents); personal factors (fighting, gunshot injury, and forceful theft); and clinical factors (diabetes mellitus, hypertension, epilepsy, psychiatric disorders, Alzheimer's disease, and brain tumors). In a related study on factors associated with

outcomes of head-injured patients in Bahir Dar, Ethiopia, head injury resulting from fall-down accidents, interpersonal violence, and RTA was found in 41.9%, 24.8%, and 24.9% of cases, respectively [31].

Methods and Materials

Study Area and Period

This study was conducted at Yanet Trauma and Surgery Specialized Center (YTSSC), Hawassa, Ethiopia. YTSSC is a tertiary health institution designed to give specialized trauma and surgical services under one roof. It is a private health institution under Liyana Health Care PLC, inaugurated and functioning since January 12, 2019. As the only trauma and surgery specialized center in Sidama region, its service is focused specially on trauma. It offers diagnosis and treatment services for an average patient flow of 13,673 per year, including 2,126 trauma and 11,547 non-trauma patients. The study was conducted from June 1 to June 30, 2025, drawing on patient records from July 2020 to July 2024.

Study Design

An institution-based retrospective cohort study design was used.

Population

All trauma patients' charts registered at YTSSC from July 2020 to July 2024 constituted the source population, and all randomly selected trauma patients' charts from this period constituted the study population.

Inclusion and Exclusion Criteria

All trauma patient charts registered at YTSSC from July 2020 to July 2024 were included in the study. Charts with incomplete information were excluded.

Sample Size Determination

A single population proportion formula was used, based on a 95% confidence interval, 3% margin of error, and a 34.6% prevalence of head injury from a previous study conducted in Addis Ababa [34], yielding a calculated sample size of 966. After adding a 10% non-response rate, the final sample size was 1,062.

Sampling Technique and Procedure

A simple random sampling technique was used to select patient charts. The sampling frame was the registry of trauma patient data recorded in Excel from July 2020 to July 2024. Study units were selected using computer-generated random numbers from this registry.

Variables

The dependent variable was the outcome of head injury. Independent variables included socio- demographic factors (age, sex), mechanism of trauma (RTA, fall-down accident, burn, fall-down object, fighting, gunshot), and clinical characteristics (epilepsy, psychiatric illness, diabetes mellitus, hypertension, brain tumors, Alzheimer's disease).

Data Collection Tool and Procedures

Data were collected via a checklist designed using the KoboCollect toolbox, adapted from the World Health Organization's injury surveillance guidelines [35] and modified for the study population. Data were exported from the YTSSC patient registry to an Excel sheet, and simple random sampling was used to select study units. BSc-holder nurse professionals, trained for half a day, served as data collectors, and the tool was pre-tested on 10% of the sample at Hawassa University Comprehensive Specialized Hospital prior to full data collection. Incomplete charts were discarded and replaced with the next eligible trauma patient chart; if the replacement chart was also incomplete, this was recorded as a non-response.

Data Quality Assurance

The principal investigator supervised the data collection process daily, and 10% of the collected data was checked by the principal investigator each day for completeness.

Data Processing and Analysis

Data collected via KoboCollect were downloaded as Excel files and exported to SPSS version 27 for analysis. After cleaning, recoding, and transforming variables as necessary, descriptive statistics were computed and findings presented using text, tables, frequencies, means, and standard deviations. Bivariate and multivariable binary logistic regression analyses were conducted to identify factors associated with the outcome variable. Variables with a p-value < 0.2 in bivariate analysis were candidates for multivariable analysis, which was performed using a backward stepwise likelihood ratio method to control for confounding. Variables with a p-value < 0.05 at 95% CI in the multivariable model were considered significantly associated with the outcome. Model fitness was assessed using the Omnibus Tests of Model Coefficients, with a value greater than 0.05 considered a good model fit.

Operational Definitions

Head injury was defined as traumatic scalp and/or skull injury with or without traumatic brain injury. Traumatic brain injury was defined as an alteration in brain function manifested as confusion, altered levels of consciousness, coma, or seizures. Conservative management referred to traumatic scalp or skull injury treated without surgical procedure. Outcome of head injury referred to the patient's functional recovery following TBI, assessed using standardized scales and clinical observation.

