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Patterns, Associated Factors and Treatment outcomes of Penetrating Abdominal Injury Among Patients Seen at Tebebe Ghion Specialized Hospital and Felege Hiwot Comprehensive Specialized Hospital from Jan.2019-September 2022, Bahir Dar, Ethiopia.

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COLLEGE OF MEDICINE AND HEALTH SCIENCE

DEPARTMENT OF General Surgery

Patterns, Associated Factors and Treatment outcomes of Penetrating Abdominal Injury Among Patients Seen at Tebebe Ghion Specialized Hospital and Felege Hiwot Comprhensive Specialized Hopital from Jan.2019-September 2022, Bahir Dar, Ethiopia.

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NOV, 2022

BAHIR DAR, ETHIOPIA

BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCE

DEPARTMENT OF GENERAL SURGERY

**PATTERNS, ASSOCIATED FACTORS AND TREATMENT OUTCOMES OF
PENETRATING ABDOMINAL INJURY AMONG PATIENTS SEEN AT TEBEBE
GHION SPECIALIZED HOSPITAL AND FELEGE HIWOT COMPRHENSIVE
SPECIALIZED HOPITAL FROM JAN.2019-SEPTEMBER 2022, BAHIR DAR,
ETHIOPIA.**

**THESIS TO BE SUBMITTED TO BAHIR DAR UNIVERSITY COLLEGE OF MEDICINE AND HEALTH
SCIENCE DEPARTMENT OF SURGERY FOR PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR SPECIALTY CERTIFICATE IN SURGERY.**

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DECLARATION

This is to certify that the thesis entitled “patterns, associated factors and treatment outcomes of penetrating abdominal injury among patients seen at Tebebe Ghion specialized hospital and Felege Hiwot comprehensive specialized hospital from jan.2019-september 2022, Bahir Dar, Ethiopia.”, submitted in partial fulfillment of the requirements for the certificate of specialty program in general surgery, Department of surgery, Bahir Dar University, is a record of original work carried out by me and has never been submitted to this 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.

Principal investigator Amhasilassie Ewunetu signature Date

Nov/2022

Bahir Dar, Ethiopia

Bahir Dar University
College of medicine and health science
Department of surgery

Approval of proposal for defense

I hereby certify that I have supervised, read, and evaluated this thesis titled "patterns, associated factors and treatment outcomes of penetrating abdominal injury among patients seen at Tebebe Ghion specialized hospital and Felege Hiwot comprehensive specialized hospital from jan.2019-september 2022, Bahir Dar, Ethiopia" by Amhasilassie Ewunetu final year general surgery resident prepared under my guidance. I recommend the thesis proposal be submitted for oral defense.

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Date 28/11/2022

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Date 12/11/2022



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ABSTRACT

Back ground: The abdomen is one of most commonly injured body part, necessitating surgery. Blunt and penetrating are the two main mechanisms of abdominal trauma. Stab and gunshot wound are major patterns in penetrating abdominal injuries. Morbidities and mortality of penetrating abdominal injuries is based on mechanism of injuries and patient's condition.

Objective: To assess patterns, associated factors and treatment outcomes of penetrating abdominal injury among patients seen at Tebebe Ghion specialized hospital and Felege Hiwot comprehensive specialized hospital from Jan.2019-Sep. 2022, Bahir Dar, Ethiopia.

Methods: A retrospective crosssectional hospital based study of patients operated with diagnosis of penetrating abdominal injuries. About 261 cases who meet inclusion criteria were selected by simple random techniques and included in the study. The collected data entered into Epi data 3.1 and exported to SPSS version 25 for analysis. A Binomial logistic regression model done to identify the associated factors. Variables with P-value < 0.25 in binary logistic regression analysis were a candidate for multi-variable analysis and P-value <0.05 in multi-variable analysis used to declare as statistically significant. The odds ratio (OR) with at 95% confidence interval (CI) used to measure the strength of association.

Result: Among 261 operated cases males were predominant 219(83.9%) whereas females were only 42(16.1%). The mean age was 29 years (SD \pm 13). The mechanism of injury was gunshot wounds in 166(63.6%) and stab injuries in 95(36.4%) cases. 204(78.2%) had hollow viscus injury, of which isolated small bowel, large bowel, stomach, and genitourinary injuries account 68(26.1%), 53(20.0%), 19(7.3%), and 9(3.4%) respectively. 59(22.6%) were diagnosed with solid organ injuries with 29(11.1) liver, 15(5.7%) spleen, 11(4.2%) kidney and 3(1.1) pancreatic injuries. Surgical site infection was the most common post-operative complication (16.9%), and mortality is 9.2%. Operative time, blood pressure at presentation and presence of solid organ injuries were significantly associated factors of mortality.

Conclusion: Penetrating abdominal injury affects predominantly males between ages of 19-45 years. GSW is a major mechanism of injuries study found the length operative time, presentation with shock and presence of solid organ in penetrating abdominal injury were highly associated with mortality in penetrating abdominal injuries.

Recommendation: We recommend to the hospital to enhance delivery of early intensive post-operative care decrease death of critically injured penetrating abdominal injury patients. We recommend the department of surgery to encourage abbreviating operative time in patients with hemodynamic instability as much as possible.

Table of Contents

Contents

DECLARATION	iii
Approval of proposal for defense	Error! Bookmark not defined.
Acknowledgement	v
ABSTRACT.....	vi
Table of Contents.....	vii
LIST OF TABLES	x
Table 2: Binary logistic regression for outcome of penetrating abdominal injuries .	x
LIST OF FIGURES	x
Figure:2 Durations of presentations.....	x
ACRONYMS AND ABBRIVATIONS	xi
1. INTRODUCTION	1
1.1BACKGROUND OF THE STUDY	1
1.2 STATEMENT OF THE PROBLEM.....	3
1.3 SIGNIFICANCE OF THE STUDY	4
2. LITERATURE REVIEW	5
2.1EPIDEMIOLOGY OF TRAUMA	5

2.2 PATTERNS AND TREATMENTS OF PENETRATING ABDOMINAL INJURIES.....	5
2.3 OUTCOMES OF TREATMENTS OF PENETRATING ABDOMINAL INJURIES	8
3. CONCEPTUAL FRAMEWORK.....	10
4. OBJECTIVES OF STUDY	11
4.1 GENERAL OBJECTIVE	11
4.2 SPECIFIC OBJECTIVES	11
5. METHODS & MATERIALS	12
5.1 STUDY DESIGN	12
5.2 STUDY AREA AND PERIOD	12
5.3 SOURCE POPULATION	12
5.4 STUDY POPULATION.....	13
5.5 INCLUSION AND EXCLUSION CRITERIA.....	13
5.6 SAMPLE SIZE, SAMPLING TECHNIQUE AND PROCEDURE	13
5.7 DATA COLLECTION PROCEDURES	14
5.8 DATA QUALITY CONTROL ISSUE	14
5.9 STUDY VARIABLES	15
5.9.1Dependent variable	15
5.9.2 Independent Variables	15
5.10 DATA PROCESSING & ANALYSIS.....	16
5.11 DISSEMINATION AND UTILIZATION OF THE RESULT.....	16
5.12 ETHICAL CONSIDERATIONS	17
6.0 RESULT	18
6.1 SOCIODEMOGRAPHIC CHARACTERISTIC AND PATTERNS OF PENETRATING ABDOMINAL INJURY	18
6.2 INTRA OPERATIVE FINDINGS AND PROCEDURES	21
6.3 OUTCOMES	23
6.4 ASSOCIATED FACTORS OF PENETRATING ABDOMINAL INJURIES	23
7. DISSCUSSION.....	27
8. CONCLUSION.....	30

