

ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCE
DEPARTMENT OF SURGERY

Patterns of Injury and Outcomes of patients with
Thoraco-abdominal Injury in public hospitals in
Addis Ababa, Ethiopia

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Declaration

This is to certify that the thesis proposal entitled “Patterns of Injury and Outcomes of patients with thoraco-abdominal injuries”; submitted as partial fulfillment of specialty in General Surgery, Addis Ababa University, is a record of my original work and has not been submitted to any other institution for any purpose. The references used for this thesis proposal are properly cited and the assistance I received has been duly acknowledged.

Dr. Hedagewoin Friew

Name of the candidate

Date

Approval of thesis for oral defense

I hereby certify that I have supervised, read and evaluated this thesis titled “Patterns of Injury and Outcomes of patients with thoraco abdominal injury” by Dr. Hedagewoin Friew under my guidance.

I recommended the thesis for oral defense.

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Signature

Date

1. _____

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Summary

Background; Trauma is a major public health issue accounting for 10% of the total death globally. The thorax and the abdomen are commonly injured sites in association with RTA and account for the most common cause of death next to head injury. In relation to several compounding factors concurrent presence of injury in this two body cavities imposes significant challenge in the diagnosis as well as in the management plan of such cases. The relative rarity in this pattern of injury has hindered large scale study both in this country and globally. Therefore, the optimal management strategies in this population still remains area of debate. Worldwide, the mortality rate of abdominal trauma is reported to be between 1 and 20%. Thoracic trauma is a significant cause of mortality. Globally, chest trauma is the third important cause of mortality and morbidity. Abdominal injuries require careful triaging for appropriate intervention because approximately 25% of such injuries require surgery. Therefore, the optimal management strategies in this population still remain area of debate. The aim of this study is to assess the pattern and outcome of patients with thoraco-abdominal injury attending four public hospitals, Addis Ababa, Ethiopia,

Objectives; Assess the patterns of injury, associated factors and outcomes among patients with thoraco- abdominal injury attending in four public hospitals, Addis Ababa, Ethiopia.

Method; Institution based retrospective quantitative cross-sectional study design was used to get patients chart for assessing the patterns of injury and outcomes in patients with thoraco-abdominal injury admitted to the 4 hospitals in Addis Ababa over a period of 3 years. A standard checklist was used to collect all the necessary data from patient's medical record and OR registry. The collected data was entered into Google Form, and then exported to IBM SPSS version 26 for analysis and descriptive statistics was used to present the result. Descriptive and inferential statistics as well as binary logistic regression analysis was done. All factors on the bivariate analysis discordant at P 0.25 were included in a stepwise logistic regression model to identify independent predictors of mortality. Model fitness checked by Hosmer-Lemshow goodness of fit test and multi collinearity checked by VIF.

Results;

96 patients fulfilling the inclusion criteria were identified, men make up the majority of the study population 84(87.5%). The mean age of the patients was 31.2 years \pm SD 11.3. 56(58.3%) arrived at the health facility within 6 hours of injury. Penetrating injury is the commonest mechanism of injury 50(52.1%), stab accounts for 35(36.5%), gunshot occurred in 16(16.7%) and blast in 5 (5.2%). 50(52%) were hemodynamically unstable at presentation and among this 42(84%) were managed operatively. 27(28.1%) required ICU admission and 9 (9.4%) patients had massive transfusion. FAST was done in 50(52.1%) patients at the emergency and it was positive in 35(70%). The diagnosis of thoraco-abdominal injury was made with CT scan in 22 patients and 13(59%) of them were managed operatively. Among these patients only 1(7%) patient was operated within 24 hours of presentation. Majority of the patients were managed with concomitant tube thoracotomy and laparotomy 47(49%), 15(15.6%) were managed with laparotomy alone, 4(4.2%) undergone thoracotomy, 10(10.4%) were conservatively managed and only 1 patient had dual cavity intervention. Among the 63 patients who had laparotomy, in 1(1.5%) patient the laparotomy was unnecessary and in 13(19.40%) of them the laparotomy was non-therapeutic and among this 5(38.46%) had died and 1 patient was re operated.

From the 67 among the total 96 patients who were operatively managed repair was done for the 39(40.6%) as part of the operative intervention, 4(4.2%) underwent resection and anastomosis, 12(12.5%) had diversion. Among the 8 patients who had IOF of splenic injury 7(7.3%) had splenectomy and 1 patient had splenorrhaphy, there were two patients who had IOF of kidney injury, 1(1%) of them had nephrectomy and the other one 1(1%) had renorrhaphy. damage control surgery was performed in 4(4.2%) of the patients, 1(1%) patient had right middle lobe wedge resection for massive hemo thorax, Cholecystectomy was done for 2(2.1%) of the patients, 2(2.1%) of the patients were just explored.

The in hospital mortality rate is 14.6%. For those patients discharged improved the average length of hospital stay is 16.18 days. The need for ventilator support was associated with increased risk of mortality.

Conclusion:

Patients presenting with thoraco abdominal injury poses significant diagnostic and therapeutic challenge due to the high requirement of timely surgical intervention despite a considerable number of negative and non-therapeutic laparotomy rate. Therefore, Routine laparotomy should be abandoned and should be reserved for patients who are hemodynamically unstable, having signs of peritonitis, or evisceration and non-operative management should be considered in select cases provided that close follow up and imaging modalities are available.

The significant mortality rate associated with ICU admission requirement calls for improvement in the setup of the facilities as well as in the provision of care of critical trauma patient starting from the emergency to the ICU unit. A multidisciplinary team of health professionals should also be organized in the management of this patients to effect in a better outcome.

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Acronyms and Abbreviations:

AAU.....	Addis Ababa University
AAUCHS.....	Addis Ababa University College of Health Science
AIS.....	Abbreviated Injury Score
CT.....	Computed Tomography
DI.....	Diaphragmatic Injury
FAST.....	Focused Abdominal Sonography for Trauma
GSW.....	Gun Shot Wounds
HVI.....	Hollow Viscus Injury
ICU.....	Intensive Care Units
NOM.....	Non Operative Management
OR.....	Odds Ratio
PAI.....	Penetrating abdominal injury
RT.....	Resuscitative Thoracotomy
RTA.....	Road Traffic Accident
SW.....	Stab Wound
TASH.....	Tikur Anbessa Specialized Hospital
TDI	Traumatic Diaphragmatic Injury

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1. INTRODUCTION

1.1 Background

Trauma is a major public health issue accounting for 5.1 million deaths in the year 2000 which makes up about 10 % of the total death(1).The thorax and abdomen are commonly injured sites in association with most RTA accidents and have significant mortality risk next to head injury.(2)The chance of overlooking injuries is higher in patients with multiple injuries. Assault, GSW, Suicidal attempts and fall down injuries are common mechanism of injuries other than RTA that are reported in most literatures. The extent of injury imposed by different mechanism of injury should be considered and therefore dictate the management plan.

