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Surgical Management Outcomes and Associated Factors of Epidural Hematoma in Tibebe Ghion Specialized Hospital and Felege Hiwot Comprehensive Specialized Hospital, Northwest Ethiopia

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BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF MEDICINE, DEPARTMENT OF Surgery

Surgical Management Outcomes and Associated Factors of Epidural Hematoma in Tibebe Ghion Specialized Hospital and Felege Hiwot Comprehensive Specialized Hospital, Northwest Ethiopia

By: - Dr Aytenew Amsalu (Md)

A THESIS RESEARCH SUBMITTED TO BAHIR DAR UNIVERSITY, COLLEGE OF MEDICINE AND HEALTH SCIENCES, SCHOOL OF MEDICINE AND DEPARTMENT OF SURGERY FOR PARTIAL FULFILLMENT OF SPECIALTY IN GENERAL SURGERY

NOVEMBER 2022

BAHIR DAR, ETHIOPIA

BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

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TITLE: SURGICAL MANAGEMENT OUTCOMES AND ASSOCIATED FACTORS OF EPIDURAL HEMATOMA AT TIBEBE GHION SPECIALIZED HOSPITAL AND FELEGE HIWOT COMPREHENSIVE SPECIALIZED HOSPITAL, NORTHWEST ETHIOPIA

NOVEMBER 2022

BAHIR DAR, ETHIOPIA

Declaration

This is to certify that the thesis entitled "Surgical Management outcomes and associated factors of epidural hematoma at Tibebe Ghion Specialized Hospital and Felege Hiwot Comprehensive

Specialized Hospital, Northwest Ethiopia, 2022" submitted in partial fulfillment of the requirements for the specialty in General surgery. The record of original work carried out by me and has never been submitted to Bahir Dar University or any other institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been duly acknowledged.

Dr Aytenew Amsalu (MD)	_____	_____
Name of the candidate	Signature	Date

Approval of the advisors

I hereby certify that I have supervised, read, and evaluated this thesis titled "Surgical Management outcomes and associated factors of epidural hematoma at Tibebe Ghion Specialized Hospital and Felege Hiwot Comprehensive Specialized Hospital, Northwest Ethiopia, 2022" by Dr Aytenew Amsalu (MD) prepared under my guidance. I recommend the thesis be submitted for oral defense.

1. Melkamu Bedimo (MPH, Asso't pro) _____ 9/3/25 E.C

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Acknowledgment

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Table of Contents

List of Table

List of figures

List of annex

Abbreviations and acronyms

CNS	Central Nervous System
CT	Computed Tomography
DM	Diabetic Mellitus
DSF	Depressed skull fracture
EDH	Epidural Hematoma
FHCSH	Felege Hiwot Comprehensive Specialized Hospital
GCS	Glasgow Coma Scale
ICP	Intracranial pressure
IRB	Institutional Review Board
RTA	Road Traffic Accident
SOM	School of medicine
SPSS	Statistical Package for Social Sciences
TBI	Traumatic Brain Injury
TGTH	Tibebe Ghion Teaching Hospital
WHO	World Health Organization
MRI	Magnetic Resonance Imaging

Abstract

Background: Epidural hematoma (EDH) is a major traumatic brain injury and a potentially life-threatening condition. Epidural hematoma is one of the most common causes of mortality and morbidity among head injury, but little is known about the problem in Northwest Ethiopia. Intracranial hematoma is the collection of blood in the various intracranial spaces.

Objective: To assess the surgical management outcome and associated factors of epidural hematoma in Felege Hiwot Comprehensive Specialized Hospital (FHCSH) and Tibebe Ghion Teaching Hospital (TGTH), Bahir Dar City, Northwest Ethiopia, 2022.

Methods: Institution-based retrospective cross-sectional study among 366 epidural hematoma patients charts from January 2020 January 20, 2022 at TGTH and FHCSH, Northwest Ethiopia. Systematic random sampling technique was used to select patient charts. Data were collected by reviewing patient charts using pre-tested questionnaires. Data were entered into the Epi data version 3.1and exported to SPSS version 23 for further analyses. A binary logistic regression model was fitted to identify the associated factors. Variables with P-value < 0.25 in the bi-variable analysis were a candidate for multivariable analysis and P-value <0.05 in the multivariate analysis were used to declare as statistically significant. The odds ratio (OR) with a 95% confidence interval (CI) was used to measure the strength of association.

Results: Over all, death among EDH treatment was 20(5.5%, 95% CI: 3.3-7.7%) outcome was death. The most common presentation of EDH were headache 343(93.7%), LOS 330(90.2%), vomiting 298(81.4%), and 107(10.9%) increased ICP. Of patients with increased ICP 64(59.8%) had decreased mentation followed by 33(33.7%) vomiting and 91(24.9%) had hypertension. The increased ICP (AOR=5.72, 95% CI: 1.55-21.07**),** >25mm thickness of hematoma (AOR=5.29, 95% CI: 1.43-19.61) and hypotension (AOR=4.30, 95% CI: 1.41-13.08) was significantly associated with the outcomes of EDH treatment.

Conclusion: The outcome of EDH treatment was comparable with other studies. The increased ICP, >25mm thickness of hematoma and hypotension was significantly associated with the outcomes of EDH treatment. Health care professionals should closely monitor blood pressure and the size hematoma >25mm.

Key words: Epidural hematoma, traumatic brain injury, outcome, trauma, craniotomy

1. INTRODUCTION

1.1 Background

An epidural hematoma (EDH) is a collection of blood that forms between the skull and the dura mater, the outermost protective membrane covering the brain. It is bleeding between the inside of the skull and the outer covering of the brain (called the dura) and includes collection of blood in epidural, subdural, parenchymal and intraventricular areas. Other names for EDH are extradural hematoma, epidural hemorrhage or intracranial hematoma. More broadly, it is also a type of traumatic brain injury (TBI). It is a life-threatening complication of severe traumatic brain injury (TBI)(1). It may be classified to into three groups: traumatic epidural hematoma which is the main cause of epidural hematoma, spontaneous spinal epidural hematomas and postoperative epidural spinal hematoma(1, 2).

Cranio-cerebral lesions can be classified into primary and secondary. Primary lesions occur as a direct result of a trauma to the head and include scalp injuries, skull fractures, extra-axial hemorrhage and intra-axial lesions. Secondary brain injury occurs as a complication of primary lesions and includes ischemic and hypoxic damage, cerebral edema and brain herniation. Extra-axial hemorrhage includes EDH, subdural hematoma (SDH), and subarachnoid (SAH) and intraventricular (IVH) hemorrhage. Primary intra-axial injuries include diffuse axonal injuries (DAIs), cortical contusions, intra-parenchymal hematomas (IPHs) and vascular lesions(3).

It is a potentially life-threatening complication of a head injury and usually caused by a head injury. The most common cause of EDH is trauma, microscopic tears in the blood vessels under the skin, bleeding disorders, and thinner skin due to aging(4). A skull fracture occurs in 75% of the cases. Physical abuse, vehicular accident, or collision in contact sports can also cause head injury and lead to an epidural hematoma. An EDH is diagnosed using computed tomography (CT) or magnetic resonance imaging (MRI) of head or spine. In the head, a hematoma appears as a dense mass that pushes the brain away from the skull.