9. ANNEX.....	31
10. REFERENCES	34

LIST OF TABLES

Table 1: Frequency distribution of Sociodemographic characteristics of PAI

Table 2: Binary logistic regression for outcome of penetrating abdominal injuries

LIST OF FIGURES

Figure:1 Associated factors of penetrating abdominal injuries

Figure:2 Durations of presentations

Figure:3 Mechanism of injuries

Figure :4 Distribution of indications for exploration.

Figure:5 Proportion of solid organ injuries

Figure:6 histogram of operative time

ACRONYMS AND ABBRIVATIONS

AOR-Adjusted odds Ration

BD- base deficit

BDU- Bahir Dar University

BAT- Blunt abdominal trauma

COD-crude odds ration

CI-confidence interval

CMHS- College of Medicine and Health sciences

DCS – Damage control surgery

GI- Gastrointestinal

GSW- Gunshot wounds

ICU- Intensive Care Unit

ISS- Injury Severity Sore

IAA- Intra abdominal abscess

NOM- non operative management

PAI- Penetrating abdominal injury

PATI-Penetrating abdominal trauma index

RTA- Road traffic accidents

SD- Standard deviation

SSI- Surgical site infection

TGSH- Tibebe Ghion Hospital

1. INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Trauma is still the most frequent cause of death in the first four decades of life, and it remains a major public health problem in every country, regardless of the level of socioeconomic development.(1)

It is estimated that by the year 2020, 8.1 million people will die yearly as a result of injuries, and road traffic accidents (RTA) will be the third-most common cause of disabilities globally and the second-most common cause in developing countries (2)

Trauma accounts for major losses of the workforce due to the associated morbidity and mortality. It was estimated that approximately 671 billion dollars were spent on trauma victims in the United States of America in 2013, and the costs associated with fatal injuries are 214 billion dollars.(3)

Abdominal trauma is a leading cause of morbidity and mortality among all age groups. Mechanisms of injury often determine the severity of abdominal injury and the likely associated injuries.(8)

Penetrating abdominal trauma (PAT) typically involves the violation of the abdominal cavity by a gunshot wound (GSW) or stab wound. (4)

The frequency of PAT across the globe relates to industrialization of developing nations, weapons available and significantly to the presence of military conflicts. Therefore the frequency varies. (5)

The abdominal viscera are among the most vulnerable organs of the body to penetrating trauma. The small intestine and colon respectively were the most prevalent abdominal organs damaged.(6)

Care of the patient with penetrating abdominal injury (PAI) has changed significantly over time. Such wounds were managed expectantly and were uniformly. Management has gone full cycle from exploration for all cases of penetrating trauma to the present maxim that “not everybody with a hole in the abdomen needs exploration”.(7)

Outcome of management of penetrating injury depends of various factors from patients overall status, trauma factors up to level of care given in each health care facilities.

1.2 STATEMENT OF THE PROBLEM

Mortality related to PAI is known to be related to the wounding agent, organs injured, number of organs injured, and severity of individual organ injury.(9)

The management of penetrating abdominal injury (PAI) has undergone a few paradigm shifts in the past century. Up until the early 1900s, PAI was managed conservatively. During World War I, however, it was discovered that patients who underwent mandatory operative exploration with subsequent intervention had a better chance of survival, and this soon became the standard of care.(10)

Trauma management in the developing world is faced with many challenges. Inadequate and underdeveloped emergency systems to care for victims further amplify the magnitude of the problem because there are no well-established response teams in most places. In this scenario, an abdominal trauma victim's outcome becomes catastrophic.(11)

In developed countries, trauma victims have better outcomes because of the costly trauma care centers with multidisciplinary teams caring for the victim. Pre-hospital interventions are not in place in our setting as there are no paramedic services. There is no organized trauma team as well. So our trauma management in our setting faces many challenges from patient reception up to discharge and follow up because of limited setting. Evidence based comparison and recommendation for health policy maker is needed to improve patient's outcome.(19)

There is no study done on patterns and outcome of PAI in our hospital which can be used to compare the prevalence of PAI and its management outcome with other regard to current paradigm of penetrating abdominal trauma management. There is also limited evidences exist in Ethiopia on this public health issue. This study assessed our patient's outcome and patterns of injuries with associated factors, the result of which, can be used at different levels. Especially in our locality, the institute can benefit to assess the trend of care for PAI patients.

1.3 SIGNIFICANCE OF THE STUDY

In Ethiopia, and Amhara region Tibebe Ghion specialized Hospital in particular have limited data showing the pattern of penetrating abdominal injury victims and treatment outcome. Previous studies have largely addressed patterns of both penetrating and blunt injury who needed Laparotomy .Therefore, this research has motivated to assess patterns, related injury characteristics, and outcome of PAI in our hospital. Evidence based local guideline can be developed based on the result, and it also help to compare our patient care with currently practiced recommendations.

2. LITERATURE REVIEW

2.1 EPIDEMIOLOGY OF TRAUMA

Trauma is the leading cause of death in the first four decades of life, and it is a major public health issue in all countries, regardless of socioeconomic progress.(1)

Trauma accounts for 16% of worldwide disease burden and it is most prevalent among people aged 15 to 45. According to estimates, 8.1 million people will die each year as a result of injuries by 2020. Trauma causes significant workforce losses due to the accompanying morbidity and mortality.(2)

In 2013, it was predicted that around 671 billion dollars were spent on trauma victims in the United States of America, with 214 billion dollars spent on fatal injuries. (3) According to the World Health Organization, poor and middle-income nations account for more than 90% of all injuries. Africa, primarily Sub-Saharan Africa region, contributes 21% of these. (2) The limited data on the burden of trauma in Ethiopia suggests that it is expanding at an alarming rate, accounting for half of all surgical emergencies.(12)

2.2 PATTERNS AND TREATMENTS OF PENETRATING ABDOMINAL INJURIES

The abdomen is the third most often wounded body part, requiring surgery in nearly a quarter of civilian cases. (13)

Although there are many patterns in terms of causation and type of abdominal injury, most literatures indicate that blunt is the most common (85%) method. The most common causes of blunt and penetrating injuries were road traffic accidents (RTAs) and stab injuries, respectively

.Exsanguination induced by injury to the abdominal organs accounts for 40 to 80 percent of mortality following trauma.(12)

Interpersonal violence is also on the rise, and this epidemic has been ignored for decades. (14)