1.2 Statement of the problem

Globally, injuries continue to be a major cause of morbidity and mortality, accounting for 5.8 million fatalities annually and 16,000 deaths each day (3). More over two thirds of these cases involve men (4). In Europe and the United states, the mortality rate as a result of blunt trauma can be as high as 60%(5). These injuries account for roughly 12% of all fatalities in low-income areas like Southeast Asia (6). According to global reports, abdominal trauma deaths range from 1 to 20% (7), and chest trauma is the third important cause of mortality and morbidity (23). Less than 10% of blunt chest injuries and only 15 to 30 % of penetrating chest injuries require operative intervention (24). The abdomen is the third most common injured region, with surgery required in about 25% of civilian cases (25). Abdominal injuries occur in < 10% of all injured patients but in up to one-third of those suffering from severe injured organs. (26) A traumatic injury to the diaphragm (TID) is a potentially challenging condition that is often accompanied by other thoraco-abdominal injuries (27). Up to 75% of TID are caused by blunt trauma mechanisms (25). A male predominance of about 2.5:1–4:1 (male: female) has been reported for this injury (27). The overall mortality of patients with TID has been recently reported as being from 26.8 to 41% (28). Abdominal injuries require careful triaging for appropriate intervention because approximately 25% of such injuries require surgery (29).

An estimated 10% of all years spent with a disability are attributed to injuries; this places a tremendous strain on national economies, costing nations billions of dollars annually in healthcare,

lost productivity, and law enforcement (30). The cost of treating trauma patients in the United States of America was estimated to be 671 billion dollars in 2013, and the cost of treating fatal injuries was 214 billion dollars (29).

Depending on the organ implicated, the length of time until therapy, and the number of additional organs involved, the fatality rate from penetrating abdominal trauma ranges from 0% to 100%(30). The incidence of abdominal injuries in North Africa has been estimated at 9%(30) (30). While blunt abdominal injury was the most frequent mechanism of damage in Uganda, accounting for 85.7%⁴, and affecting more males than females, 92.5% and 7.5% respectively (30)., penetrating abdominal trauma accounts for 90.2% of injuries in South Africa and 9.8% in that country (30). In South Africa, chest injuries account for 27.4% of all trauma-related fatalities, with penetrating trauma accounting for 88.8% of those deaths (31).

In Ethiopia, trauma is the major public health challenges (32). A survey conducted at Dilchora Hospital in Eastern Ethiopia found 3.14% of patients had abdominal injuries. (33). The proportion of abdominal trauma in Arbaminch, and Dilla was 15.4% 11.44% respectively (30). A study conducted in Tikur Anbessa Specialized Teaching Hospital (TASTH), Ethiopia traumatic injury was responsible for 30.1% of death in emergency department (34), and chest trauma accounts for 13.9% of road traffic related injuries (31). Moreover, as study conducted in Zewditu memorial hospital revealed; chest region is the fourth mostly affected region accounts for 9.5% of all body region injured (35). In Tikur Anbesa, Addis Ababa, 12.5% had penetrating abdominal injuries and 9.4% had a blunt abdominal injury (36), and the study done at St. Paul hospital showed 62% of abdominal injuries requiring laparotomy were penetrating injuries and 38% were blunt abdominal injuries (37).

In relation to several compounding factors the presence of concurrent injury in two body cavities is a significant challenge in both the diagnosis as well as treatment of such patients. As most of the patients with this pattern of trauma are unstable and require urgent intervention, it is rather difficult to do a proper evaluation. The lack of easy access to important diagnostic modalities in most of the health facilities in the country makes prioritization of the treatment plan a lot harder. The effectiveness of clinical history and physical findings is blunted in those patients with altered mentation from concomitant head injury, alcohol intoxication or illicit drug use. Furthermore, the presence of spinal cord injury, adjacent thoracic and diaphragmatic injuries will result in unreliable

findings. Drainage output from placed tube thoracostomies may also make it difficult to be sure from which compartment the fluid is generated.

The relative rarity of this pattern of injury has hindered large scale study. The frequency and the nature of operative intervention, the amenability to conservative management and the subsequent outcomes still remains incompletely described and therefore the optimal management strategies are uncertain for this population. (8)

In patients requiring surgery, giving priority to the cavity with the most significant injury will significantly alter the outcome of the patient.

Although multiple studies have reviewed isolated thoracic/abdominal cavity injuries in our country such magnitude of problem in dual cavity injuries in our setup needs to be studied and requires development of management protocol, which will help for early diagnosis and make it possible for early and appropriate intervention and prevents avoidable mishaps.

1.3 Significance of the study

Early recognition and prompt management is crucial in the management of patients presenting with thoraco-abdominal injury because of the associated significant and fatal consequences. To the best of the researcher's knowledge, no adequate findings on the pattern and prognosis of thoraco-abdominal injury have been made in any public hospital in Ethiopia. Therefore, the objective of this retrospective study is to analyze hospital experience with the management of thoraco-abdominal injury in order to identify patterns, treatment outcomes, and outcome determinants.

This study will provide data on the burden of thoraco-abdominal injury, identify the factors associated with poor outcomes in such patient, which could be essential for establishment of prevention strategies as well as development of treatment protocols. It can be used as reference data for the policy makers to make evidence based decision and serve as a bench mark for further studies.

2. Literature Review

In a retrospective study conducted between 1997-2001 which reviewed 32,100 trauma patients ,507 out of 3644 (14 %) of the patients with significant chest trauma ($ASI \geq 2$) had concomitant abdominal injuries. In this patient's intra-abdominal injury is significantly common in 21% of the penetrating as compared to 12% of the blunt trauma patients. In this study they concluded that patients with serious chest and pelvic trauma have a much higher chance of serious intra-abdominal injury and therefore recommend a low threshold for the use of diagnostic imaging of the abdomen in all patients with significant chest and pelvic trauma.(9).

In India among all injury related death thoraco-abdominal injury accounts for the second most common cause of death. In a single institution based prospective observational study conducted in south India, thoraco abdominal injury accounts for 19.8% of all the trauma cases. (10)

An autopsy based cross sectional study was done in India to know the fatality and incidence of injuries to the chest and abdomen regions of two-wheeler riders caused by RTA. The majority of fatal injuries were noted in the region of the head followed by thoraco-abdominal regions. (11)

In a retrospective study performed in a single institution in Senegal over a period of 21 years, there were 1535 patients with thoraco-abdominal trauma. 859 were of blunt trauma and 676 were penetrating chest or abdominal trauma. Incidence of diaphragmatic injury was 2.6%. Preoperative diagnosis of diaphragmatic injury was made in 45% of the case and in 90% of the cases the DI was on the left side. From this study they concluded diaphragmatic injury are usually located in the left side and surgery is an efficient management. (12)

A prospective cross sectional hospital based study done in Ethiopia, the most frequent locations of the injury were found to be in the head, neck and face (43.6%). Of the remaining patients, 23.1% had injuries to lower extremity, 17.1% to the upper limbs, and 10.3% to the spinal cord.(13).