The clinical symptoms can also occur in mild to moderate TBI and EDH can develop rapidly after an injury or slowly over the course of several hours. The time it takes for symptoms to develop depends on the severity of the injury and how quickly blood is filling into the lining

between the brain and skull. Some of the most common signs and symptoms of an EDH include; vomiting, confusion, seizures, loss of vision on one side, dizziness, changes in breathing, nausea, severe headache, weakness in one half of the body, and drowsiness or loss of alertness. The possible complications of EDH are herniation of the brain and permanent coma, normal pressure hydrocephalus, and paralysis or loss of sensation (which began at the time of the injury)(5).

Management of EDH is both conservative and surgical. Conventionally, urgent evacuation is the definitive mode of management(6). With the routine use of CT non-operative management is being used more often in selected patients(7-9) Evacuation of the hematoma, coagulation of bleeding sites, and inspection of the dura follows the craniotomy and burr hole(10, 11). The decision to perform a surgery in a patient with a traumatic EDH is dependent on several factors (neurologic status, size of hematoma, age of patients, CT findings). Indications for surgery: An EDH greater than 30 cm3 should be surgically evacuated regardless of the patient's Glasgow Coma Scale (GCS) score. To date, the outcomes of AEDH vary from center to center, depending on the resources and quality of care in different regions(12). The management outcome of EDH may be measured using; morbidity, mortality, functional status, mental wellbeing, and other aspect of health-related quality of life (13-15).

1.2 Statement of problem

Annually 69 million people suffer from TBI, of whom 5.48 million experience severe TBI(16). Cranial EDHs result from TBI and represent a potentially life-threatening neurosurgical emergency(17). It can be associated with significant morbidity and mortality if untreated; however, patients with isolated EDH who are fortunate enough to undergo safe and timely surgical evacuation often sustain favorable outcomes(18).

A systematic review and meta-analysis study shows that, an overall EDH incidence of 8.2 % and an operative rate of 55.5 %, 3.1 million people worldwide require surgery for traumatic EDH every year, most of whom are in prime working age. Given the favorable prognosis with treatment, traumatic EDH is a strong investment for neurosurgical capacity building(19). An EDH can be a life-threatening condition and results in death in up to 15% of cases. It usually requires immediate treatment or can cause brain damage or possibly death if left untreated. Injuries continue to be an important cause of morbidity and mortality in the developed and developing world(20).

Study performed in the United States has estimated that EDH occurs in approximately 3 % of head injury cases(20). The study in Australia, indicate that the Injury Severity Score adjusted in-hospital mortality rates for young patients with EDH were 4.8%(21).

An EDH occurs in 2% of all head injuries and up to 15% of all fatal head traumas. Males are more often affected than are females. Furthermore, the incidence is higher among adolescents and young adults. The mean age of affected patients is 20 to 30 years, and it is rare after 50 to 60 years of age. As an individual's age advances, the dura mater becomes more adherent to the overlying bone. This decreases the chance that a hematoma can develop in the space between the cranium and dura(22)

Trauma is the leading cause of death in people younger than 45yrs worldwide. [(1)] There is evidence that prompt neurosurgical management of TBI can significantly improve outcome, especially if decompression is performed within 48 h of injury(23). An EDH occurs in 2% of all head injuries and up to 15% of all fatal head traumas(22). EDHs occur in 0.2–12% of acute head-injured patients, and the overall mortality is 5%(24). EDHs generally occur at the site of impact, and a fracture is associated in 90% of cases(25).

It is a life-threatening condition, which may require immediate intervention and can be associated with significant morbidity and mortality if left untreated. Rapid diagnosis and evacuation are important for a good outcome (13, 26).

According to previous studies done in Ethiopia, the prevalence of head injury in patients presenting to the surgical emergency department ranged from 24.9% to 49.4% (27-29). More than half of the patients sustained a mild head injury 53.3% and 63.8% an open head injury(29).

A study in Hawassa shows that, the incidence of the mortality rate in TBI was 2.26 per 100-person day observation. The independent predictors of time to death were age above 65 years severe TBI, moderate TBI, hypotension, hypoxia, hyperthermia and hypoglycemic positively associated with mortality, while underwent neurosurgery was negatively associated with mortality(30). In Addis Ababa the prevalence of acute EDH was 15.9% which is the second leading cause of head trauma injury admission(31).

Generally, in our centers (FHCSH and TGTH) patients with AEDH are one of the commonly encountered patients but our health care area doesn't have well-structured document, and full information on management outcome that creates difficulty of showing health care improvement. Doing research on management outcome provides realistic information about benefit and risk of specific procedure and guides institution and addresses their problem. In Ethiopia, population and patient visits to hospitals that provide or doing surgical procedure are increasing in number.

1.3 Significance of the study

This study can also help surgical staff in the setting an opportunity to assess their performance and a chance to improve the outcomes of epidural hematoma. The hospital admin can also be made to give a special attention on surgical service provision to improve the management outcome.

This study is important to provide crucial information about the predisposing factors, clinical characteristics and outcome of epidural hematoma. The finding of this study will be identifying the factors of epidural hematoma. This should help the physician and the patient to choose better treatment options for reduction of morbidity, mortality and cost of health care.

The findings of this study will be used as inputs for program implementers at national as well as regional levels to improve treatment outcomes of epidural hematoma. This study can be used to guide a clinician for choosing the appropriate managements of epidural hematoma. Therefore, this study used as an input for other researchers to do further analysis.

2. LITERATURE REVIEW

2.1 Outcomes of EDH

A study in Pakistan shows that 62.4% EDH patient's outcome was good and predominantly these patients were in GCS 14 – 15 on presentation. Death occurred in 7.90% patients and 0.817% patients remained in vegetative state. These patients had very low GCS and coning or associated parenchymal or systemic injuries were already present before their operations(12). A study in Nigeria shows that the mortality rate of patients presented with EDH was 16.9%.(32)

A study in Mulago National Referral Hospital, Uganda shows that overall proportion of favorable outcome in patients with extra axial hematoma was 71.7%, with 42.3% and 81.7% for ASDH and AEDH, respectively. Factors associated with a favorable outcome were admission systolic BP > 90 mmHg, oxygen saturation > 90% and diagnosis AEDH. Moderate TBI and severe TBI were significantly associated with unfavorable outcomes(33).

A study in India shows that about 70% of patients recover well, 20% had moderate disability, 3.33% had severe disability, 3.33% were in persistent vegetative state, and 1 3.33% patient were dead(34). Although conservative management is successful management of epidural hematoma, surgical evacuation constitutes definitive treatment(9).

A study in Australia shows that, 21.5 % of severe TBI had EDH; of these, 30.8 % died in the hospital, 13.2 % survived with unfavorable outcome, 51.6 % with favorable outcome. Mortality rates predicted by the Rotterdam score showed good correlation with observed mortality rates(35). Study show that patients with EDH who have a high GCS score 13–15, volume <40 mm, and less than 6 mm of midline shift should be considered for conservative management(36).