The reason for the rise in violence is the cheap availability of firearms, which has resulted in an increase in direct attacks, murders, and suicide attempts, as well as ineffective gun legislation. (15)

In a study done in Egypt, abdominal trauma was found in 248 of 300 cases (82.7%), with 172 patients suffering from blunt abdominal trauma (69.4%) and 76 (30.6%) suffering from penetrating abdominal trauma. Among patients with penetrating abdominal trauma, the most common cause was stabbing (47.4%). (16)

From prospective, descriptive hospital-based study done in Khartoum, Penetrating abdominal injuries (PAIs) were common in the first four decade of life 89.4%.Males accounted for 91.8% of the total. 27.1% reported to the ER in a condition of shock, and 20 (23.5%) had symptoms of peritonitis.83.5% of the victims were stabbed with knives or other sharp objects, while 16.5 percent received gunshot wounds. (16)

Based on above two studies ,stab injury is a major mechanism of truma

In this study majority of patients were managed by exploratory laparotomy 69 (81.2%) however 18.8% underwent conservative measures. Hollow viscus injuries occurred in 86.9%, while solid organ injuries in 22.9%. All stomach, diaphragmatic, vascular, ureteric and isolated anterior abdominal injuries were repaired. (16)

A study done on changing pattern in management of Penetrating abdominal trauma the patterns and survival from PAI have remained similar over the past decade. This paper retrospectively reviewed 250 patients undergone laparotomy for penetrating abdominal injury.189 laparotomies 75.6% were performed for GSWs and 24.4% were performed for SWs. 92.8% were male patients, 7.2% were female patients, and the ages ranged from 1.4 to 71.8 years. (9)

A descriptive, cross-sectional study of 147 consecutive cases of abdominal trauma presenting to emergency showed the commonest mode of injury was stabbing occurring in 76 cases (51.7%) followed by gunshot injuries in 60 cases, 11 patients sustained blast pellet injuries. (15) All gunshot injuries underwent mandatory Laparotomy. 92% of the patients who underwent laparotomy had obvious signs of intra-abdominal visceral injury on physical examination. 76 patients had stab wound of which 59% had no peritoneal breach and were managed by local wound exploration, 29 patients underwent Laparotomy. Most commonly injured viscus was gut, small in 22 and large gut in 19 cases, liver in 12, kidney in 5, stomach and spleen in 3 cases each.(19)

A prospective study from Calabar, Southern Nigeria, showed gunshot injuries were the commonest. A total of 48 patients presented with abdominal trauma: PAT 29 (60%) and blunt abdominal trauma (BAT) 19 (40%). The patients were categorized into two groups for management: operative (laparotomy) 25 (86.2%) and non-operative 4 (13.8%). In the latter, the 4 male patients (stab wounds) whose ages ranged from 18 - 27 years were managed with satisfactory outcomes.(5)

In Ethiopia a retrospective study on Laparotomy for Abdominal Injury Indication & Outcome of patients in Addis Ababa. The study showed Penetrating trauma was the commonest injury, stab (35.7%) and Road Traffic Accidents (RTA) being the leading causes. Hollow organs were commonly injured than solid organs. The main procedure performed was repair of hollow and solid organ laceration/perforation. The negative laparotomy rate was 4.6%. (6) Complications were seen in 17.8% patients, the commonest being irreversible shock. The mortality rate was 8.5 %.(12)

Other Facility based cross-sectional study done in eastern Ethiopia at Hiwot Fana hospital on Treatment Outcome and Pattern of Penetrating Abdominal trauma victims. Total of 352 records with penetrating abdominal injury was reviewed from January 15 2020 up to January 31 2020. M: F ratio of 5.6:1 and the mean age was 26 years old. Machete accounts for 65% of the injuries followed by Bullet 22%. The most common site of injury is anterior abdomen and commonly injured organs were Small Intestine 55%, Colon 25% and Liver 11.4%. Commonly performed

procedure is Repair of hollow and solid organ n=200. Damage control surgery was done in 25 patients. The negative laparotomy rate is 6.5 %.(18)

2.3 OUTCOMES OF TREATMENTS OF PENETRATING ABDOMINAL INJURIES

In study in Khartoum, most of the patients (69.4%) run smooth post-operative course and discharged home in good general condition. Complications were encountered in 22 (25.9%) and four patients died. The causes of their death were (hemorrhagic shock, sepsis and pulmonary embolus). Surgical site infection was seen in 16.4% from the whole study group. Overall mortality for this series was 13.2%. Mortality was 0% for SWs versus 17.5% for GSWs. Rates of sepsis, IAA, GI tract fistula, and intra-abdominal hemorrhage were 8%, 5.6%, 3.6%, and 0.8%, respectively.(9)

However, the prospective study of calabar, south Nigeria showed less morbidity SSI and mortality were recorded in 6.9% and 10.3% patients respectively. (5)

The crossectional descriptive study of 147 showed the most common complication was wound infection, occurred in 20% of patients. Other complications included fecal fistula due to anastomotic breakdown, respiratory tract infection and multi organ failure. 3 patients required re exploration for management of fecal fistula. Overall mortality was 5 %.(19)

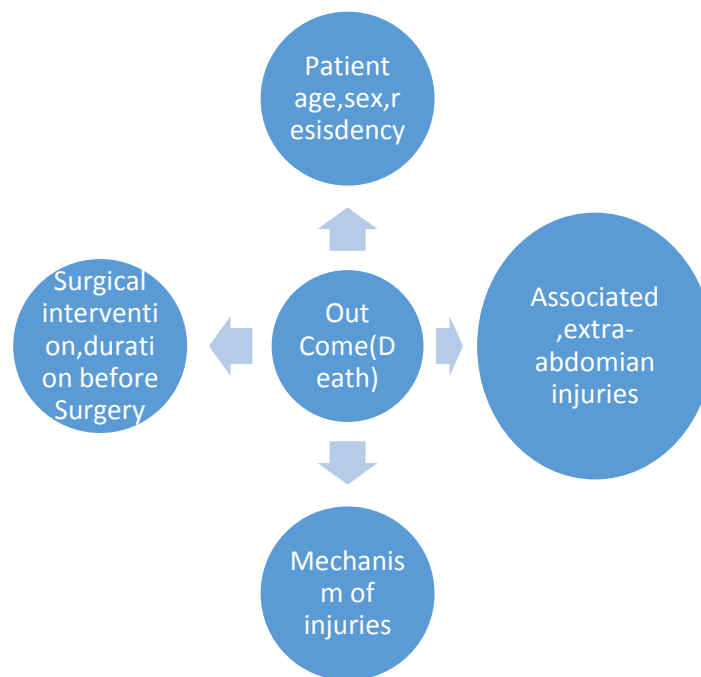
The commonest complication, in study done at Hiwot Fana hospital, was surgical site infection 23.9%. The Intensive care unit (ICU) admission rate is 3.7% and Mortality rate is 3.4%. In multivariable binary logistic analysis mortality is associated with hypotension, age above 45,

post op infectious complication (Pneumonia & Organ spaced surgical site infection) and ICU admission. (17)

This Literatures review revealed the patterns of penetrating abdominal injuries is varied in different countries in relation to cultural, socioeconomic and domestic conditions. The management principles of penetrating abdominal injury, regarding mandatory exploration versus expectant management, area similar. Mortality of these injuries range (4.5% up to 13.2 %), which can be explained by differences in common mechanism of injuries, associated injuries and the level of care. This study aims to comparing the patterns of injuries and there outcome as well as the principle of managements in our hospital with the global and relative local settings.