In a retrospective review of 14 patients with DI managed in a regional hospital in Wolayta, Ethiopia; chest X-Ray was diagnostic or suggestive of TDI in 70% of the acutely presenting cases. CT scan was a useful adjunct in patients with diagnostic uncertainty. All of the patients were managed with surgical repair, and all acute trauma patients were managed via a trans-abdominal approach. They concluded that there should be high index of suspicion for DI in patients presenting

with blunt or penetrating thoraco-abdominal trauma. Whilst useful, CT scan is not essential for diagnosis in the majority of cases. In such patient's surgery is an effective treatment. (14)

In a study conducted in a level I trauma center in Los Angeles, excluding patients with severe head trauma, mortality ranged from 4.5% with non-operative management to 18.1% and 66.7% in those requiring laparotomy and dual cavity exploration, respectively. Age 55 years or older, Injury Severity Score of 25 or more, Glasgow Coma Scale score of 8 or less, initial hypotension, massive transfusion, and liver, cardiac, or abdominal vascular trauma were all found to be independent risk factors for mortality. In this study they concluded that most patients can be managed non-operatively. The need for non-resuscitative thoracotomy or combined thoraco-abdominal operation is rare. The abdomen contains the overwhelming majority of injuries requiring operative intervention and should be the initial cavity of exploration in the patient requiring emergent surgery without directive radiologic data. In the same study they also tried to examine the poor outcome related with resuscitative thoracotomy and the limits of the procedure. They concluded that return of circulation after RT in patients in cardiac arrest with combined thoracic and abdominal trauma is even less likely than it is with trauma isolated to 1 anatomic cavity (15).

Greater kinetic destructive potential drives the peril of thoraco-abdominal firearm trauma, producing clinical challenges qualitatively and quantitatively different from non-firearm injuries. Nearly 9 of 10 of those arriving alive require surgical intervention, typically emergent, with very low rates of negative cavitory exploration finding. NOM is still feasible but greatly limited by a 75% incidence of either DI or HVI. Even with ultrasound, emergent preoperative diagnosis remains challenging, decompression of pericardial tamponade into the pleural cavity and mediastinal space will result in mediastinal widening and massive hemo-thorax, furthermore the complex combination of intra-abdominal, thoracic, and diaphragmatic injuries can provoke misinterpretation of both radiologic and clinical data. Based on injury patterns, laparotomy with trans diaphragmatic pericardial window seems to be the optimal management approach for patients with hemodynamic instability who do not have clear hard signs of cardiac or thoracic vascular injury (16)

Thoracotomy, either alone or with laparotomy, was a significant risk factor for mortality in those arriving alive with gunshot thoraco-abdominal injuries, reflecting both the prognostic significance

of major intrathoracic injury as well as the use of this technique as a “salvage maneuver” in the presence of significant intra- abdominal hemorrhage. (16)

Patients with thoraco-abdominal stab wounds present considerable clinical challenges due to high surgical need, high occult DI incidence, persistently high rates of negative laparotomy, and significant mortality with dual-cavitary intervention. Many patients with solid-organ injuries do not require intervention. High incidence of hollow viscus injury and DI ultimately limits non-operative management. Laparoscopy is necessary to exclude occult DI. In unstable patients, determination of which anatomic cavity to explore primarily requires exclusion of cardiac injury. In those with equivocal clinical or ultra-sonographic evidence of cardiac trauma, laparotomy, with trans-diaphragmatic pericardial window, if a causative abdominal injury is not immediately apparent, seems the most effective strategy. (8)

Incorrect sequencing in stab victims who require both thoracotomy and laparotomy at the same sitting is associated with a high mortality. The common dilemma is failure to appreciate that cardiac tamponade does not present with bleeding and difficulty in assessing peritonitis in an unstable patient with multiple stab wounds. In the setting of the unstable patient with stab wounds and suspected dual cavity injuries the chest should be opened first followed by the abdomen. (17)

A single center retrospective study reviewed 186 patients with abdominal or thoraco-abdominal penetrating wounds treated between 2004 and 2013. From their analysis they concluded that Unstable patients must be brought to the operating room as quickly as possible for complete surgical exploration after a minimum of imaging, the sequence of which is guided by pre- and intra-operative findings. Stable patients should have a thoraco-abdominal CT scan. Routine laparotomy should be abandoned because of the high rate of negative and non-therapeutic laparotomies, and should be reserved for patients who are hemodynamically unstable, have signs of peritonitis, or evisceration. Laparoscopy should be performed when any doubt exists as to the penetrating character of the wound, especially for supra-umbilical wounds, because laparoscopy is particularly good for detection of diaphragmatic injury. If a penetrating diaphragmatic injury is discovered, laparoscopy can also be therapeutic, whenever technically possible, but requires experienced surgeons. Non-operative management is possible in patients who are stable and paucisymptomatic, but they must remain under surveillance for at least 48 hours in a surgical service with 24/7 accessibility to CT scan. (18)

In a prospective study designed to test the hypothesis conservative management of right thoraco-abdominal GSW in hemodynamically stable patient concluded from their analysis; hemodynamically stable patients without peritonitis after sustaining a GSW to the RTA can be managed non surgically with a low incidence of minor intrathoracic complications. Thoraco-abdominal CT scanning is a comprehensive means of diagnosis and follow-up when nonsurgical management is chosen; and such patients will usually have injury to the right lung and the liver. (19)

Traumatic diaphragmatic injuries showed varying injury patterns with blunt versus penetrating mechanisms of injury, and were associated with significant mortality rates. Blunt traumas and penetrating traumas were more frequently associated with acute diaphragmatic herniation/contusions and tears, respectively. (20)

A 12-year retrospective review at a tertiary trauma center did not demonstrate statically significant difference in the frequency of right side and left side diaphragmatic injury based on the mechanism of injury except in a high energy impact from a fall which can cause sudden increase in the intra-abdominal pressure and disrupt the already anatomically weak left diaphragm. This study also demonstrates that left DI was associated more with organ herniation than the right and with a different surgical approach but there was no demonstrable difference in outcome. (21)

A retrospective review that analyzed the outcome of patients with thoraco-abdominal gunshot injuries that were managed operatively at a district hospital in Cape town/ South Africa had a high mortality. The non-survivors had significantly shorter door to surgery times, higher markers of shock severity and more cardiac, pulmonary and thoracic and abdominal vascular injuries and required transfer to high care/ intensive care unit postoperatively. (22)

3.Objective

3.1 General objective

Assess the patterns of injury and outcome among thoraco abdominal injury patients admitted in Public hospital in Addis Ababa, Ethiopia, 2023.

3.2 Specific objectives

- Assess the patterns of thoraco-abdominal injury.
- Identify most commonly injured organs requiring operative management.
- Assess the way of management in patients with thoraco-abdominal injury.
- Assess risk factors associated with mortality in such patients

4/Research Design and Methodology

4.1 Study area and study period

The study was conducted in four selected hospitals. The facilities are selected by simple random sampling techniques. Equal number of sample size was allocated from the total sample size to each of the selected hospitals. The four selected hospitals are Tikur Anbessa Comprehensive Specialized hospital, Menilik II hospital, Yekatit -12 hospital and Alert hospital in Addis Ababa, Ethiopia between the period June 2019 to July 2023.

4.2 Study design

- Institution based retrospective quantitative cross-sectional study design was used.

4.3 Population

4.3.1 Source population

The source population was the entire adult trauma patients seen at the Emergency departments of the mentioned public hospitals from June 2019 to June 2023.

4.3.2 Study population

All patient above the age of 15 presenting with concurrent injuries in both the thoracic and abdominal cavity at the Emergency departments of the selected hospitals from June 2019 to June 2023.