Ethical Considerations

Ethical clearance was obtained from the Institutional Research Ethics Review Committee of Pharma College of Health Sciences. Informed consent was obtained from the management of YTSSC prior to data collection. Raw data were secured and accessible only to the principal investigator, and personal identifiers were not disclosed, to maintain confidentiality.

Results

Socio-Demographic Characteristics

A total of 1,062 study participants were included in the final analysis. The median age of participants was 36 years (range: 1–92 years), with a mean (±SD) age of 36.9 ± 15.4 years. The majority (79.1%) of participants were male. Considering referral history, 29.9% of participants had a referral history, and the majority of these (82.9%) were referred from public health institutions (Table 1).

Table 1: Socio-Demographic Characteristics of Study Participants Visited at YTSSC, July 2020–July 2024

Variable	Category	Frequency (n)	Percent (%)
Sex	Male	840	79.1
	Female	222	20.9
Age	<15 Years	49	4.6
	15–30 Years	342	32.2
	31–45 Years	412	38.8
	46–60 Years	146	13.8
	≥60 Years	76	7.2
Referral history	Yes	317	29.9
	No	745	69.1
Source of referral	Private health institutions	54	17.1
	Public health institutions	263	82.9

Admission Characteristics

The largest proportion of trauma cases resulted from road traffic accidents (45.2%) and fall-down accidents (27.8%). Most participants (78.4%) presented with a Glasgow Coma Scale (GCS) of 13–15 at admission (Table 2).

Table 2: Admission Characteristics of Trauma Patients Visited at YTSSC, July 2020–July 2024

Variable	Category	Frequency (n)	Percent (%)
Mechanism of trauma	Road traffic accident (RTA)	480	45.2
	Fall down accident	295	27.8
	Intentional fight	201	18.9
	Other (machine injury, animal bite, or burn)	86	8.0
Glasgow Coma Scale at admission	<8	62	5.8
	9–12	167	15.7
	13–15	833	78.4

Clinical Characteristics

More than half (60.1%) of participants were managed as outpatients. In addition, 9.2% presented with poly-trauma, most commonly involving the extremities. Medical comorbidities and visceral organ injury were present in 8.0% and 6.1% of participants, respectively. Regarding investigation modalities, head CT scan was the most commonly used (59.7%), followed by X-ray (0.8%) (Table 3).

Table 3: Clinical Characteristics of Trauma Patients Visited at YTSSC, July 2020–July 2024

Variable	Category	Frequency (n)	Percent (%)
Patient treatment condition	Admitted	350	32.9
	Outpatient	638	60.1
	Referred	74	6.9
Skull X-Ray	Yes	9	0.8
	No	1053	99.2
Head CT-Scan	Yes	635	59.7
	No	427	40.3
MRI	Yes	51	4.9
	No	1011	95.1
Poly trauma	Yes	98	9.2
	No	964	89.8
Injured part among poly trauma	Extremity	57	58.1
	Abdomen	27	27.5
	Chest	27	27.5
	Other (face, nose, neck)	54	55.0
Bone fracture	Yes	98	9.2
	No	964	89.8
Injury on visceral organ	Yes	64	6.1
	No	998	93.9
Injured visceral organ	Spleen	4	—
	Liver	3	—
	Heart	3	—
	Lung	48	75.0
	Genitourinary	6	—
Presence of comorbidity	Yes	84	8.0
	No	978	92.0
Type of comorbidity	Diabetes mellitus	29	23.7
	Hypertension	39	50.5
	Epilepsy	4	—

Outcome of Head Injury

The overall prevalence of head injury among trauma patients was 35.4%. Considering the type of head injury, the highest proportion was constituted by brain contusion (39.1%), followed by epidural hematoma (EDH) (35.1%), skull fracture (15.8%), and intracerebral hematoma (ICH) (13.0%). Trauma-related complications and hospital-acquired infections developed in 5.0% and 4.0% of participants, respectively. More than half (55.6%) of participants received conservative management for their head injury. The majority (79.4%) of participants had a good or improved discharge outcome, while 6.0% died. Only 16.0% of participants stayed longer than seven days in the treatment center (Table 4).