A study in Hawassa shows that, 72.2% TBI cases were managed conservatively, while 27.8% underwent various surgical interventions within the first one week of presentation. Most of the operated cases were aged 5 to 10 years (55%). The common surgical indications were the evacuation of epidural and subdural hematoma (4.5%); wound debridement for compound skull fracture (21.3%); and depressed skull fracture elevation (74.2%). Burr hole and evacuation was done for four mild TBI cases(37).

2.2 Associated factors of EDH

2.2.1 Sociodemographic characteristics

A study in Pakistan shows that, majority of patients with EDH was younger than 60 years; and the commonest age group was 21 to 30 years(27.79%) (12). A study in India shows the largest number of patients having head injury belong to age group of 21-30 years (50%), followed by 41-50 years age group (16.66%), less common in age group more than 60 years (3.3%). Male to female ratio was 4:1(34). Males are more often affected than females, and the incidence is higher among adolescents and young adults. The mean age of affected patients is 20 to 30 years, and it is rare after 50 to 60 years of age. As an individual's age advances, the dura mater becomes more adherent to the overlying bone. This decreases the chance that a hematoma can develop in the space between the cranium and dura(22).

A study in Australia shows that, age was the main factors influencing outcomes after severe TBI associated with EDH(35).

A study in Hawassa shows that, about 79.8% of falls and 58.3% of RTAs occurred in boys(37).
A study in Gedeo Zone, Southern Ethiopia; the majority of head injury patients were found in the age categories of 15-29 years (36.8%), and under 15 years (29.2%). Majority of patients were male dominance of head injury patients (71.7%)(27).

2.2.2 Clinical related characteristics

A study in Pakistan shows that, the commonest presentation of EDH was 73.11% headache, 63.44% had vomiting, 32.7% loss of consciousness and 26.97% focal neurological deficit as presenting complaints. The site of hematoma was temporal-parietal(30.79%), frontal(26.97%), parietal(12.8%), posterior fossa (2.99%), and occipital (2.99%) (12).

A study in India shows the mode of injury in majority of patients was due to road traffic accidents (60%), self-fall (30%), and assault (10%). Patients presented with lucid interval (36.66%), anisocoria (23.33%), Battle’s sign (13.33%), hemotympanum (10%), black eye (10%), and hypoxia or hypotension (6.66%). Majority of mode of EDH management 63.33% were conservatively (34).

A study in Australia shows that, severity of TBI, and neurological status were the main factors influencing outcomes after severe TBI associated with EDH(35).

Study show that a low GCS before surgery, or on arrival, abnormal pupil examination, the time between neurological symptoms and surgery, and elevated ICP in the post-operative period were associated with poor prognosis of EDH. The typical presentation is an initial loss of consciousness following trauma, a complete transient recovery ("often termed as a lucid interval"), culminating in a rapid progression of neurological deterioration. This occurs in 14% to 21% of patients with an EDH. Therefore, the presentations range from a temporary loss of consciousness to a coma. The presentation of symptoms depends on how quickly the EDH is developing within the cranial vault. A patient with a small EDH may be asymptomatic, but this is rare. Also, an EDH may also develop in a delayed fashion. Enlarging hematoma leads to eventual elevation of intracranial pressure which may be detected in a clinical setting by observing ipsilateral pupil dilation, the presence of elevated blood pressure, slowed heart rate, and irregular breathing(1).

A study in Hawassa shows that TBI contributed to 7.4% of pediatric emergency room visits. Pedestrian RTA and falls, early presentation (<24 hours of injury), and mild form of TBI among boys were the most common documented patterns. ICP, hyperglycemia, severe TBI, and presence of contusion, DAI, or intracranial bleeding on head CT predicted poor outcome. Majority (34%) of the TBI cases stayed from 4 to 7 days, while 78 (24.6%) were discharged within 24 hours of arrival. The average length of hospitalization days among those who died was 4.5 days (median 2 days), and 50% of deaths occurred within the first 3 days of admission. Factors affecting the outcomes were presence of increased ICP at admission, severe TBI, presence of hyperglycemia and contusion, DAI, or intracranial bleeding on head CT scan found to be significantly associated with death or neurologic disability among pediatric TBI(37).

2.2.3 Trauma related characteristics

A study in Pakistan shows that location of epidural hematoma is significant because the prognosis relies on location of EDH. Supra tentorial epidural hematomas are more common than posterior fossa epidural hematomas. The most common location for EDH was temporo-parietal region 30.79% followed by frontal region 26.97%(12).

A study in India shows the most common site of EDH was temporal (20%), and temporo-parietal (20%) regions, parietal (16.66%) and frontal (13.33%) regions. About 56.6% had EDH on right side, 36.66% on left side and 6.66% had Bilateral EDH. CT brain findings of EDH shows; 46.66% patients clot volume was more than 30ml, and 53.33% of patients was found in less than 30ml. Midline shift was noted in 40% of patients, absent in 60% patients, and brain herniation was absent in 93.33% patients (34).

A study in Hawassa shows that, the main cause of TBI was RT (45.4%), falls (32.8%); fighting/violence (12.6%); and animal bite or kick injury (8.8%)(37).