4.4 Inclusion and Exclusion Criteria

4.4.1 Inclusion Criteria

All alive adult patients admitted with blunt and penetrating thoraco-abdominal injury.

4.4.2 Exclusion Criteria

- Patients that have arrested within 2 hours of arrival to the hospital.
- Patients younger than 15 years of age
- Patients with incomplete medical record for any reason.
- Patients who were referred after a laparotomy.

4.5 Sample size determination and sampling Technique

The sample size was determined based on single proportion population formula with the assumption of 5% marginal error (d), 95% confidence level (z).

There were no specific studies that could be obtained on the prevalence of thoraco-abdominal injuries. So, based on the prospective cross-sectional study done at Tikur Anbessa Specialized Referral Hospital between Feb1-April 2013 in the prevalence of injury to Torso will make up 6% of the total injuries. (13)

Using $n = z_{\alpha/2}^2 p (1-p) / d^2$

Where,

n=required sample size

$Z_{\alpha/2}^2$ =critical value for normal distribution at 95% confidence level which equals to 1.96

(Z value at $\alpha=0.05$)

p = Prevalence of injury to the torso.

D =desired precision with 5% marginal error

$n = 1.96^2 * 0.06(1-0.06)/0.05^2$

n = 87

By adding 10% for incomplete data, the total sample size will be 96.

Based on a study conducted in a similar environment at a district hospital in cape town using a population proportion of 13.2%(22) based on our primary outcome which is mortality, using a margin of error of 5%, with a single proportion sample size calculation, the sample size becomes 117.

4.6 Variables

4.6.1 Dependent variables

Length of hospital stay, re operation, mortality

4.6.2 Independent variables

1. Age
2. Sex
3. Mechanism of injury.
4. Physiologic conditions on admission
5. Time of diagnosis
6. Extent of injury
7. Operative management
8. Requirement for massive transfusion.
9. Presence of comorbidity
10. Requirement of ventilatory support.
11. GCS on admission
12. Time of operation
13. Duration of injury
14. Other sites of injury other than the torso.

4.7 Data collection tools

Data collection was done by using structured check list prepared in English on a digital collecting tool, Google Form. Initial information of the patients who were managed operatively was retrieved from the operation logbooks, morning reporting format and the ward and emergency registry. Patients chart was then collected and reviewed based on the designed checklist. Demographic details, physiologic parameters upon admission, mechanism and extent of injury, type of operative procedure, time of diagnosis, admission to ICU, need for massive transfusion, length of hospital

stay and other additional data were obtained from OR registration books, morning reporting formats and patient medical records. The collected data was checked for completeness and accuracy.

4.8 Data processing and Analysis

Data was cleaned, coded, and entered into Google Form and exported to the SPSS version 26 software package for analysis. Incomplete and inconsistent data was excluded from the analysis. A descriptive statistic used to describe the data. The results of the descriptive statistics expressed as percentages and frequencies. The Chi-square and crosstab analyses was carried out to calculate the relationship between the dependent and independent variables. Associations between independent and dependent variables was first analyzed by using bi-variable logistic regression analysis to identify factors associated with the outcome variable. Those variables which were found to have an association with the outcome variable at $P < 0.25$ in the bi-variable logistic regression were eligible for the multivariable regression model used in the association between the independent and the outcome variable. P-values less than 0.05 were considered to be statistically significant. Hosmer and Lemeshows fitness model was used to check the model fitness. Multi-collinearity was checked by using variance inflation factor.

4.9 Data quality control

Various precautions and appropriate data quality control mechanism was mainstreamed in all data management process to assure quality of data. These include pre testing data collection tool, close supervision of data collection process and verification of completeness. The data collection tool was pre-tested in Tikur Anbessa Specialized Hospital.

4.10 Ethical Consideration

Letter of permission to carry out the study was obtained from AAUCHS, IRB (Institutional Review Board) and A.A Health Bureau. Then cooperation letter was sent for Tikur Anbessa Specialized Referral Hospital, Menilik II, Yekatit-12 and Alert Hospital to obtain consent to perform data collection. Confidentiality of patient information was maintained by taking the data anonymously. The data extracted from medical registration charts was only used for the study and every data was kept confidential.

4.11 Dissemination plan

The findings of the study will be presented during final thesis defense at AAU College of health sciences. Copies of the final thesis will be sent to libraries of AAU and to Addis Ababa health Administration and Public Health Bureau. The findings are expected to be presented in different seminars, meetings and workshops as well as further effort will be made to publish the findings on national and international peer reviewed journal.

4.12 Operational Definition

- Blunt thoraco-abdominal injury; defined as an abbreviated injury score of 2 or more in the chest and abdomen (15)
- Penetrating thoraco-abdominal injury defined as presence of non-superficial external wound involving both the chest and the abdomen regardless of the underlying injury or the severity of injury (16)
- Non-therapeutic laparotomy signifies that the intra-abdominal lesions discovered did not require any surgical treatment. (18)
- Unnecessary laparotomy defined as a procedure without any peritoneal violation or where there are no intraperitoneal lesions. (18)
- Hemodynamic instability defined by systolic blood pressure less than 90 mmHg and/or pulse rate greater than 120 beats/minute. (18)
- correct Sequencing; defined as first opening the cavity with the most lethal injury. (17)

5.Result and Discussion

5.1 Result

Socio- Demographic characteristics of participants

From the total of 111 charts reviewed, 96 had complete data and did fulfil the diagnostic criteria to be included in the analysis. Men make up the majority of the study population 84(87.5%). Most of the study population 71(74.0%) were in the age group of between 20-40 years. The mean age of the participants was 31.2 years \pm SD 11.3, where the minimum age of 15 years and the maximum of 70 years. When we look at the residency of the participants, 76(79.2%) were from Urban areas and 56(58.3%) arrived at the facility within six hours of sustaining injury. Majority of the participants 85(88.5%) had no alcoholic intoxication and 94(97.9%) of them had no history of comorbidity.

Table 1: Socio-demographic characteristics of participants among patients with thoraco abdominal injury attending Public hospital at Addis Ababa, Ethiopia, 2023. (n=96)

Variables	Category	Frequency	Percentage (%)
Sex	Male	84	87.5
	Female	12	12.5
Age group in years	\leq 20 years	11	11.5
	20-40 years	71	74.0
	>40 years	14	14.6
Residency	Urban	76	79.2
	Rural	20	20.8
Time of arrival at the facility	Within 6 hour	56	58.3
	6-23 hour	22	22.9
	24-48 hour	8	8.3
	greater than 48 hour	10	10.4
Alcoholic intoxication		11	11.5
History of comorbidity		2	2.1

Mechanism of injury and Clinical conditions of patients

Penetrating injury is the most common mechanism of injury 50(52.1%) of these stab injury covers 35(36.5%) of the total, Gunshot occurred in 16(16.7%) and blast in 5(5.2%). 2(2.1%) patients presented with severe TBI.

50(52%) patients out of the total 96 were hemodynamically unstable at presentation, 23(34%) having SBP<90mmHg, 5(5.2%) having un palpable pulse and 33(34.4%) having tachycardia of 120 and above. Among this 42(84%) were managed operatively

Among the total study population 50(52.1) of the patients required oxygen support. 27(28.1%) required ventilatory support and (9.4%) had massive transfusion.