Table 4: Type, Management, and Outcome of Head Injury Among Study Participants Visited at YTSSC, July 2020–July 2024

Variable	Category	Frequency (n)	Percent (%)
Presence of head injury	Yes	376	35.4
	No	686	64.6
Type of head injury	Epidural hematoma (EDH)	132	35.1
	Skull fracture	59	15.8
	Intra cerebral hematoma (ICH)	49	13.0
	Brain contusion	147	39.1
Management given for head injury	Conservative	209	55.6
	Surgical	167	44.4
Trauma related complications	Yes	54	5.0
	No	1008	95.0
— Urinary retention		3	—
— Skin contracture		7	—
— Amputation		4	—
— Aspiration pneumonia		20	37.1
— Post-trauma meningitis		5	—
— Post-traumatic seizure		15	27.8
— Extremity paralysis		4	—
Hospital acquired infection	Yes	43	4.0
	No	1019	96.0
Type of hospital acquired infection	Pneumonia	20	46.5
	Wound infection	13	30.2
Discharge outcome of head injury	Improved	299	79.4
	The same	6	1.5

Variable	Category	Frequency (n)	Percent (%)
	Referred	70	18.6
	Death	22	6.0
Length of hospital stay	≤7 days	315	84.0
	>7 days	61	16.0

Factors Associated with Head Injury

In bivariate analysis, four variables were significantly associated with head injury at a significance level below 0.25: sex, place of trauma, mechanism of injury, and comorbidity. After adjusting for confounders using backward stepwise likelihood ratio in multivariable binary logistic regression, three variables retained a statistically significant association with head injury among trauma patients. Mechanism of injury, specifically road traffic accident [AOR=5.5; 95% CI (2.27–13.34)] and intentional fight [AOR=3.4; 95% CI (1.35–8.37)], and comorbidity of chronic disease [AOR=2.2; 95% CI (1.13–4.18)], were the three independent predictors of head injury (Table 5).

Table 5: Factors Associated with Head Injury Among Study Participants Visited at YTSSC, July 2020–July 2024

Variable	Head Injury: Yes	Head Injury: No	COR [95% CI]	AOR [95% CI]	P value
Sex – Female	82	223	1	1	
Sex – Male	255	502	1.4 (1.06–1.93)	1.3 (0.92–1.73)	0.149
Place – Recreational area	23	54	1	1	
Place – Home	66	212	1.23 (0.56–2.69)	1.1 (0.50–2.51)	0.779
Place – Work place	82	222	1.5 (0.72–3.37)	1.2 (0.56–2.75)	0.579
Place – Street	209	271	3.6 (1.72–7.62)	1.6 (0.71–3.52)	0.264
Mechanism – Other (machine, animal bite, burn)	6	40	1	1	
Mechanism – Road traffic accident	183	212	5.6 (2.32–13.56)	5.5 (2.27–13.34)	0.000**
Mechanism – Fall down accident	70	338	1.3 (0.55–3.31)	1.3 (0.54–3.27)	0.541
Mechanism – Intentional fight	74	138	3.5 (1.41–8.64)	3.4 (1.35–8.37)	0.009**
Comorbidity – No	313	704	1	1	
Comorbidity – Yes	21	25	1.8 (1.02–3.44)	2.2 (1.13–4.18)	0.019*