2.3 Conceptual framework

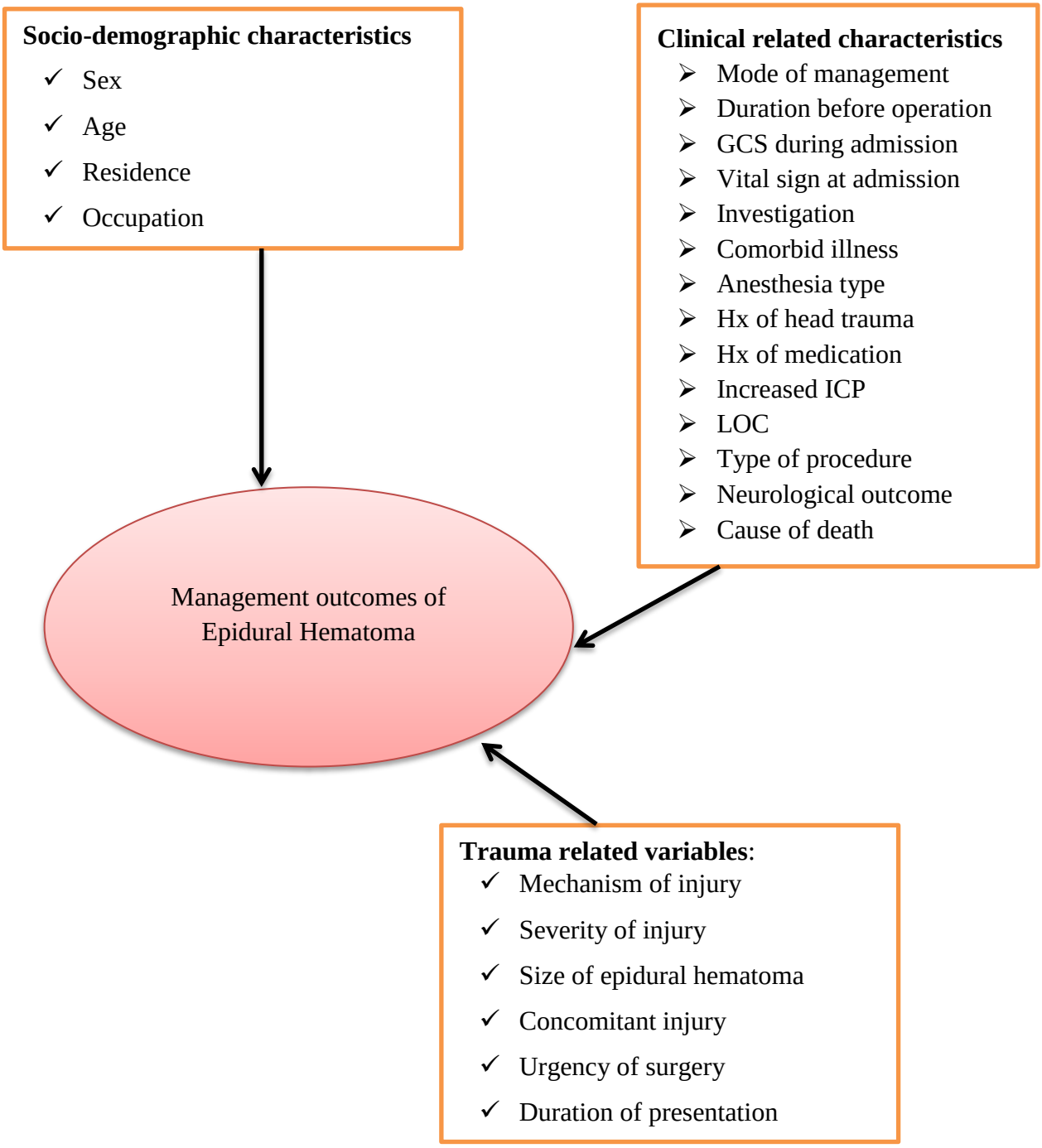

Figure 1: Conceptual framework of epidural hematoma

3. Objectives

3.1 General objective

- ✓ To assess the Surgical management outcome and associated factors of epidural hematoma in FHCSH and TGTH, Northwest Ethiopia 2022

3.2 Specific Objective

- ➢ To identify the surgical management outcomes of EDH in TGTH and FHCSH.
- ➢ To identify the associated factors of EDH in TGTH and FHCSH

4. METHODS AND MATERIAL

4.1 Study area and period

This study was carried out in Tibebe Ghion Teaching Hospital (TGTH) and Felege Hiwot Comprehensive Specialized Hospital (FHCSH), from August 1-30/2022. TGTH and FHCSH found in Bahir Dar city, is the capital city of Amhara regional state, found in northwest Ethiopia, 565 Km far from Addis Ababa; the capital city of Ethiopia.

Bahir Dar city have two public Comprehensive Specialized hospitals. This study was conducted in TGTH and FHCSH from October 15-November 13/2022 G.C. since it is possible to obtain a sufficient number of surgical patients coming from different parts of Northern Ethiopia; Department of neurosurgery is one of the main departments in TGTH and FHCSH, which gives full-fledged clinical service.

4.2 Study design

Institution-based retrospective cross-sectional study design was conducted

4.3 Population

4.3.1 Source population

Surgical patients with epidural hematoma from January 2020 to January 2022.

4.3.2 Study population

All patients diagnosed and surgically treated for Epidural hematoma.

4.4 Inclusion and Exclusion Criteria

4.4.1 Inclusion Criteria

All surgical patients with epidural hematoma treated surgically were included. All patients who had a brain injury requiring admission and patients fit for operative modes in the study period were included.

4.4.2 Exclusion criteria

Those patients referred out with post-craniotomy complications were excluded. Patients with incomplete documentation and unknown discharge results were excluded.

4.5 Variables of the Study

4.5.1 Dependent variables

- Management (surgical) outcomes of EDH

4.5.2 Independent variables

- Socio-demographic characteristics including; sex, age, and residence
- **Clinical related characteristics including; mo**de of management, duration before operation, GCS during admission, vital sign at admission, investigation, comorbid illness, and anesthesia type
- **Trauma related variables**: mechanism of injury, severity of injury, size of epidural hematoma, concomitant injury, urgency of surgery, and duration of presentation.

4.6 Operational definition and term definitions

Outcome: the final result of surgical patient after surgical management (at discharge)

Emergent surgery: surgery for a condition which is immediately life-threatening. Surgery must be performed within a few hours

Urgent surgery: surgery for a condition that is potentially life-threatening surgery usually must be completed within 24 hours

Co morbidity: the presence of one or more additional disease or disorder co-occurring with a primary disease or disorder

Anesthesia type: category that enables the painless performance of surgery.

Complication: is unfavorable evolution or consequence of a disease, a health condition or a therapy.

Craniotomy: it is a procedure of open up part of skull and removal of an epidural hematoma to reduce the pressure on the brain.

Burr hole: Drilling a small hole in the skull to relieve pressure and allow blood to drain outside the skull.

4.7 Sample size determination and sampling procedure

The sample size was determined using a single population proportion formula by considering a 95% confidence level, 5% marginal error and 39.0% the proportion of EDH in Addis Ababa(31).

Where;

n=desired sample size

Zα/2= the value of standard score at 95% confidence level (1.96),

P= proportion of EDH (39.0%)

d= marginal error= 5% (0.05)

$$n_i = \frac{(Z\alpha/2)^2 PQ)}{d^2} = \frac{(1.96)^2(0.39*(1-0.39))}{0.05^2} = \frac{0.91392}{0.0025} = 365.57 \approx \underline{\underline{366}}$$

Therefore, the final sample size is 366.

4.8 Sampling technique and procedure

In Bahir Dar city there are two public hospitals providing epidural hematoma management. Two hospitals were included based on adequate information it has been provided and its number of patients flow for the study area. A simple random sampling technique was used to select patients chart from the surgeon's registration log book. A patient's chart with incomplete documentation and unknown discharge result were replaced with the next charts.