Table2: Mechanism of injury and clinical condition

Variables	Category	Frequency	Percentage (%)
Mechanism of injury	Blunt	40	41.7
	Penetrating	50	52.1
	Both penetrating and blunt	6	6.2
Types of penetration	Stab	35	36.5
	Gunshot	16	16.7
	Blast	5	5.2
SBP record	<90 mmHg	23	34
	> 90 mmHg	73	76.0
Respiratory rate	16-20 breath/min	4	4.2
	20-30 breath/min	74	77.1
	>30 breath/min	18	18.8
Pulse rate	Un palpable	5	5.2
	60-110	58	60.4
	>120	33	34.4
GCS	<=8	2	2.1
	>8	94	97.9
Oxygen Support		50	52.1
Requirement of ventilatory support		27	28.1

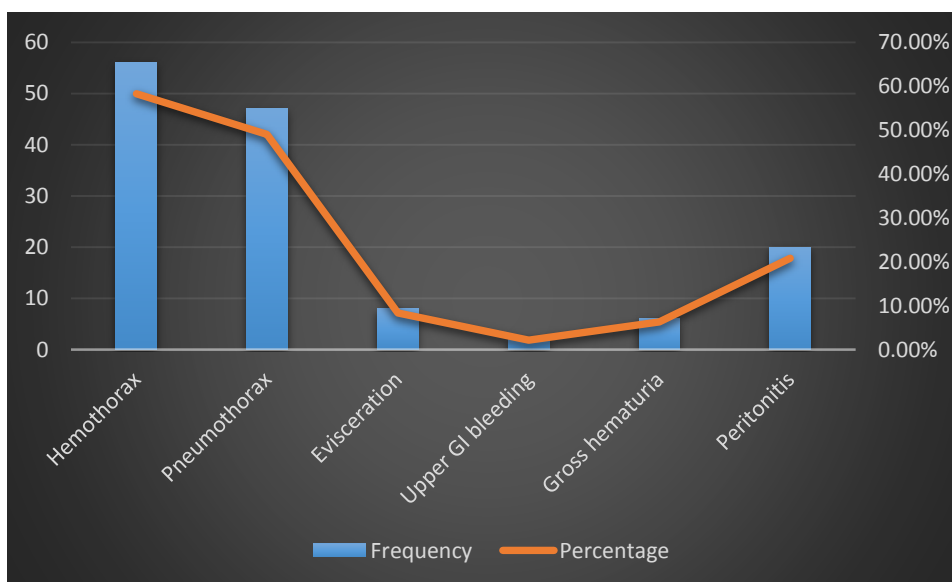
Massive Transfusion	9	9.4
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Among the total study population 20(20.8%) of the patients presented with futures of peritonitis at presentation and 8(8.3%) patients had Signs of evisceration.

Table3: Clinical presentation among thoraco-abdominal injury patients attending Public hospital at Addis Ababa, Ethiopia, 2023. (n=96)

Sign of hemothorax	56	58.3
Sign of Peritonitis	20	20.8
Sign of pneumothorax	47	49
Evisceration	8	8.3
Upper GI bleeding	2	2.1
Gross hematuria	6	6.3

Figure1. Clinical presentation



Among the total study population presenting with thoraco-abdominal injury 50(52.1%) had concomitant injury to other sites other than the torso. FAST was done in 50(52.1%) of the total 96 patients and among those it was positive in 35(70%) of them. Out of the 22 patients whose diagnosis was made with CT scan 13(59%) were managed operatively. Among this 5 (38.5%) of them were operated after 72hrs and only 1(7%) patient was operated within 24hr of presentation.

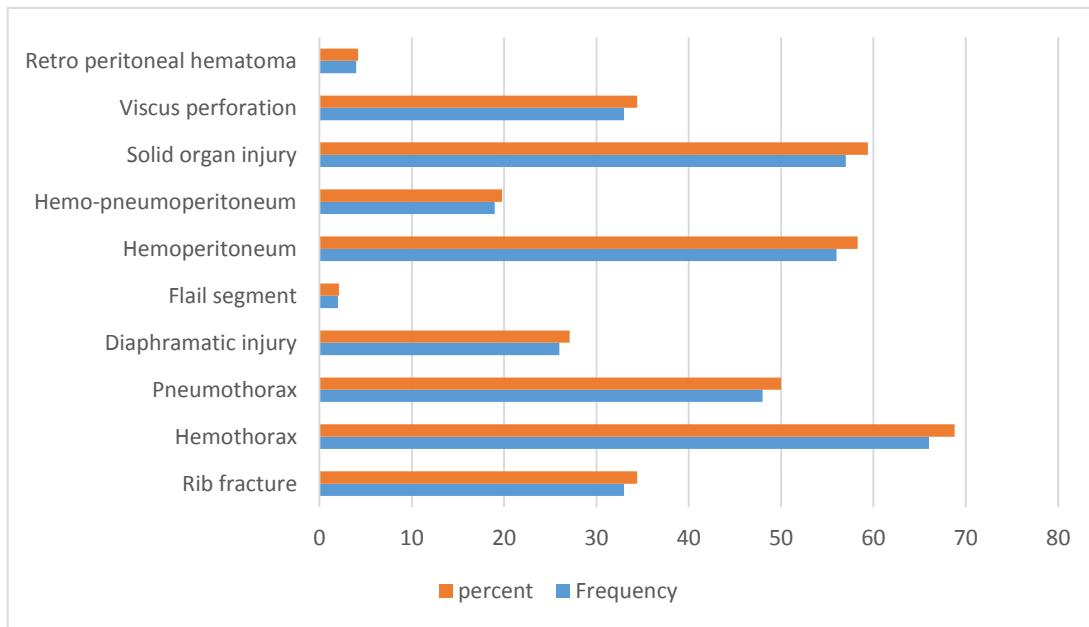
Table4: Time of diagnosis and means of diagnosis of thoraco-abdominal injury

	Frequency	Percent
At presentation	75	78.1
After 24 hour	21	21.9
Clinically	74	77.1
CT Scan	22	22.9

Table5: Clinical Diagnosis of Patients Presenting with thoraco-abdominal injury

Clinical Diagnosis	Frequency	percent
Rib fracture	33	34.4
Hemothorax	66	68.8
Pneumothorax	48	50
Diaphragmatic injury	26	27.1
Flail segment	2	2.1
Hemoperitoneum	56	58.3
Hemo-pneumoperitoneum	19	19.8
Solid organ injury	57	59.4
Viscus perforation	33	34.4
Retro peritoneal hematoma	4	4.2

Figure 2; Clinical Diagnosis



Among the total 96 patients with concomitant thoraco-abdominal injury 10(10.4%) were managed conservatively, majority of the patients 47(49%) were managed with both tube thoracostomy and laparotomy, 15(15.6%) were managed with laparotomy alone, 4(4.2%) undergone thoracotomy, and only 1 patient was managed with both thoracotomy and laparotomy.