Discussion

This study assessed the magnitude, outcome, and determinants of THI among trauma patients who visited YTSSC in Hawassa, Ethiopia. The prevalence of head injury among trauma patients was 35.4%, which is comparable with findings from similar studies in Addis Ababa (34.6%) [34], Gondar (32.1%) [28], and Debre Tabor (36.1%) [10]. This high burden underscores the ongoing public health challenge of THI in urban Ethiopia. The observed prevalence is notably higher than that reported in Fiji (12.4%) [24], which may be due to differences in trauma surveillance systems, access to care, road safety measures, and urbanization patterns. In this study, the most frequently diagnosed types of head injuries were brain contusion (39.1%) and epidural hematoma (35.1%). These findings are consistent with other Ethiopian studies, including those from Jimma and Addis Ababa, where contusions and epidural hematomas were among the leading causes of intracranial trauma [36,30]. The predominance of such injuries likely reflects the high rates of blunt trauma, especially from RTAs, which remain the leading mechanism of trauma in Ethiopia. Globally, RTAs are the primary cause of TBI, especially in LMICs, where the enforcement of traffic laws and pedestrian protection measures remain inadequate [8,9]. In our study, RTAs were significantly associated with head injury, with victims of road accidents being 5.5 times more likely to sustain THI compared to other trauma mechanisms. This is in agreement with data from AaBET Hospital in Addis Ababa, where 45% of TBI cases were attributed to RTAs, and with studies from Gondar and Amhara regional hospitals [27,28,12]. The findings also reflect broader patterns documented by the WHO, which indicate that RTAs disproportionately affect young adults in LMICs and account for a large share of injury-related mortality and disability [3,18]. In the context of Hawassa, the rapid urbanization and expansion of vehicular traffic without corresponding infrastructure improvements, such as safe pedestrian crossings or adequate motorcycle regulations, have likely exacerbated this burden. Intentional interpersonal violence (assault) was the second major mechanism of trauma in this study and was also significantly associated with THI (AOR=3.4). This is consistent with reports from Bahir Dar and Gondar, where interpersonal violence accounted for 24.8% and 46.7% of head injuries respectively [28,31]. In urban Ethiopian settings, especially among young males, disputes in public spaces, alcohol-related violence, and lack of effective law enforcement contribute to this pattern. In contrast, studies in high-income countries such as Australia and the U.S. report sports and recreational injuries as more common causes of head trauma than assault or RTAs [21,7]. These contextual differences highlight the need for community-level violence prevention and mental health support systems in Ethiopia. This study also found that patients with pre-existing chronic diseases such as hypertension, diabetes, and epilepsy were 2.2 times more likely to experience head injury compared to their counterparts. Comorbid conditions may increase susceptibility to falls, impair judgment during physical activity, or complicate recovery post-injury. Previous literature also links comorbid conditions with increased TBI complications and worse outcomes [30]. For instance, diabetic patients may be more prone to post-traumatic infections, and those with epilepsy face an elevated risk of seizure-related injury [5,12]. These findings suggest that chronic disease management and injury prevention must be integrated into broader public health planning in Ethiopia. The majority (79.4%) of patients with head injuries had good discharge outcomes, which is significantly better

than the 57.3% reported in Debre Tabor [10] and the 60.4% in Gondar [28]. Several factors likely contributed to this favorable outcome. Most patients presented with mild head injuries (78.4% had GCS 13-15), and over half were managed conservatively. Additionally, YTSSC has specialized staff, better imaging availability (with 59.8% of patients receiving CT scans), and relatively efficient triage protocols. These factors are crucial in head trauma care, as studies have shown that early diagnosis, especially with CT imaging, significantly improves clinical decision-making and outcomes [26,9]. However, 6% of patients died, which is still a concern, though lower than the 10.1% mortality reported in Bahir Dar [31] and the 8.4% from Addis Ababa [36]. Hospital-acquired infections and trauma-related complications were observed in a small subset of patients (4.6% and 1.7%, respectively), with aspiration pneumonia and wound infections being most common. These findings are similar to international reports that show pneumonia as a frequent complication in immobilized or severely injured patients [14]. Although the rates were low, the presence of such complications may prolong hospital stay, increase costs, and elevate mortality risk if not promptly addressed. The demographic profile of patients in this study was also in line with national trends. Young males (mean age ~36.9 years, 79.1% male) were most affected. This is in agreement with WHO data and various Ethiopian studies, indicating that young men are more likely to be involved in risky behaviors such as speeding, fighting, or working in hazardous environments [3,7,27]. This suggests a need for targeted awareness campaigns focusing on high-risk populations, particularly in urban areas like Hawassa. From a public health perspective, these findings highlight the urgent need for integrated injury prevention strategies. For instance, road safety interventions, such as helmet laws, pedestrian education, speed limit enforcement, and improved trauma response systems, could dramatically reduce the incidence and severity of THI. The success of YTSSC in achieving relatively good outcomes also suggests that establishing specialized trauma centers with imaging and surgical capacity could be a scalable model for regional and national implementation. Moreover, there is a need for functional trauma registries and improved data systems in Ethiopia to track injury patterns, outcomes, and resource utilization, as recommended by the WHO's emergency care systems framework [17].

Strengths and Limitations

This study collected data on factors associated with the outcome of head injury, including mechanism of injury, injury setting, and comorbidity of chronic diseases, drawing on four years of patient data. The limitations of this study are that, being a retrospective study, data related to alcohol consumption, smoking status, and patient residence were not assessed.