3. CONCEPTUAL FRAMEWORK

Figure:1: Associated factors of penetrating abdominal injuries



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4. OBJECTIVES OF STUDY

4.1 GENERAL OBJECTIVE

To assess patterns, associated factors and treatment outcomes of penetrating abdominal injury among patients seen at Tebebe Ghion specialized hospital and Felege Hiwot comprehensive specialized hospital from Jan.2019-Sep. 2022, Bahir Dar, Ethiopia.

4.2 SPECIFIC OBJECTIVES

To assess the relative proportion of patterns of penetrating abdominal injury

To assess outcome (death) of penetrating abdominal injury

To evaluate morbidity of penetrating abdominal injury

To determine the associated factors of penetrating abdominal injury

5. METHODS & MATERIALS

5.1 STUDY DESIGN

A retrospective cross-sectional hospital based study

5.2 STUDY AREA AND PERIOD

This study was conducted at Tibebe Ghion specialized hospital, CMHS BDU, and Felege Hiwot Comprehensive specialized from month of Jan.2019- Nov. 2022 in Bahir Dar, Ethiopia.

Bahir Dar is situated on the southern shore of Lake Tana, the source of the Blue Nile (locally called Abay). The city is located approximately 578 km (360 miles) north-northwest of Addis Ababa, and an elevation of 1,840 meters (6,036 foot) above sea level.

Tibebe Ghion specialized hospital is located about 10km south from the city center and about 7 km from the new bus station ('Addisu Meneharia') on the way to Adet District and about 23 km from the Blue Nile Falls (locally called 'Tis Esat' (Smoke of Fire). It is a tertiary university teaching hospital with 450 bed capacity out of which 72 are occupied by medical adult patients. The hospital receives patients who are referred from across the Amhara region and gives outpatient and inpatient services in all major departments.

5.3 SOURCE POPULATION

All Patients admitted to Tibebe Ghion specialized hospital and Felege Hiwot specialized comprehensive Hospital (FHCSH) were the source population.

5.4 STUDY POPULATION

Patients operated for diagnosis of penetrating abdominal injury at Tibebe Ghion specialized hospital and FHCSH from Jan. 2019 to Sep.2022.

5.5 INCLUSION AND EXCLUSION CRITERIA

Inclusion criteria

Patients operated with penetrating abdominal injury and discharged/deceased in in the study period with complete medical records.

Exclusion criteria includes

Patients operated in others hospital before referral.

Patient who opted to leave treatment against advice

Patient referred to other hospitals after

5.6 SAMPLE SIZE, SAMPLING TECHNIQUE AND PROCEDURE

The sample size was calculated by using single population proportion formula by taking p=20% which accounts for morbidity of patients for penetrating abdominal injuries and p=% which represents the mortality of patients at study done by Babar KM et al(15) and considering level of confidence 95% and 5% marginal error.

$$n = \frac{(z_{\alpha/2})^2 \cdot pq}{d^2}$$

Where; - n= minimum sample size

$Z_{\alpha/2} = 1.96$ (for 95% of CI)

p = accounts for morbidity of patients for penetrating abdominal injuries (P = 20%) and mortality of patients (P=5%).

d = marginal error = (5%)

$q=1-p$

$$n = \frac{(1.96)^2 \times 0.2 (0.8)}{(0.05)^2} = 245.86$$

$$n = \frac{(1.96)^2 \times 0.05 (0.95)}{(0.05)^2} = 72.99$$

This yields a sample size of nearly 245 and 72 respectively.

Considering incomplete charts of 5%, $=245 \times 5\% = 257$ and $72 \times 5\% = 75$

So, from both sample size calculation taking the largest one, the sample size was 257.

Therefore, about 261 patients' charts/cards diagnosed and operated for penetrating abdominal injury at TGSH and FHCSH were taken from total of 313 cases identified from OR registration logbooks. 10 cases record were incomplete and rest of them were selected by simple random techniques.

5.7 DATA COLLECTION PROCEDURES

Structured data extraction checklists as prepared through reviewing varieties of literatures

The target study populations first identified from registration books of surgical operation theatre. Then the patients' medical records were retrieved and data collected using a pre-prepared standard checklist from the chart.

5.8 DATA QUALITY CONTROL ISSUE

The structured data extraction checklists, prepared in English version. Two days training was given for data collectors (2interns), supervisor (1 resident) and regarding chart review, and practical exercise on patient chart review.

Pre-testing of the preliminary review of checklist was made at Felege Hiwot comprehensive specialized hospital at 5% of sample (34 charts), correct, and reformat accordingly. Check the completeness and consistency of each checklist with close supervision. All the collected data was checked & rechecked and necessary correction was made each day.

It was extremely important that the data we collect were of good quality, that is, reliable and valid.

We prepared Instruction sheets on how to fill the questionnaire and data extraction format.

Work in collaboration with research assistants carefully in all topics covered in the field work and make sure that all data collectors members of the research team master research technique.

Data collectors and supervisors trained on the objectives and significance of the study as well as how to fill the questionnaire and charts.

Data retrieval was done using scientifically sound methods.

The department of surgery and medical director of the institution was requested to full fill all the necessary requirements for the research.

5.9 STUDY VARIABLES

5.9.1Dependent variable

Death of patients after penetrating abdominal trauma.

5.9.2 Independent Variables

Patterns of injuries (stab vs gunshot)

Associated extra abdominal organ injuries

Age

Sex

Residency

Duration of presentation

Operative time

Type of organ injuries

Surgical interventions

Post-operative complications

Preoperative hemoglobin

Length of hospital stay

5.10 DATA PROCESSING & ANALYSIS

The principal investigator checked the collected data and any incomplete documents cleared prior to data entry. Data was entered using Epi Data 3.1 version from filled data check list .Data was extracted from Epi data for Data analysis to SPSS software version 25. The descriptive analysis was done by simple frequencies and proportions, and results was be presented by tables, bar graphs, and pie charts. Univariate analysis carried to assess the relation of dependent and independent variables at p-values less than 0.25. 95% confidence and p-value used to measure the association. Independent variables with significant association during univariate analysis taken to multivariate binary logistic regression test and adjusted odds ratio (AOR) calculated with 95% confidence intervals (CI) used.

5.11 DISSEMINATION AND UTILIZATION OF THE RESULT

The final report of this thesis will be presented to BDU, CMHS, and department of surgery. The findings will be published in a relevant scientific journal and disseminated online so that they can be of use for other academic researchers and clinical practitioners. It will also be presented on different conferences, and professional society meetings like Ethiopian Society of surgery. The data can also serve as a base line for future studies. At last, the final report will also be disseminated to regional health bureau.