Figure 3; Type of Procedure

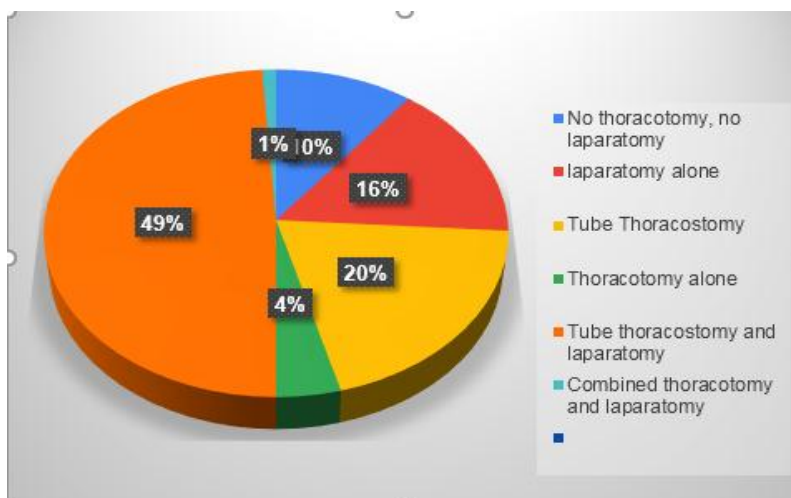


Table 6; Time of laparotomy/thoracotomy

	Frequency	Percent
Within 24 hour	36	53.7
24-48 hour	19	28.4
48-72 hour	6	9.0
After 72 hour	6	9.0

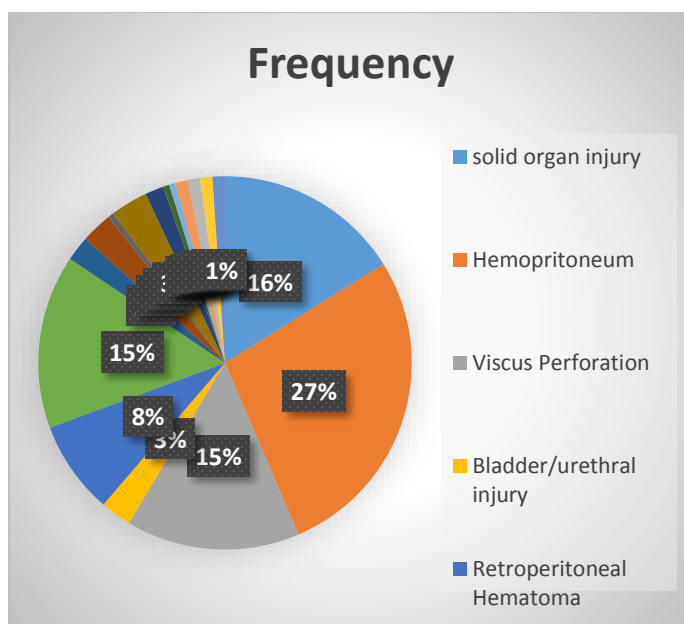
Among the 40 patients out of the total 96 who presented with blunt abdominal trauma 17(42.5%) were managed non-operatively and among those only 1(5.9%) patient had died. Among the 63 patients who were managed with laparotomy the laparotomy was therapeutic in 49(73.13%), non-therapeutic in 13(19.40%) and unnecessary in 1(1.5%) patient.

Among the 13 patients with non-therapeutic laparotomy 1(7%) patient was re operated and 5(38.46%) patients have died and among this 2 presented with blunt abdominal trauma and 3 presented with penetrating trauma.

Table 7; IOF

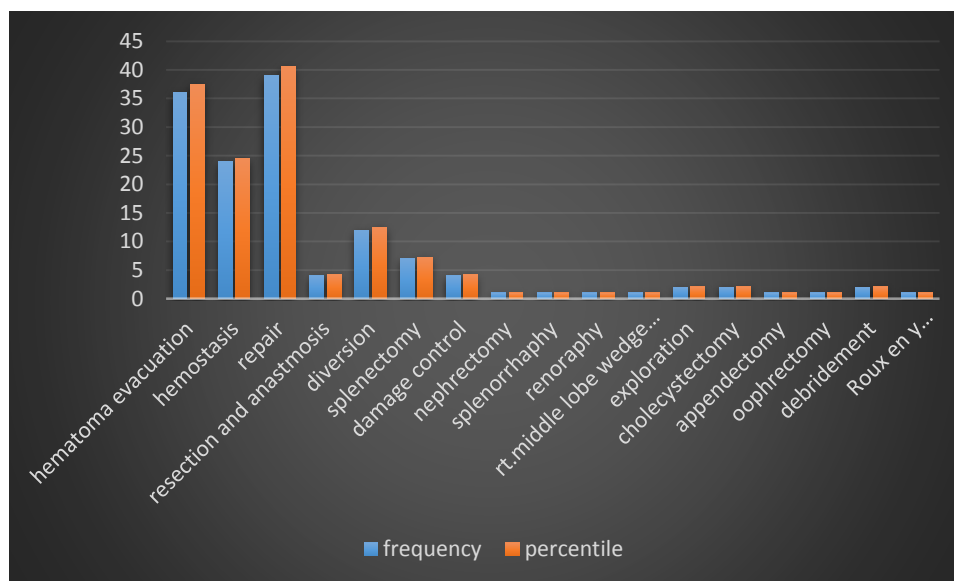
Intra-operative finding	Frequency
solid organ injury	30
Hemo peritoneum	51
Viscus Perforation	28
Bladder/urethral injury	5
Retroperitoneal Hematoma	15
Diaphragmatic Injury	28
Major Vascular injury	4
Gross fecal contamination	5
Contused viscera and abdominal wall	6
Gangrenous colon/bowel	3
Necrotizing Fasciitis of the chest wall	1
Empyema	1
massive Hemothorax/bleeding IC vessels	1
GB injury	2
urinoma	2
serosal tear	2

Figure 4; Intra-op Finding



From the 67 among the total 96 patients who were operatively managed repair was done for the 39(40.6%) as part of the operative intervention, 4(4.2%) underwent resection and anastomosis,12(12.5%) had diversion. Among the 8 patients who had IOF of splenic injury 7(7.3%) had splenectomy and 1 patient had splenorraphy, there were two patients who had IOF of kidney injury, 1(1%) of them had nephrectomy and the other one1(1%) had renorrhaphy. 4(4.2%) underwent damage control surgery, 1(1%) patient had right middle lobe wedge resection for massive hemo- thorax, 1(1%) patient had Roux en- y choledochojejunostomy plus gastro jejunostomy plus transverse colectomy plus cecostomy with descending mucus fistula and feeding jejunostomy for IOF of pancreaticoduodenal injury with partially detached GB, avulsed middle colic artery and ischemic hepatic flexure and transverse colon. Cholecystectomy was done in 2(2.1%) of the total operated patients, appendectomy and oophorectomy was performed in 1(1%) of the total cases that were operated, 2(2.1%) of the patients were just explored, 1 of them had no intra op finding and the other patient was unstable intra- op and arrested on the table and the procedure was abandoned, 2(2.1%) had debridement as intra-op procedure for necrotizing fasciitis and extensive devitalized tissue.