Conclusion

The overall prevalence of head injury obtained from the current study indicates that head injury is a major problem in the study setting. RTA, intentional fight, and comorbidity of chronic disease were identified as independent predictors of head injury. While outcomes at YTSSC have been favorable, sustained progress will require systemic interventions targeting injury prevention, emergency response, and chronic disease management. Based on these findings, appropriate prevention strategies should be devised and

implemented against the contributing factors both at the individual and community level to minimize the risk of head injury. Health and related stakeholders should establish appropriate health education programs to create awareness about head injury, and traffic police, passengers, and drivers should follow appropriate traffic laws to prevent RTA-related head injuries. Patients with chronic disease should be encouraged to engage in moderate- or high-intensity muscle-strengthening activities involving major muscle groups on two or more days per week.

References

[1] Bogli, S.Y.,Olakorede, I., Beqiri,EDynamic assessment of signal entropy for prognostication and secondary brain insult detection after TBI. Critical Care, (2024);28, 436

[2] Mohammad J, Mousareza A , Seyed M, Prognostic factors in traumatic brain injuries in emergency department, 2022 Nov 25

[3] Brown W, Leff P. Penetrating head trauma: Clinical management and outcome. Trauma Surg Acute Care Open. 2023;8(1):e000571.

[4] Dikici F, Epidemiology of traumatic brain injury: A global overview. World Neurosurgery. 2021;141:167-175.

[5] Tadelech A,Tsegaye A,Mende M Incidence, risk factors and outcomes of traumatic head injury among trauma patients visited at the Yanet Trauma and Surgery Specialized Centre, Sidama region, Hawassa, Ethiopia: Nurotruma volume 15 – 2024

[6] International brain injury association, brain injury fact,2024G.C.

[7] Augmas Prevalence and Associated Factors of TBI Among Trauma Patients Admitted to the Adult Emergency Departments of Three Governmental Hospitals in Addis Ababa, Ethiopia.,2023.

[8] Roozenbeek B, Maas AI, Menon DK. Changing patterns in the epidemiology of traumatic brain injury. Nature Reviews Neurology. 2013;9(4):231-6.

[9] Miller GF, Daugherty J, Waltzman D, Sarmiento K. Predictors of traumatic brain injury morbidity and mortality: examination of data from the national trauma data bank: predictors of TBI morbidity & mortality. Injury. 2021;52(5):1138-44.

[10] Tesfaw A, Eshetu M, Dagnaw F, Fenta E, Gelaw M, Mihret G, Prevalence of Head Injury Among Trauma Patients at Debre Tabor Comprehensive Specialized Hospital, North Central Ethiopia. Open Access Surgery. 2021;Volume 14:47-54.

[11] Patel H, Mortality in traumatic brain injury: A meta-analysis. J Clin Neurosci. 2018;59:87- 94.Singh M, Kapoor S. Skull fractures: Epidemiology, clinical management, and outcomes. Brain Injury Rev. 2022;40(2):231-239

[12] Solomon G, Bewuketu T, Marye G ,Bikis L Outcomes and associated factors of traumatic brain injury among adult patients treated in Amhara regional state comprehensive specialized hospitals BMC Emergency Medicine volume 23, Article number: 109 (2023)

[13] Muili AO, Kuol PP, Jobran AWM, Lawal RA, Agamy AA, Bankole NDA. Management of traumatic brain injury in Africa: challenges and opportunities. 2024 Apr 4;110(6):3760–

[14] Sharma P, Gupta R. Blunt trauma to the head: An analysis of clinical outcomes. Neurotrauma Rep. 2019;10(3):143-151.