5.12 ETHICAL CONSIDERATIONS

Ethical clearance obtained from the Institutional Review Board (IRB) of College of Medicine and health sciences, Bahir Dar University, Ethiopia. Official letter of permission from the college submitted to Bahir Dar University College of medicine and health sciences. Then, support letter obtained from TGSB medical director office. A formal letter submitted to all concerned bodies to obtain their cooperation. We took oral informed consent during a phone call while collecting missed information from the chart. I didn't use patient name rather their MRN and phone number on the questionnaire and the data is not given for the third person. The data extraction conducted in a separate room. Moreover, confidentiality strictly secured during data collecting, analyzing and reporting.

6.0 RESULT

6.1 SOCIODEMOGRAPHIC CHARACTERISTIC AND PATTERNS OF PENETRATING ABDOMINAL INJURY

This study included 261 patients. Their mean age was 29 years ($SD \pm 13$), ranging from 4 to 75 years. Penetrating abdominal injuries (PAIs) common in most involved age group (18 - 45 years) representing 212 cases (81.2%).

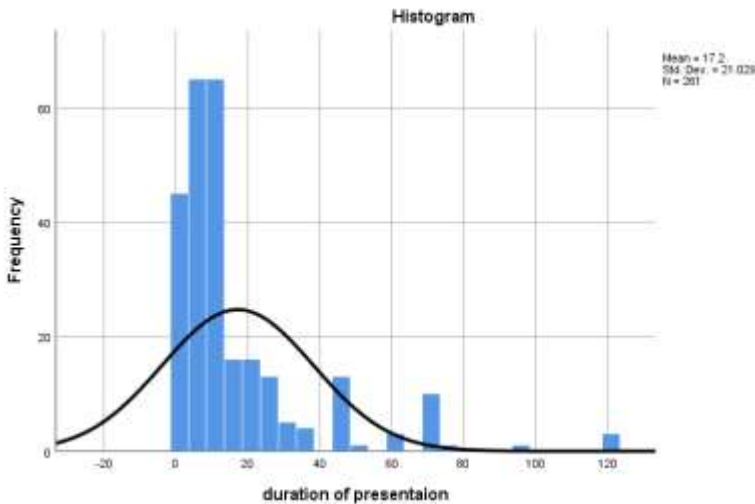
Table1 Frequency distribution of Sociodemographic characteristics of PAI

Age(yrs)	Frequency	Percent
≤18	17	6.5
19-45	212	81.2
>45	32	12.3
SEX		
Male	219	83.9
Female	42	16.1
Residence		
Rural	171	65.5
Urban	90	34.5

Males were predominant 219(83.9%)whereas females were only 42(16.1%) making a male to female ratio of 5:1.

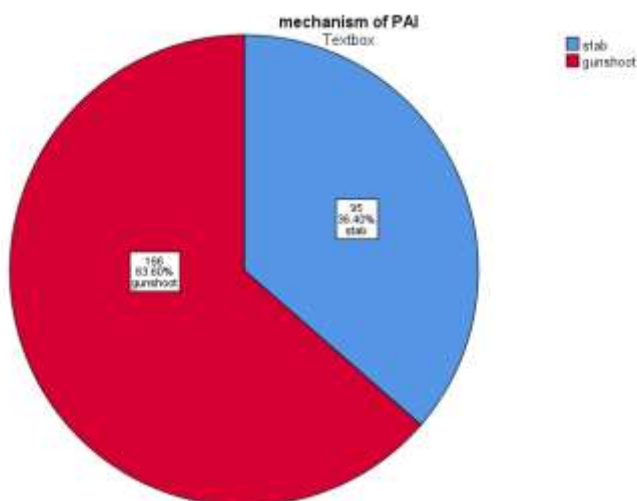
The mean duration of presentation from time of trauma to the facilities 17.2 hours (SD±21.029) ranging from 1 up to 120 hours.

[Figure 2: Durations of presentations](#)



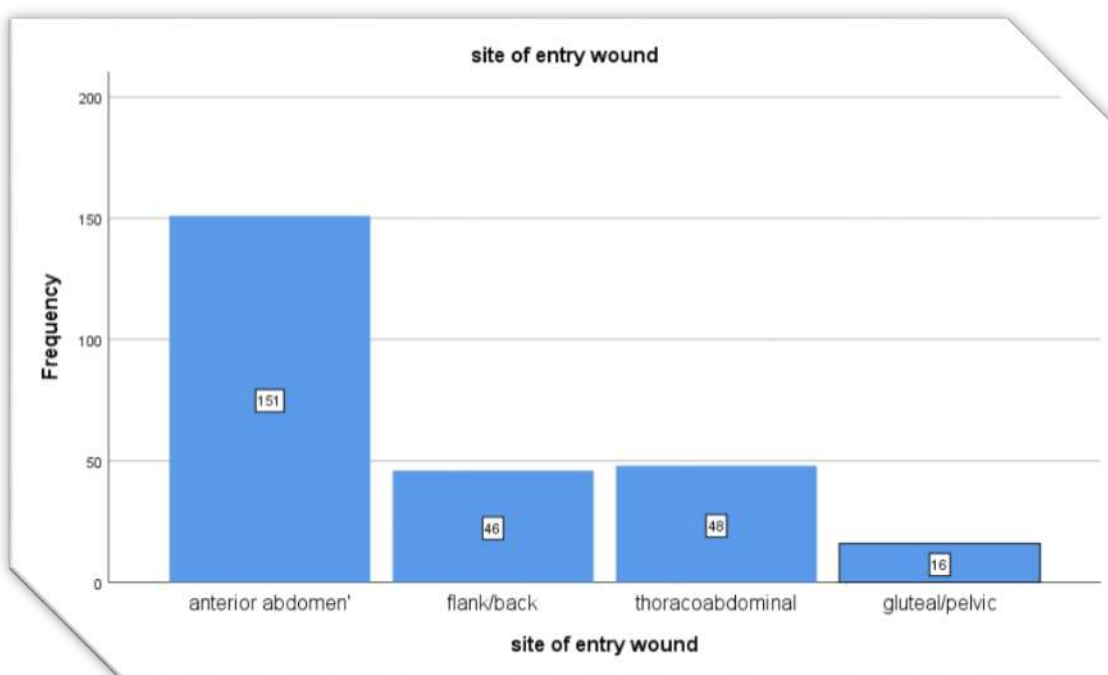
The pattern of trauma varies between stab with knives or other sharp structures in 95(36.4%) and gunshot wounds in 166(63.6%). 171(65.5%) were from rural areas whereas urban residency accounts 90(34.5%).

[Figure 3: Mechanism of injuries](#)



According to the site of injury (stab or bullet entry); the majority of our patients 152(58.2) sustained the trauma in their anterior abdomen, 46(17.6%) in the flank and back, 47(18.0%) in the thoracoabdominal areas.