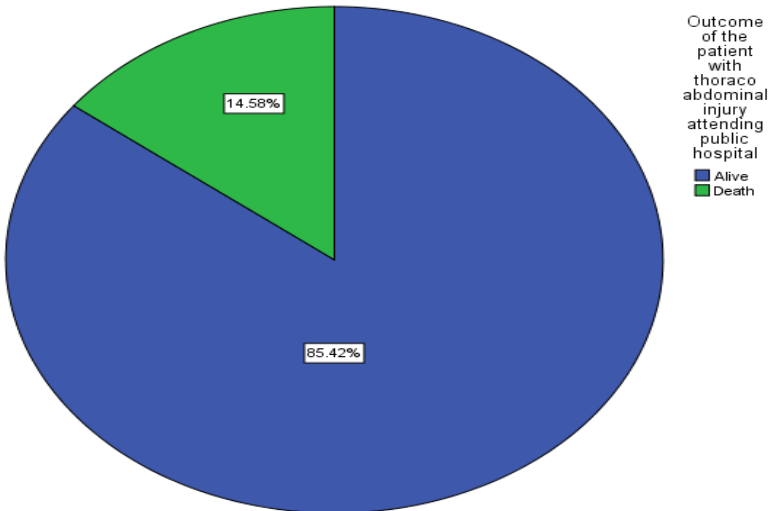
Figure 5; Type of operative procedure



The prevalence of patient outcome among thoraco abdominal injury

Among the total participants involved in the study, the magnitude of patient mortality rate was 14.6% with 95% CI of (7%, 22%). This means among 100 patients with thoraco abdominal injury visiting the public hospital, almost 15 of them have died.

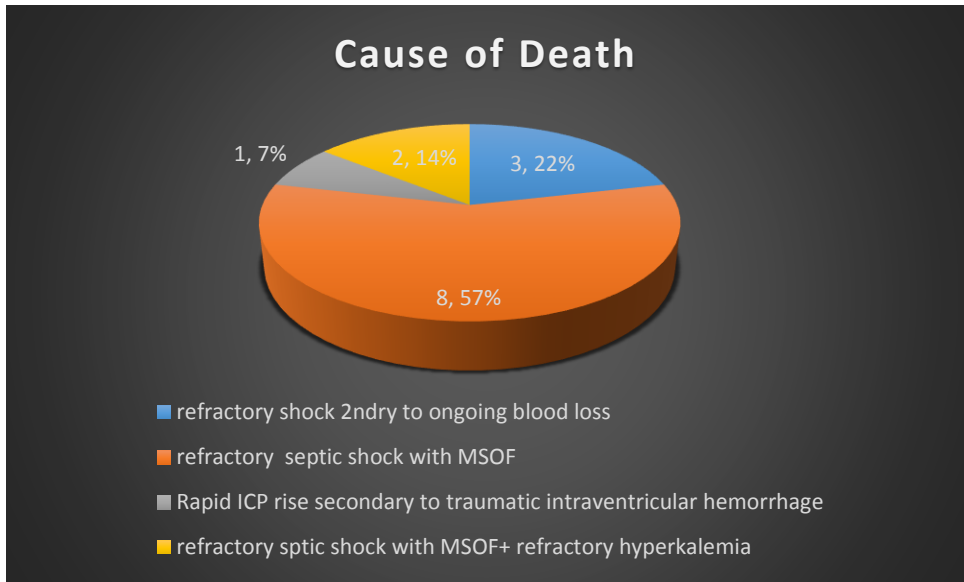
Figure 6; Outcome of patients with thoraco-abdominal injury



Outcome of the patient with thoraco abdominal injury attending public hospital, Addis Ababa, Ethiopia, 2023.

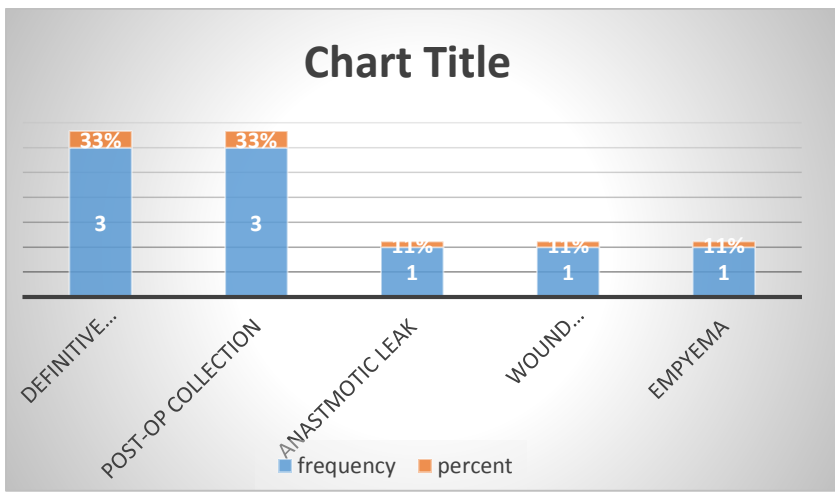
Twelve of the patients were operatively managed among the total 14 who have died and 2 of those were intraoperative deaths. The median time from admission to death in this patients is 5 days. Commonest cause accounting for 8(57.14%) deaths was Refractory septic shock with Multi System organ failure.

Figure 7;



Among the 85.4% of the patient from the total study population who were discharged improved the average length of hospital stay is 16.18 days. The minimum length of stay was 3 days and the maximum length of stay was 88 days. Among the total 67 patients who were managed operatively, 9(13.43%) of them were re-operated.

Figure 8; Reason for reoperation



Among the 3 patients who underwent damage control surgery on the initial surgery on the subsequent re-laparotomy; in one patient liver laceration repair, cholecystectomy, IVC repair was

done; pack removal, peritoneal lavage and retention suture was applied for the other patient, exploration cholecystectomy and drainage was done for the 3rd patient. For the patient who developed anastomotic leak after undergoing primary resection and anastomosis ileostomy and mucus fistula was done. One of the patient who developed post-op collection had missed stomach and colonic perforation on the initial surgery for which primary repair and peritoneal lavage was done on the 2nd surgery. For the patient who had fecal peritonitis, necrotizing fasciitis of the chest wall and abdominal wall subsequently developed empyema thoracic; and thoracotomy and debridement was done subsequently.

Factors associated with mortality for patient with thoraco-abdominal injury attending Public hospital at Addis Ababa, Ethiopia, 2023. (n=96)

In a multivariate analysis requirement of ICU ventilatory support was found to be the only significant independent predictor of mortality in patients presenting with thoraco-abdominal injury with (AOR=17.1, 95%CI (3.15, 93.3), P=0.001) meaning those patients with thoraco abdominal injury who required ventilatory support were 17 times more odds of high mortality than those patient who did not.