[15] Feigin VL, Nichols E, Alam T, Bannick MS, Beghi E, Blake N, Global, regional, and national burden of neurological disorders, a systematic analysis for the Global Burden of Disease Study 2016. The Lancet Neurology. 2019;18(5):459-80.
[16] Morrison J, Epidemiology of head injuries in developed and developing countries. Trauma Acute Care Surg. 2022;79(2):182-189.
[17] Global burden of disease ,head injury collaborators (2021)global, regional and national burden of traumatic brain injury and spinal cord injury,lacent nurology,20(9)792-803
[18] Huiming Z, Yieng, J, Taiwen R,· Haijiang D, Wen Z, Guangfeng Z, Global Burden of Traumatic Brain Injury in 204 Countries and Territories From 1990 to 2021 Volume 68, Issue 4p754-763April 2025
[19] Juliet H, Mary J, Eric M , Jessica W, Epidemiology of Chronic Effects of Traumatic Brain Injury, Neurotrauma. 2022 Aug 17;38(23):3235–3247
[20] Van Tulder R, Rodrigues SB, Mirza H, Sexsmith K. The UN's Sustainable Development Goals: Can multinational enterprises lead the Decade of Action? Journal of International Business Policy. 2022;4(1):1-21.
[21] Amaranath JE, Ramanan M, Reagh J, Saekang E, Prasad N, Chaseling R, et al. Epidemiology of traumatic head injury from a major paediatric trauma centre in N ew S outh W ales, A ustralia. ANZ journal of surgery. 2014;84(6):424-8
[22] James SL, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N,Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2022, The Lancet. 2022;392(10159):1789-858.
[23] Kool B, Raj N, Wainiqolo I, Kafoa B, McCaig E, Ameratunga S. Hospitalised and fatal head injuries in Viti Levu, Fiji: findings from an island-wide trauma registry (TRIP 4). Neuroepidemiology. 2018;38(3):179-85.
[24] Purcell LN, Reiss R, Eaton J, Kumwenda K-K, Quinsey C, Charles A. Survival and functional outcomes at discharge after traumatic brain injury in children versus adults in resource-poor setting. World Neurosurg. 2022;137:e597–602
[25] James SL, Theadom A, Ellenbogen RG, Bannick MS, Montjoy-Venning W, Lucchesi LR,Global, regional, and national burden of traumatic brain injury and spinal cord injury, 1990–2016: a systematic analysis for the global burden of Disease Study 2016. Lancet Neurol. 2019;18(1):56–87.
[26] Ghelichkhani P, Esmaeili M, Hosseini M, Seylani K. Glasgow Coma Scale and FOUR Score in Predicting the Mortality of Trauma Patients; a Diagnostic Accuracy Study. Emerg (Tehran). 2018;6(1)
[27] Julien D,,Béatrice O, Élaine G, Ève.LPrognostic factors for persistent symptoms in adults with mild traumatic brain injury: an overview of systematic reviews,Systematic Reviews volume 12, 127 (2023)
[28] Walle T, Tadesse B, Bashah D. Prevalence of head injury and associated factors among trauma patients visiting surgical emergency department of Gondar University Referral Hospital, , Northwest Ethiopia 2016. Across-sectional study. International Journal of Africa Nursing Sciences. 2018;9

[29] Abraham H. Feven T, Abrham T, Ayalew Z,, Pattern and Outcome of Traumatic Brain Injury, Addis Ababa, Ethiopia: A Cross-sectional Hospital-based Study, 2022 32(2):343-350
[30] Gemechis B, Mengist A, Gemechu L,Dinka D, Busha G,Tesfaye L,Clinical characteristics and outcomes of traumatic brain injury in patients admitted to surgical ward of Jimma Medical Center, Southwest Ethiopia: a prospective observational follow-up study ,2022
[31] Hailu Y. The Magnitude of Traumatic Head Injuryas Diagnosed on Computed Tomography and Associated Factors at Felge Hiwot Hospital Bahir Dar, North West Ethiopia 2022G.C
[32] Jasper U, Opara M, Pyiki E, Akinrolie O. The epidemiology of hospital-referred head injury in Northern Nigeria. Journal of Scientific Research & Reports. 2014;3(15):2055-64
[33] Medax Hospital Management System (2025). Patient demographics. Data accessed from Yanet trauma and surgical specility center , Hawassa, [2025]
[34] Abebe Y, Tesfaye T, Woldemariam Y,Prevalence and associated factors of traumatic brain injury among trauma patients admitted to the adult emergency departments of three governmental hospitals in Addis Ababa, Ethiopia. Ethiop Med J. 2020;58(2):123-130.
[35] Y. Holder ,World Health Organization. (2001). Injury surveillance guidelines
[36] Ghandour H, Abbas H, Al-Hajj S, El Sayed M, Harati H, Kabbani S,Traumatic brain injury patient characteristics and outcomes in Lebanon: a multicenter retrospective cohort study. Journal of Global Health Reports. 2022.