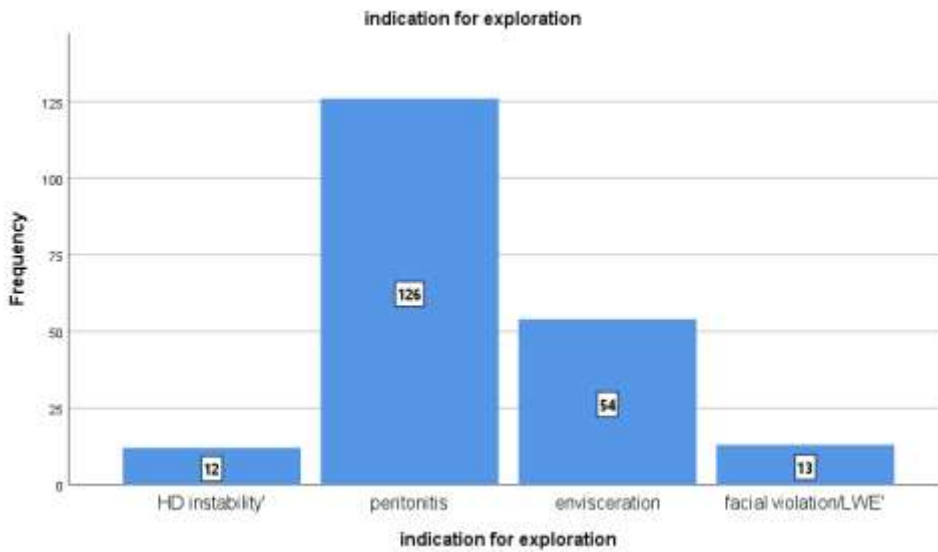
[Figure 4: Distribution of site of injuries](#)



202(77.4) patients presented with normal blood pressure (SBP 90-140mmhg), and 54(20.7%) with hypotension.

The most common indication for exploratory laparotomy was generalized peritonitis with 126(48.3%) and last is hemodynamic instability accounting 12 (4.6%) at time of presentation. All patients had preoperative hemoglobin determined.10 (3.8%) has Hgb <7g/dl, 60(23%) Hgb 7-10 g/dl and 191(73.2%) >10g/dl. The mean of patients Hgb was 12.15 ± 2.684

[Figure 5; Distribution of indications for exploration.](#)

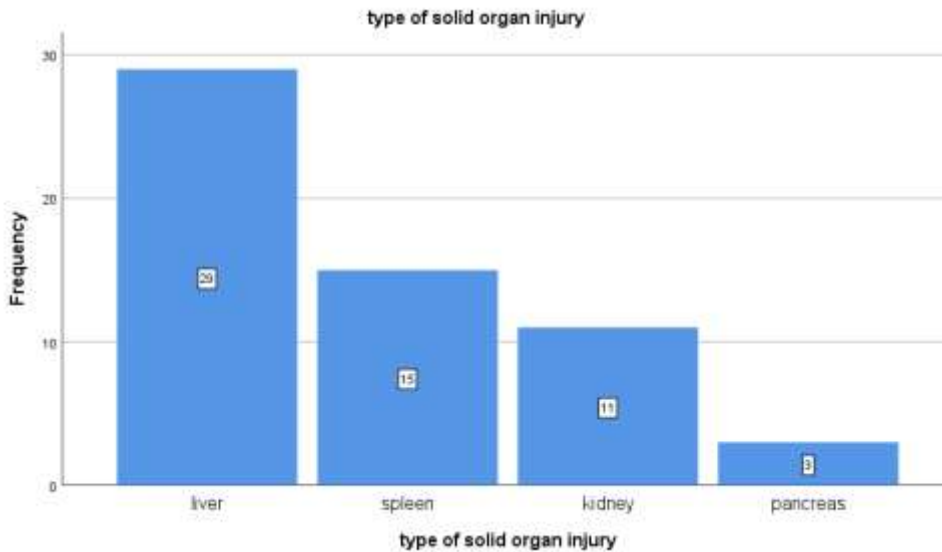


106(40.6%) had associated extra-abdominal injuries from which chest injuries including diaphragmatic injuries (25.75)) is the most common one, followed by pelvic fracture (10.3%).

6.2 INTRA OPERATIVE FINDINGS AND PROCEDURES

204(78.2%) had hollow viscus injury, of which isolated small bowel, large bowel ,stomach ,and genitourinary injuries account 68(26.1%),53(20.0%),19(7.3%),and 9(3.4%)respectively.52(20%) represent multiple hollow viscus injuries. 59(22.6%) were diagnosed with solid organ injuries with 29(11.1) liver, 15(5.7%) spleen, 11(4.2%) kidney and 3(1.1) pancreatic injuries.

[Figure 5; Proportion of solid organ injuries](#)

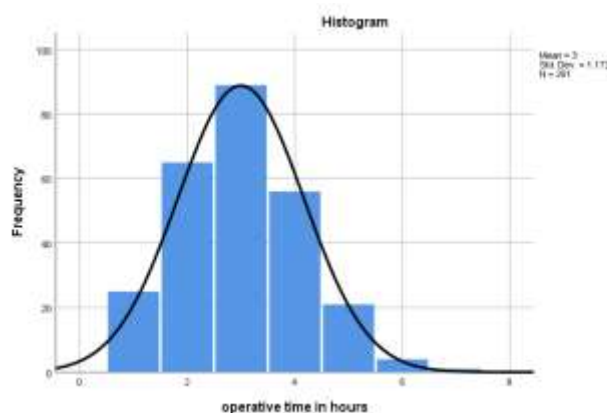


Primary repair, resection and anastomosis were done in 65(24.9%), and 91(30.3%) of hollow viscus injuries respectively, while either ileostomy or colostomy was the options of management in the rest of the patients.

Among procedures for solid organ injuries liver repair, splenectomy, nephrectomy and renorrhaphy were done in 31(11.9), 10(3.8), 6(2.3) and 2(0.8%) patients respectively.

The mean operative time was 3 hours \pm 1.17 ranging from 1-7 hours.68.6% of operations took less than 3 hours.

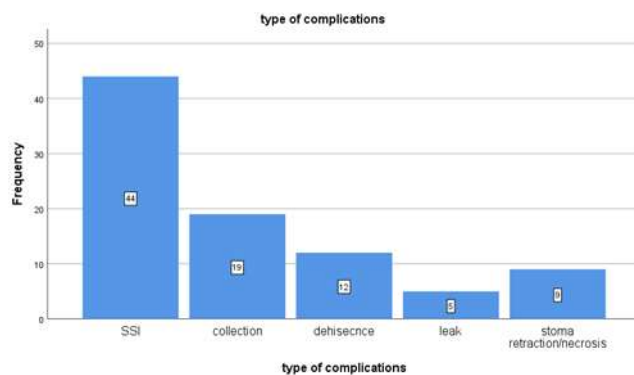
[Figure 6; histogram of operative time](#)



6.3 OUTCOMES

The mean of length of hospital stay is 12.90 ± 10.641 days ranging from 1 up to 91 days.

89(34.1%) patients develop post-operative complications with surgical site infection (16.9%), intra-abdominal collection (7.3%), wound dehiscence (4.6%), stoma necrosis/retraction (3.4%) and anastomotic leak (1.9%) in their respective orders.