Figure8: Predictors of Mortality

Variables	Categories	Outcome		COR with 95%CI	AOR with 95%CI	P value
		Death	Alive			
Residency	Urban	8	68	1	1	0.460
	Rural	6	14	3.6(1.09,12.15)	1.87(0.35, 9.9)	
Hemothorax	Yes	12	54	3.1(0.65, 14.9)	1.8(0.2,14.5)	0.583
	No	2	28	1	1	
Pneumothorax	Yes	9	38	2.08(0.643, 6.76)	1.1(0.24, 5.1)	0.891
	No	5	44	1	1	
Viscus Perforation	Yes	8	25	3.0(0.95, 9.7)	2.4(0.45, 12.9)	0.303
	No	6	57	1	1	
SBP group	≤ 90mmHg	6	17	2.9(0.9, 9.4)	1.7(0.32, 9.5)	0.520
	> 90mmHg	8	65	1	1	
Respiratory rate	≤ 30 breath/min	8	70	1	1	0.103
	>30 breath/min	6	12	4.4(1.3, 14.8)	4.2(0.75 23.9)	
Requirement of ventilatory Support	No need	2	67	1	1	0.001**
	Need	12	15	26.8(5.4, 132.5)	17.1(3.15, 93.3)	

5.2. Discussion

In this study there is Male and younger age group predominance which is a similar observations seen in other studies conducted both in Africa and globally. (2,13,18,22,).

In our study 50(52%) patients out of the total 96 were hemodynamically unstable at presentation, 23(34%) were having SBP less than 90mmHg,5(5.2%)were having un palpable pulse and 33(34.4%) were having tachycardia of 120 or greater and among this 42(84%) were managed operatively. Out of the 40 patients from the total 96 who presented with blunt abdominal trauma, 17(42.5%) of them were managed non-operatively and among those only 1(5.9%) patient had died. Among the 63(65.62%) patients who were managed with laparotomy, the laparotomy was therapeutic in 49(73.13%), non-therapeutic in 13(19.40%) and unnecessary in 1(1.5%) patient. Berg, Regan J and his colleagues reported a similar finding in their study among 617 patients presented with thoraco abdominal injury the rate of non-therapeutic laparotomy was 12.3%. (8) In another study conducted at a level I trauma center which was a retrospective study on 984 patients with thoraco abdominal gunshot injury, they reported a 3% occurrence of negative laparotomy which is also comparable to our study. (16)

In a single center retrospective review of abdominal or abdomino-thoracic penetrating wounds treated between 2004 and 2013 in their study they reported laparotomy was performed in 87/186 patients (46.8%) and among this unnecessary laparotomy (35.6% — 31/87) included those patients without peritoneal violation (4/87 — 4.6%) or with peritoneal violation but without any intraperitoneal lesion (27/87 — 31%). Eleven (12.6%) patients had an intraperitoneal organ injury that did not require specific treatment (non-therapeutic laparotomy). Which is higher as compared to our study and may be explained by their sample size which is almost twice higher. (18)

In a retrospective review conducted in a district hospital in Cape Town, South Africa they reported the in-hospital mortality was 13.2%. (22). Regan J. Berg and his colleagues carried a retrospective study in a Level I trauma center in Los Angeles, California over a period of 15 years and concluded in their study; excluding the 72 who presented in cardiac arrest, mortality rate was 17.6% (280 of 1588). (15). These findings are comparable to our finding in which the in hospital mortality was 14.6% with 95% CI of (7%, 22%).

In a retrospective study conducted in Wolyta Sodo, Ethiopia, they studied 14 patients who presented with TDI. All of the patients were managed with surgical repair, and all acute trauma patients were managed via a trans-abdominal approach. Post-operative complications were seen in three patients. There were no mortalities within the case series. (14). Similarly, in a study conducted by Berry. M and his colleagues, they studied 32 patients with right sided thoraco abdominal gunshot injury, in their study 13(40%) were managed non-operatively and all were hemodynamically stable at presentation and no sign of peritonitis. No patient required laparotomy and there was no death. Mean length of hospital stay for the 11 patients who did not have injury to the SC was 5.1 days (3-8 days). No complications occurred after discharge. (19). In both studies compared to our study the difference in mortality and post-operative complication rate can be explained with a lower sample size and selection of specific study population.

John B. Moore and his colleagues reviewed 248 patients with isolated lower chest penetrating injuries and reported one death (4 %) among the patients with thoraco abdominal stab wounds and six (13%) among those with gunshot wounds. (38). In a retrospective review carried out in Grenoble University hospital, France over a period of 9 years the mortality rate was 5.9% (11/186 patients). (18). Both studies have lower mortality rate as compared to our study which can be explained by the difference in set up, having a dedicated trauma center may probably affect outcome.

Rakesh Mohanty and colleagues reported in their study that Systolic blood pressure <90, heart rate <60 and >100, Glasgow coma score ≤ 8 , blood transfusion in the ED, and positive e-FAST were associated with increased risk of mortality(10). Regan J. Berg and his colleagues concluded in their study that they have identified 10 independent predictors of mortality (Massive PRBC transfusion, ISS ≥ 25 GCS score ≤ 8 , Age ≥ 55 years, thoracotomy and laparotomy, hypotension on admission, liver injury, named abdominal vascular injury, Cardiac injury and Injury following motor vehicle collision) for the subgroup of patients with isolated thoraco abdominal trauma who were alive on admission. (15). On the other hand, in our study requirement of ventilatory support is the only statistically significant independent risk factor affecting mortality. This can be explained by the general poor conditions of the patient which has affected their outcome and the fact that most of the facilities handling this patient are not a standardized trauma centers which might affect the general patient management starting from admission up to the post-op period

including ICU and the overall outcome. The other possible explanation might be because of the limited sample size in our study, the number of variables which can significantly affect the outcome variable was limited.

In a study conducted in a level I trauma center in 984 thoraco abdominal gunshot injury patients, the need for thoracotomy, either alone or as part of dual-cavity intervention, was the strongest independent risk factor for mortality in those arriving alive .(16).Similarly in another study conducted in a level I trauma center on 617 thoraco-abdominal stab injury patients between the period January 1996 and December 2011; the need for dual-cavity intervention was associated with a precipitous increase in rate of patient mortality.(8) . As compared to both studies in our study we had only observed only one patient who had dual cavity intervention which makes it less likely for this factor to affect the outcome.

6. Conclusion and Recommendation

6.1 Conclusion

- Non-operative management should be considered in select cases with in a facility where close follow up and imaging modalities are available. Routine laparotomy should be abandoned because of a considerable number of negative and non-therapeutic laparotomies, and should be reserved for patients who are hemodynamically unstable, having signs of peritonitis, or evisceration
- The magnitude of mortality among patients with thoraco-abdominal injury was 14.6%.
- The requirement of ventilator support is the only independent risk factor affecting mortality.

Therefore, there should be improvement in the set up and care of critical trauma patient starting from the emergency to the ICU unit. A multidisciplinary team of health professionals should be organized in the management of this patients.

6.2 Recommendation

- The minister of health should focus on specific policy to incorporate and emphasizes in advancing the quality of care both in terms of facility and equipment to minimize the mortality rate of patients with thoraco abdominal injury.

- The hospital manager should give priority for scaling up the service at emergency and intensive care unit so that minimizing the negative outcome patients with severe trauma.
- Health care workers should identify and prioritize critical trauma patients and should work in an organized way to give a standardized care.
- As a retrospective review and with limited sample size, the number of variables for which data could be accurately corrected was limited therefore, future researcher should do a prospective study with a larger sample size to identify the contributing factor affecting the outcome.

7. Strength and Limitation

7.1 Strength

- Chart retrieval rate was 86.48%
- The findings are informative for future studies.

7.2. Limitation

- Retrospective study design
- Small sample size.

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