Bahir Dar city
2745

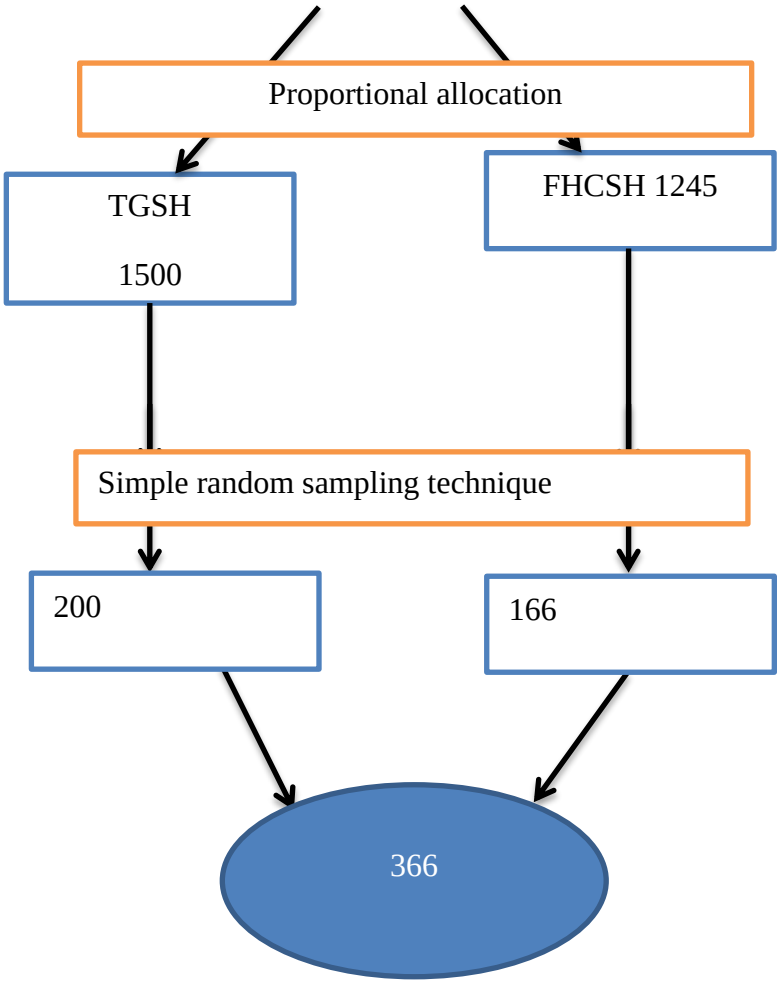

Figure 2: Schematic presentation

4.9 Data collection tools and methods

Data were collected by chart review retrospectively using structured pre-tested questioners and checklist from the patients' charts. The English language version questioners and checklist were used that adapted from different pieces of literature. The questionnaire and checklist contains; socio-demographic and clinical characteristics. The data were collected by two trained data collectors and supervised by the principal investigator.

4.10 Data quality control

Before the actual data collection, data collectors and supervisors were trained intensively on the contents of the questionnaire, checklist, data collection methods, and ethical concerns. Therefore, data collectors become familiar with the questionnaire.

Five percent of the samples were pre-tested in FHCSH and the questionnaire was modified and edited based on the findings. During data collection, both supervisors and the principal investigator were have checked the data for its completeness and missing information at each point. Furthermore, data were checked during entry and compilation before analysis.

4.11 Data Processing and Analysis

The collected data were coded, entered into EPI data version 3.1 software, and exported to statistical product and service solutions (SPSS) version 23 software packages for further analysis. Descriptive statistics were used to summarize the data in the form of frequency, mean, standard deviation (SD), and cross-tabulation. A binary logistic regression analysis was carried out to identify the association between the outcome variable and independent variables.

Variables with P-value <0.25 in bi-variable logistic regression were used for multivariable logistic regression. A p-value <0.05 were considered statistically significant. Adjusted odds ratio (AOR) with 95% confidence intervals (CI) was used.

4.12 Ethical Consideration

Ethical clearance was obtained from the Institutional Review Board (IRB) of the College of Medicine and health sciences, Bahir Dar University, Ethiopia. Then legal official clearance letters were written to the Ethiopian public health institute (EPHI). Finally, legal official clearance letters were written for TGTH and FHCSH.

Confidentiality was secured by avoiding writing the patient's name and the data were not give to the third person. The data extractions were conducted in a separate room. Moreover, confidentiality was secured during data collecting, analyzing, and reporting.

4.13 Dissemination of the Result

The plan of dissemination of the research result includes a presentation at Bahir Dar University College of Medicine and Health Sciences, Research Conferences. The report paper will also be disseminated to, Bahir Dar city health administration and regional health bureau. Publication in Scientific journal and online dissemination will also be considered.

5. Result

5.1 Socio-demographic characteristics

A total of 366 patient charts were included in the study. The mean age was 29.95 ± 11.42 years (Mean ± SD) with a range of 2-63 years. About 248(67.8%) of patients were rural residents, 327(89.3%) were male, 214(58.5%) of patients were 16-30 years and 219(59.8) of patients were farmers (Table1).

Table 1:- Socio-demographic characteristics of the management outcome of EDH at TGTH & FHCSH, Northwest, Ethiopia, 2022(n=366)

Variables	Categories	Frequency	Percentage
Residence	Rural	248	67.8
	Urban	118	32.2
Sex	Male	327	89.3
	Female	39	10.7
Age	≤15years	20	5.5
	16-30years	214	58.5
	31-45years	94	25.7
	>45years	38	10.4
Occupation	Farmer	219	59.8
	Merchant	57	15.6
	Driver	30	8.2
	Gov't employ	27	7.4
	Others	33	9.0

5.2 Clinical related characteristics

This study finding shows that majority of patients were presented with headache 343(93.7%), LOS 330(90.2%), vomiting 298(81.4%), and 107(10.9%) increased ICP. Of patients with increased ICP 64(59.8%) had decreased mentation followed by 33(33.7%) presented with vomiting and 91(24.9%) had hypertension. However, hypotension 40(10.9%), aspiration 30(8.2%) and seizure 25(6.8%) were less common clinical presentation of EDH (Figure 2 and Table 2).