Among patients operated for penetrating abdominal injuries 24(9.2%) died on same admission.

6.4 ASSOCIATED FACTORS OF PENETRATING ABDOMINAL INJURIES

Cross tabulation and binary logistic regression was carried out to determine the association between the independent and dependent variables.

One univariate logistic regression age ,sex ,mechanism of injury ,duration of presentation ,blood pressure and pulse rate at presentation, site of bullet entry /stab, pre-operative hemoglobin ,specific indication of laparotomy ,presence of hollow viscus injury ,presence of solid organ injuries ,associated extra abdominal injuries ,length of hospital stay, operative time and presence of post op complications had p-value <0.25. These variable collectively analyzed with multi variable logistic regression. However, only operative time (AOR= 0.227 95% CI, 0.059-0.874, p= 0.031), blood pressure at presentation (AOR= 0.040, 95% CI of 0.003-0.345, p=0.015),

presence of solid organ injuries (AOR= 0.208, 95% CI of 0.057-0.757, p=0.017) and length of hospital stay (AOR 34.622, 95%CI of 7.314-163.881 at p=0.00) showed significant association with mortality.

[Table 2; Binary logistic regression for outcome of penetrating abdominal injuries](#)

Variables	Outcome of penetrating abdominal injuries			COR	P-value	AOR	P-Value
		Improved	Death				
		237(90.8%)	24(9.2%)				
Sex	Male	201(91.8%)	18(8.2)	1			
	Female	36(85.7%)	6(14.3%)	1.861(0.692-5.007)	0.219		
Mechanism of injury	Stab injury	91(95.8%)	4(4.2%)	0.321(0.106-0.969)	0.044		
	Gunshot	146(88.0%)	20(12.0%)	1			
Blood pressure at arrival	Un recordable	4(50%)	4(50%)	1			
	<90 mmhg	33(71.7)	13(28.3)	0.394(0.086-1.814)	0.232		
	90-140 mmhg	196(97%)	6(3%)	0.031(0.006-0.153)	0.000	0.040(0.003-.535)	0.015*
	>140mmhg	4(80)	1(20)	0.250(0.019-3.342)	0.295		
Pulse rate Bpm	PR <60	1(50)	1(50)	5.773(0.348-95.743)	0.221		

	RR 60-140	109(99.1)	1(0.9)	0.053(0.007-0.399)	0.004		
	>140	127(85.5)	22(14.8)	1			

	Outcome of Surgical Malignancies.			COR	P-value	AOR	P-Value
		Improved	Death				
Site of injury(entr y wound)	Anterior abdomen	141(93.4)	10(6.6)	1			
	Flank and back	42(91.3)	4(8.7)	1.343(0.401-4.502)0.633	0.633		
	Thoracoabdominal	39(81.3)	9(18.8)	3.254(1.236-8.565)	0.017		
	Pelvic /gluteal	15(93.8)	1(6.3)	0.94090.112-7.858)	0.954		
Pre-operative Hemoglobin	<7 g/dl	5(50)	5(50)	1			
	7-10 g/dl	51(85)	9(15)	0.176(0.042-0.736)	0.017		
	>10 g/dl	181(94.5)	10(5.2)	0.055(0.014-0.223)	0.000		
Indications for exploration	Hemodynamic instability	5(41.7%)	5(41.7%)	1			
	Peritonitis	112(88.9)	14(11.1)	0.175(0.049-0.626)	0.007		
	Evisceration	53(98.1)	1(1.9)	0.026(0.003-0.260)	0.002		

	ion						
	Mechanism/high velocity	53(94.6)	3(5.4)	0.079(0.015-0.406)	0.002		
	Facial violaton(LWE)	12(92.3)	1(7.7)	0.117(0.011-1.212)	0.072		
Presence of solid organ injuries	Yes	44(74.6)	15(25.4)	1			
	No	193(16.9)	9(4.5)	0.137(0.056-0.333)	0.000	0.208(0.057-0.757)	0.017*
Operative time in hours	< 3 hrs	171(95.5)	8(4.5)	0.193(0.193-0.472)	0.000	0.227(0.059-0.874)	0.031*
	>3 hrs	66(80.5)	16(19.5)	1			
Presence of associated extra-abdominal injury	Yes	90(84.9)	16(15.1%)	1			
	No	147(94.8)	8(5.2)	0.306(0.126-0.744)	0.009		
Presence of post-operative surgical complications	Yes	85(95.5)	4(4.5)	1			
	No	152(88.4)	20(11.6)	2.796(0.925-8.449)	0.068		
Length of hospital stay in days	<7 days	74(78.7)	20(20.3)	11.014(3.636-33.35356)	0.000	34.622(7.414-163.881)	0.000*
	>7days	163(97.6)	4(2.4)	1			

7. DISSCUSSION

Penetrating abdominal trauma (PAT) typically involves the violation of the abdominal cavity by a gunshot wound (GSW) or stab wound. (4)

In Africa, penetrating abdominal injury constitutes 30-60% of the overall abdominal injury load in the accident and emergency department. (18) In this study the mainly affected age group is between ages of 19-45 years with mean age of 29 years. This is comparable to mean age of 26-28 years as mention in other studies. (1, 17)

The predominance of male gender (83.9) in this report is also well described. (1, 15, 18) The preponderance of rural residency (65.5%) to penetrating injuries in this report could be explained sociocultural peculiarity, and recent military conflict however, future study could be done as no similar or related is found.

The cause of penetrating abdominal injuries varies from place to place. In study done by Adana et.al Ethiopia, stab injuries consist 65% while bullet injuries account 22%. (18). A study done in Khatam, and Pakistan also mentioned stab injuries reaching 83.5%,51.7%,60% respectively . (15, 17, 19)

However, bullet injury is also predominating in other reports ranging from 38.0%-75.6%.(15, 20, 21)

Presentation of patients with PAI might be in state of hemodynamic instability, features of generalized peritonitis, evisceration of bowel or omentum. Peritonitis (48.3) is the primary presentation and indication for exploratory laparotomy in contrast to study done Omer et al, which is 23.5% predominated by eviscerations (35.3%) (18)In this report Commonly affected hollow viscus injuries were small bowel (26.1%), followed colon (20.0%(5.7%)) as well as liver (11.1%) preceding splenic injuries among solid organ which is comparable to other study finding. The pattern of injury depends upon the size and depth of the organ and the offending agent. The higher frequency of small gut, liver and colonic injuries can thus be explained on these bases.The types of procedures were done for respective injuries also comparable with similar reports. (1, 4, 15, 20)

Other study showed preoperative mean hemoglobin for penetrating abdominal injury was 111.1 ± 0.8 which is nearly agreeable to this study (12.15 ± 2.684). (1)

The anterior abdomen(58.2) was commonly involved site in both patterns of injuries followed by flank and back(17.6%) as seen in Khartoum study(72.9%), however, the second most common site of injury was thoracoabdominal(8.2%) followed by back and flank entry sites(4.7)(18)

The most common associated injuries seen in this study was chest injury (25.7%), in contrast to what had been reported by Nicolas JM et al, which only accounted 12% succeeding associated vascular injuries (30%). (9)

The commonest complication was surgical site infection (16.9%) as mentioned in other studies ranging from 6.9-23.5 % (1, 4, 9, and 18). Others complications such as intrabdominal collection (7.3%), wound dehiscence (4.6%) and anastomotic leaks (1.9) has been seen comparable to study done by Maurizio et al in Afghanistan which was intra-abdominal collection (7.9%), wound dehiscence (5.9) and anastomotic leak (2.8). (22)

The mean hospital stay in a study in Khartoum was 8.5 days (SD ± 10) as well as 10.7 days in a report Babar et al, which were higher in comparison to our study finding (12.9 ± 10.641).