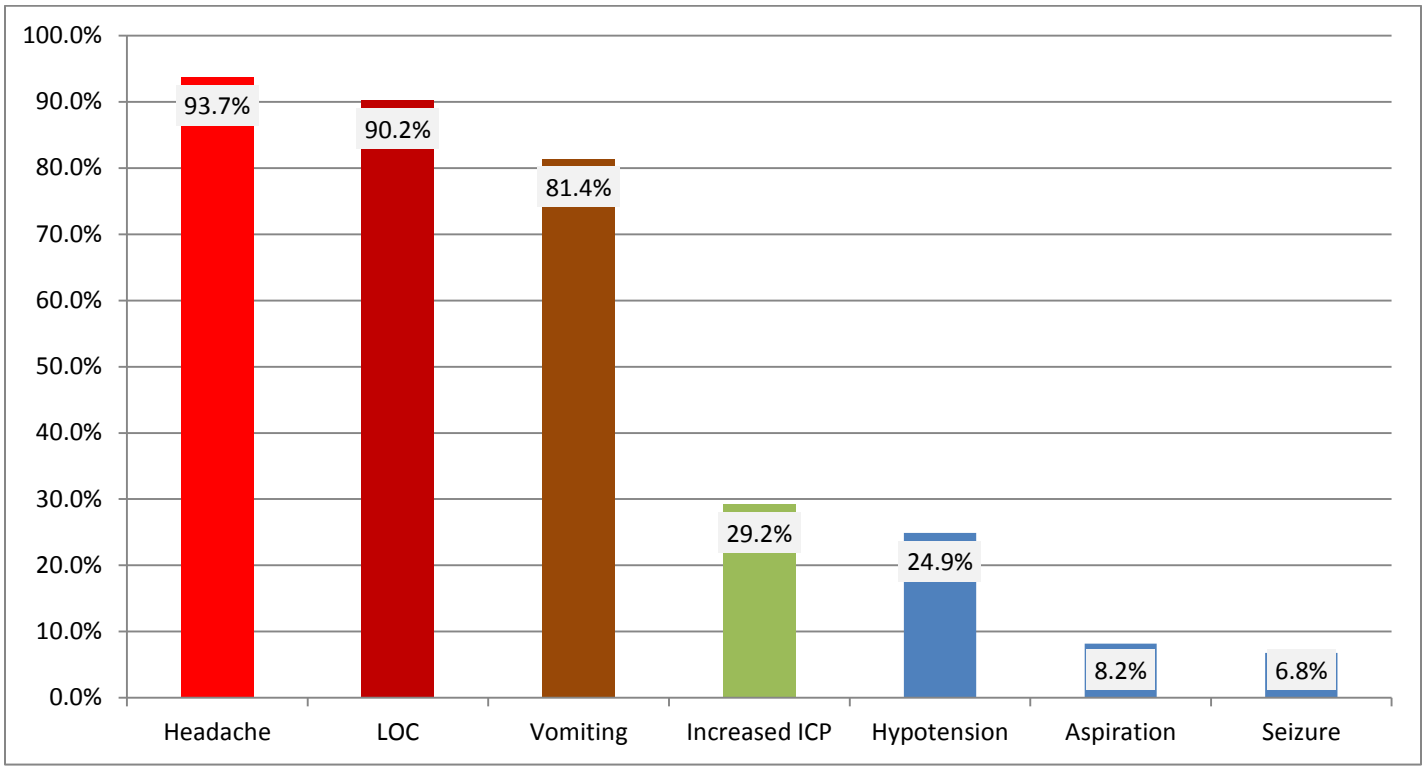

Figure 3: Clinical presentation of the EDH at TGTH & FHCSH, Northwest, Ethiopia, 2022

Ten (2.7%) of patients had chronic illness, of this six and four patients had hypertension and respiratory disease respectively. Only 6(1.6%) of patients had history of medication, and 45(12.3%) of patients had abnormal body moment. About 270 (73.8%) of patients place of occurrence trauma was outdoor. 153 (41.8%) of patients who had body weakness were hemi paretic. 298(81.4%) were right handed. Majority, 250(68.3%), of patients arrived with in

24hours. More than half 208(56.8%) patients had moderate TBI, 46(12.6%) of severe TBI and 6(1.6%) were critical head injury patients (Table 2).

Table 2:- Clinical presentation related characteristics of the management outcome of EDH at TGTH & FHCSH, Northwest, Ethiopia, 2022(n=366)

Variables	Categories	Frequency	Percentage
Chronic illness	Yes	10	2.7
	No	356	97.3
Type of chronic illness	hypertension	6	60.0
	respiratory disease	4	40.0
History of medication	Yes	6	1.6
	No	360	98.4
Duration of hospital stay	≤3days	48	13.1
	4-7 days	242	66.1
	>7 days	76	20.8
Place of occurrence	Occupant vehicle	36	9.8
	Pedestrians	18	4.9
	Outdoor	270	73.8
	Home	42	11.5
Arrival time	≤12 hrs	258	43.2
	23-24 hrs	91	24.9
	>24hrs	117	32
Abnormal body moment	Yes	45	12.3
	No	321	87.7
Dominance	Right handed	298	81.4
	Left handed	68	18.6
GCS	Mild	161	44.0
	Moderate	134	36.6
	Severe	71	19.4
Increased ICP	Yes	107	29.2
	No	259	70.8
Symptoms of Increased ICP	Decreased mentation	64	59.8
	Vomiting	36	33.7
	Hypertension	7	6.5
Pupillary sign	Midsized & reactive	185	50.5
	Unilaterally dilated &fixed	143	39.1
	Bilaterally dilated &Fixed	38	10.4
body weakness	Hemiparesis	153	41.8
	Monopoiesis	27	7.4
	Hemiplegia	40	10.9
	No	146	39.9
Severity of TB	Mild	106	29.0

	moderate	208	56.8
	Severe/critical	52	14.2

From the mechanism of injury fighting is the leading cause 72.7% and fall down injury was the second cause of EDH (Figure 4).

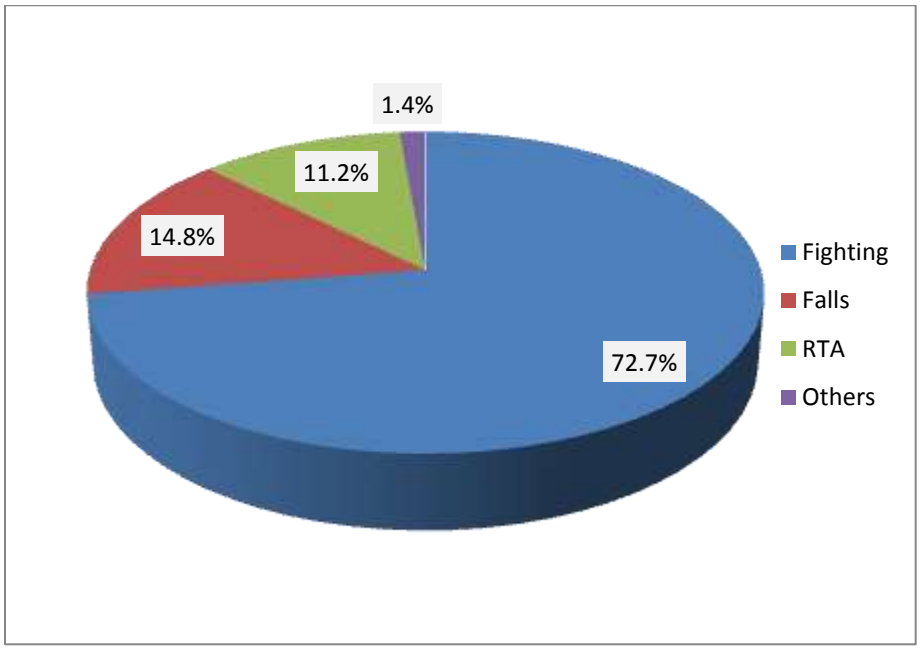

Figure 4: Mechanism injury of the EDH at TGTH & FHCSH, Northwest, Ethiopia, 2022

CT scan findings

The most commonly involved hemisphere was left 213(58.2) and 273(74.6%) of patients had more than 5cm midline shaft and the CT scan shows that 156(42.6%) of patients had linear skull fracture and 106(29.0%) patients had contusion (Table 3).

Table 3:- CT scan findings of EDH at TGTH & FHCSH, Northwest, Ethiopia, 2022(n=366)

Variables	Categories	Frequency	Percentage
Thickness of hematoma	≤25mm	224	61.2
	>25mm	142	38.8
Involvement of Hemisphere	Right	148	40.4
	Left	213	58.2
	Bilateral	5	1.4
Midline shaft	No	10	2.7
	≤5cm	83	22.7
	>5cm	273	74.6
Other CT scan findings	None	44	12.0

	Linear skull fracture	156	42.6
	DSF	56	15.3
	Contusion	106	29.0
	others	4	1.1

The most common site of EDH was Parieto-temporal 196(53.6%), followed by frontal 89(24.3%), temporal 57(15.6%) and 24(6.5%) other sites (Figure 5).