The mortality of patients with penetrating abdominal injury ranges from 5% up to 13.2%. (1, 9, 17, 18) This study revealed death (9.2%) of victims of PAI within acceptable range.

Multivariate analysis of different associated factors with binary logistic regression showed there was significant association of death of PAT patents with low blood pressure at presentation, long operative time, associated solid organ injuries and hospital stay.

From multivariate analysis Length of hospital stay less than 7 days was more likely to increase death by 34.622 times than less than length of hospital stay greater than 7 days (p value 0.000). The explanation for this result is on cross tabulation table, which shows most of patients' death were recorded within 4 days of admission. In a study done by Nicolas JM et al, ICU length of stay and hospital length of stay averaged 6.1 and 8.1 days overall, respectively with survivors averaging 6.7 and 20.3 days versus 1.9 and 4.1 days, respectively for non survivors. (9) This explains the probability of high rate of less than 7 days' hospital stay among patient with critical multiorgan injuries.

Operative time less than 3 hours had significant reduction in mortality by 88 % (p=0.031) compared to operative time more than 3 hours. One of the main purpose of damage control surgery is to limit operative time so that patient can return for stabilization of physiologic disturbance related to massive blood loss and metabolic acidosis. (23)

In a study done on the length of operative time in damage control surgery for trauma patients' average operative room time was almost twice as long in the LORT group (214.6 ± 6.2 vs. 121.4 ± 2.6 minutes, p< 0.0001). The in-hospital mortality rate was similar between the LORT and SHORT cohorts (14.3%, n= 14/98 13.7%, n= 13/95, p= 1.0) in contrary to this study. (24)

There other factor which has strong association with mortality of patients is blood pressure at arrival. From the analysis patients with blood pressure within a normal range (SBP 90-

140mmhg) had less than 96% risk of death than patients with un-recordable blood pressure. In a report of 953 penetrating injury victims in Pakistan, the most frequent cause of death was hemorrhagic shock (73.7%).(22)

Patients with an episode of systolic BP of < 90 had 4times higher odds of mortality, with a P-value of 0.015 for the COR, which was significant as showed in study of abdominal injury patients. (22)

As Aldemir and colleagues reported during admission, the shock was diagnosed in 87 patients and in 96 patients in the HG and DG respectively and was a significant factor for mortality ($p = 0.000$)(1)

Presence of solid organ injury had 79 % risk of death compared to those with no solid organ injury (AOR= 0.208, 95% confidence interval of 0.057-0.757 at $p=0.017$). This could be related to multiple organ injury resulting in significant blood loss.

8. CONCLUSION

Penetrating abdominal injury affects predominantly males between ages of 19-45 years. GSW is a major mechanism of injuries. More than two third of patients has hollow viscus injuries while solid organ injuries found in 20% of patients. The most common associated extra abdominal injury is chest injury. The study found the length operative time, presentation with shock and presence of solid organ in penetrating abdominal injury were highly associated with mortality in penetrating abdominal injuries. The most common complication is surgical site infection affecting 16.9% of victims. The mortality is 9.2%

RECOMMENDATIONS

We recommend to the hospital to enhance deliver of early intensive post-operative care decrease death of critically injured penetrating abdominal injury patients.

We recommend the department of surgery to encourage abbreviating operative time in patients with hemodynamic instability as much as possible.

LIMITATION OF THE STUDY

This study did not include patients managed with non-operative management of penetrating abdominal injuries.

Since it is a retrospective study design limitations inherent to the method could be implicated.¹²

CONFLICT OF INTEREST

We declare is no conflict interest.

9. ANNEX

DATA EXTRACTION CHECK LIST FOR PENETRATING ABDOMINAL INJURY

1 Age of the patientyears

2 Sex of the patient

1. Male
2. Female

3 Residence

1. Rural
2. Urban

4 Mechanism of penetrating abdominal injury

1. stab /sharp injuries
2. Gunshot/blast injuries

5 Duration from time of accident/in jury in hours.....

vital signs at EOPD

6 systolic blood pressure at EOPD during arrival

1. Unrecordable
2. SBP <90mmhg
3. SBP 90-140 mmhg
4. SBP >140

7 pulse rate (bpm)

1. <60
2. 60-100
3. >100

8 Sites of penetrating entry wound

1. Anterior Abdomen
2. Flank and Back
3. Thoracoabdominal
4. Pelvic/gluteal

9 Preoperative Hemoglobin -----g/dl

10 Indication for exploratory Laparotomy

1. hemodynamic instability
2. Generalized Peritonitis
3. evisceration
4. Mechanism/site of Injury (high velocity anterior abdominal)
5. Peritoneal violation after local wound exploration

11 does patient has viscus injury viscus

- Yes
- No

12 if yes for 11, type of viscus injury identified

1. stomach
2. small bowel
3. large bowel
4. Genitourinary (bladder ureter ,urethra)
5. Stomach ,small bowel
6. Small bowel, large bowel
7. Small bowel ,GU
8. Large bowel, GU

13 if yes for no 12, Type of procedure done for viscus injuries

1. Primary repair
2. resection and Anastomosis
3. Ileostomy
4. Colostomy
5. Ileostomy and repair
6. Resection and anastomosis and colostomy
7. Repair and colostomy

14 does patient has solid organ injury

1. Yes

2. No

15 if yes for 14, type of Solid organ injury identified

1. liver
2. spleen
3. Kidneys
4. Pancreas

16 if yes for question 15, type of procedure done for solid organ injury

1. laceration repaired
2. splenectomy
3. nephrectomy
4. splenorrhaphy
5. renorrhaphy

17 Duration of surgery Hrs

18 Associated non abdominal injuries

1. head injury
2. spinal cord injury
3. chest injury
4. pelvic fracture
5. upper extremity injury
6. lower extremity injury
7. none

Part 3:Post-Operative conditions

19 does the patient has any post-operative complications

1. yes
2. no

20 if yes for question no 18, which of the following complication the patient develops

1. Surgical site infection
2. Intra-abdominal collection abscess
3. Wound dehiscence
4. Stoma complication (Necrosis or retraction)
5. Anastomotic leak
6. Enterocutaneous Fistula

21 Number of days during hospital stay-----

22 FINAL Outcome of the patient

1. Improved
2. Deceased

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