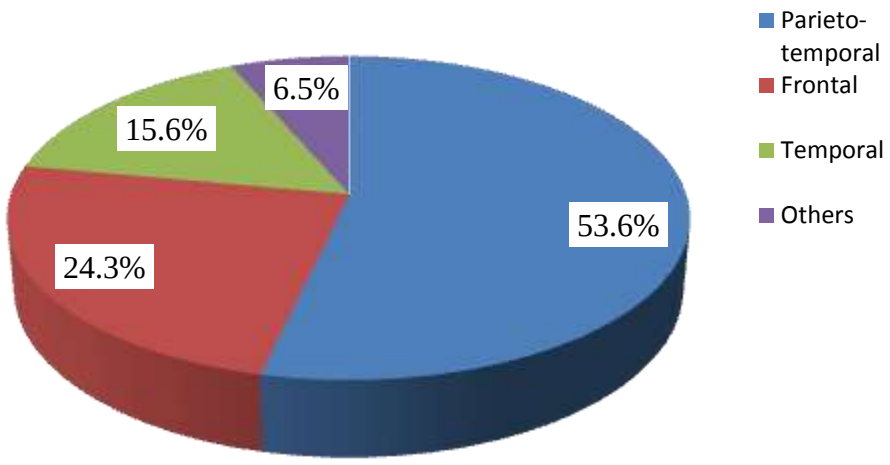

Figure 5: Site of EDH at TGTH & FHCSH, Northwest, Ethiopia, 2022

For majority of patients ,346(94.5%), craniotomy was done, 354(96.7%) were given general anesthesia and 64(17.5%) of patients were admitted in the ICU. The most common cause of death was primary brain injury 16(80.0) and respiratory failure accounted 4(20.0) (Table 4)

Table 4:- Type of management and outcome of EDH at TGTH & FHCSH, Northwest, Ethiopia, 2022(n=366)

Variables	Categories	Frequency	Percentage
Type of surgical procedure	Craniotomy	346	94.5
	Elevation &evacuation	9	2.5
	Burr hole	11	3.0
Type of anesthesia used	Local anesthesia	12	3.3
	General anesthesia	354	96.7
ICU admission	Yes	64	17.5
	No	302	82.5
Cause of death	Primary brain injury	16	80.0
	Respiratory failure	4	20.0
Neurologic outcome	Good	199	57.5
	Some disability	128	37.0
	Severe disability	15	4.3
	persistent vegetative state	4	1.2

About 20(5.5%, 95% CI: 3.3-7.7%) EDH treatment outcome was death while 346(94.5%, 95% CI: 92.3-96.7%) patients were discharged improved (Figure 6).

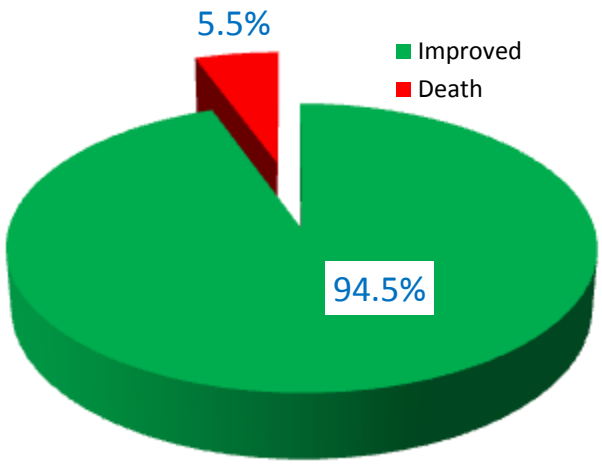

Figure 6: Treatment outcomes of EDH at TGTH & FHCSH, Northwest, Ethiopia, 2022

5.4 Factors affecting EDH

On bi-variable analysis; residences, increased ICP, hypotension, duration of hospital stay, thickness of hematoma, severity of TBI, and time of arrival were associated with the outcomes of EDH treatment. On multivariable analysis; increased ICP, >25mm thickness of hematoma and hypotension was significantly associated with the outcomes of EDH treatment.

Hypotensive patients (systolic blood pressure less than 90mmHg) were 4.30 times more likely to die as compare to those with blood pressure greater than 90mmHg (AOR=**4.30, 95% CI: 1.41-13.08)**

Those with increased ICP EDH patients were 5.72 times more likely to die as compare to whose ICP was normal (AOR=**5.72, 95% CI:1.55-21.07).**

Those with >25mm thickness of hematoma patients were 5.29 times more likely to die as compare to whose thickness of hematoma ≤25mm (AOR=**5.29, 95% CI: 1.43-19.61**)(Table 6).

Table 5:- factors affecting the outcome of EDH at TGTH & FHCSH, Northwest, Ethiopia, 2022(n=366)

Variables	Categories	EDH		COR with 95% CI	AOR with 95% CI	P-value
		Improved	death			
Residence	Rural	237(95.6%)	11(4.4%)	0.56(0.23-1.40)	0.48(0.16-1.45)	0.190
	Urban	109(92.4%)	9(7.6%)	1	1	
Increased ICP	**Yes**	**92(86.0%)**	**15(14.0%)**	**8.28(2.93-23.43)**	**5.72(1.55-21.07)**	**0.009**
	No	**254(98.1%)**	**5(1.9%)**	**1**	**1**	
Thickness of hematoma	**=<25mm**	**220(98.20%)**	**4(1.8%)**	**1**	**1**	**0.013**
	>25mm	**126(88.7%)**	**16(11.3%)**	**8.28(2.93-23.43)**	**5.29(1.43-19.61)**	
Duration of hospital stay	≤3 days	43(89.6%)	5(10.4%)	1.36(0.39-4.72)	0.87(0.15-5.22)	0.883
	4-7 days	233(96.3)	9(3.7)	0.45(0.16-1.31)	0.92(0.23-3.65)	0.905
	7days	70(92.1%)	6(7.9%)	1	1	0.987
Severity of TB	Mild	101(95.3%)	5(4.7%)	1	1	0.081
	moderate	203(97.6%)	5(2.4%)	0.50(0.14-1.76)	0.23(0.05-1.10)	0.065
	Severe/Critica	42(80.8%)	10(19.2%)	4.81(1.55-14.92)	0.87(0.18-4.28)	0.863
Arrival time	≤12hrs	146(92.4%)	12(7.6%)	1	1	0.168
	13-24 hrs	85(93.4%)	6(6.6%)	0.86(0.31-2.37)	1.86(0.53-6.58)	0.336
	>24 hrs	115(98.3%)	2(1.7%)	0.21(0.05-0.96)	1	0.183
Hypotension	**Yes**	**78(85.7%)**	**13(14.2%)**	**6.38(2.46-16.55)**	**4.30(1.41-13.08)**	**0.010**
	No	**268(97.5%)**	**7(2.5%)**	**1**	**1**	

Hosmer and Lemeshow Test (P=0.070)

6. Discussion

This study included 366 participants with a response rate of 100%. This study showed that 20(5.5%, 95% CI: 3.3-7.7%) of EDH patients were died. The study identified that increased ICP (AOR=5.72, 95% CI: 1.55-21.07**),** >25mm thickness of hematoma (AOR=5.29, 95% CI: 1.43-19.61) and hypotension (AOR=4.30, 95% CI: 1.41-13.08) were significantly associated with the outcomes of EDH treatment.

The outcomes of EDH was better than studies conducted in Pakistan 7.9%(12), Nigeria (16.9%)(32) India (13.33%) (9), and Australia (30.8 %). This difference might be due to variation of study population, area and methods used. A study in Australia shows that 21.5% of severe TBI had EDH, while in this study 52(14.2%) of EDH patients were severe TBI. Thus turns to increase the mortality and unfavorable outcomes of EDH.

This study revealed that those who had increased ICP were significantly associated with the poor outcomes (death) of EDH patient. A study in Egypt shows that systolic BP > 90 mmHg at admission significantly associated with favorable outcomes of EDH. Moderate TBI and severe TBI were significantly associated with unfavorable outcomes(33).

This study shows that those EDH patients who had >25mm thickness of hematoma were significantly associated with increased rate death. The reason might be larger hematomas were associated with a higher incidence of progression in size and clinical deterioration causing death.

This study also showed that those patients who had less than 90mmHg systolic blood pressure were significantly associated with the poor outcome (death) of EDH patients.

This study shows that majority of EDH patients were males, 16-30 years and farmers. Fighting and fall down injury were the major causes of EDH. A study in Addis Ababa shows that, assaults and RTAs was the most frequent cause of trauma(31). Also the most common site of EDH was parieto-temporal and frontal region. This finding was similar to a study in Pakistan, temporo-parietal 30.79%, frontal region 26.97%(12), India temporal (20%), and temporo-parietal (20%), parietal (16.66%) and frontal (13.33%)(34).

This study revealed that 57.5% of patients recover well, 37.0% of patients had some disability, 4.3% of patients had severe disability, and 1.2% of patients had persistent vegetative state. This is similar to a study in India, 70% of patients recover well, 20% had moderate disability, 3.33% had severe disability, and 3.33% were in persistent vegetative state(34).

6.1 Limitations of the study

This study was retrospective in nature and is based on the registry book and chart review, which lacks very important variables. This study was institutional based retrospective cross-sectional study and due to the nature of the study design it is not possible to assess the temporal relationship.

7. Conclusion and Recommendation

7.1 Conclusions

The mortality rate of EDH was comparable with other studies. EDH was common in 16-30 years and farmers. The most common presentation of EDH was headache, LOS, vomiting, and increased ICP. The most common site of EDH was Parieto-temporal. Fighting was the leading cause of EDH.

The study identified that increased ICP, >25mm thickness of hematoma and hypotension were significantly associated with the outcomes of EDH treatment.

7.2 Recommendation

For Minster of health: Prompt intervention and postoperative management in intensive care definitely improve outcome; create well trained and organized emergency team.

For health Care Professionals: should monitor blood pressure and optimize perioperative management of EDH. Prompt and adequate management of EDH shall decrease the mortality of EDH patients. Increased caution and closer monitoring are required when the size of the hematoma is >25 mm.

For researcher: I recommend for further study especially using prospective study.

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Annex

Annex I: Information sheet

Greeting!

My name is Dr. Aytenew Amsalu and I am postgraduate general surgery resident in Bahir Dar University. I'm conducting research on management outcome of epidural hematoma at TGSH and FHCSH, Bahir Dar town, Amhara region, Northwest Ethiopia. The findings of the study will give information about outcome of patients and help conduct further research.

Title of the research: management outcome and associated factors of epidural hematoma in FHCSH and TGSH, Northwest Ethiopia 2022

Objective: To assess the management outcome and associated factors of epidural hematoma in FHCSH and TGSH, Northwest Ethiopia 2022

Participants: Secondary data will be collected from patient chart

For further information: Dr Aytenew Amsalu;

Mob:- +251974497947, e-mail:- aytenew@gmail.com

Data collector: _____ Sig _____

Code:_____

Annex II: English Version Checklist

Instruction: Please read the questionnaires carefully and circle the alternative and fill the space provided.

Part I: socio demographic Characteristics

s/n	Questions	Response	Skip
101.	Residency	1. Rural 2. Urban	
102.	Sex	1. Male 2. Female	
103.	Age in years	____ years	
104.	Occupation	1. Farmer 4. Government employee 2. Driver 5. Other _____ 3. Merchant	
Part II: Clinical related characteristics			
201.	Chronic illness (comorbidity)	1. Yes 2. No	
202.	If Q201 answer is yes, type of illness?	1. DM 4. renal disease 2. HTN 5. Other_____ 3. Cardiac diseases	
203.	History of medication intake	1. Anticoagulants 3. CNS drugs 2. Antihypertensive 4. Other	
204.	History of trauma to the head	1. Yes 2. No	
Part III: Pattern and mechanism of traumatic head injury			
301	Mechanism of injury	1. RTA 4. Animal kick or bite 2. Falls 5. Other 3. Fighting	
302	Time of arrival after injury	_____*hrs*	
303	Duration of hospital stay	_____	
304	Place of occurrence	1. Occupant vehicle 3. Outdoor 2. Pedestrians 4. Home	
305	History of loss of consciousness	1. Yes 2. No	

306	If yes to Q. no 305, for how long?	_____minute	
307	History of abnormal body moment	1. Yes 2. No	
308	History of Headache	1. Yes 2. No	
309	History of Vomiting	1. Yes 2. No	
310	Dominance	1. Right-handed 2. Left-handed	
311	GCS	_____	
312	Loss of consciousness	1. Yes 2. No	
313	Seizure	1. Yes 2. No	
314	Aspiration	1. Yes 2. No	
315	Hypotension (SBP< 90 mmHg	1. Yes 2. No	
316	Increased ICP	1. Yes 2. No	
317	If yes to Q.no 6, what symptoms of increased ICP	1. Vomiting 3. Decreased mentation 2. Hypertension	
318	Pupillary sign	1. Midsized & reactive 2. Unilaterally dilated &fixed 3. Bilaterally dilated &Fixed	
319	Body weakness	1. No 3. Hemiparesis 2. Monopoiesis 4. Hemiplegia	
320	Severity of TB	1. Mild 3. Severe 2. Moderate 4. Critical	
321	Associated other intracranial injury	1. Yes 2. No	
322	If answer to Q. no 11 is yes, which one	1. Brain Contusion 2. Subdural hematoma 3. Intracranial Hemorrhage 4. Skull bone fracture	
323	Associated Extracranial injury	1. Yes 2. No	
324	If yes to Q. no 323, which of it	1. Extremity bone fracture 2. Chest injury 3. Abdominal injury 4. Spinal trauma	

		5. Other (Specify)_____	
Part IV: CT scan findings			
401	Sites of EDH	1. Frontal 3. parieto-temporal 2. Temporal 4) occipital 5) others _____	
402	Thickness of the hematoma	_____cm	
403	Involvement of Hemisphere	1. Right 2. Left 3. Bilateral	
404	Midline shift	1. No 2. <5mm 3. >5mm	
405	4) Other CT findings	1. None 2. Linear skull fracture 3. DSF 4. Contusion 5. Other(specify) _____	
Management given			
406	Type of surgical procedure	1. Burr hole 3. Elevation &evacuation 2. Craniotomy 4. Others _____	
407	Type of anesthesia used	1. Local anesthesia 2. General anesthesia	
408	ICU admission	1. Yes 2. No	
Management outcome			
409	Condition on discharge	1. Improved 2. Death	
410	If Q410 answer is death, what is the cause of death ?	1. Primary brain injury 3. Cardiac/Renal failure 2. Respiratory failure 4. Others (Specify)_____	
410	Neurologic outcome	1. Good 3. Severe disability 2. Some disability 4. persistent vegetative state	

Thank You!