

**MANAGEMENT OUTCOME AND PROGNOSTIC  
FACTORS OF CHEST INJURY IN NEKEMTE  
REFERAL HOSPITAL, OROMIA REGION,  
ETHIOPIA**



BY  
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A thesis to be submitted to Jimma University, institute of health, medical faculty, department of Integrated Emergency Obstetrics/Gynecology and General Surgery for the partial fulfillment of the requirements of degree of Masters in Integrated Emergency Obstetrics/Gynecology and General Surgery

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## Abstract

**Background:** Chest injuries are major public health problems that commonly appear on the morbidity and mortality reports of the health institutions in Ethiopia. Despite this prevailing phenomenon, limited attention has been given to chest injuries as health problems and which is continuing challenge for the health professionals.

**Objective:** The objective of this study is to determine the management outcome and prognostic factors of chest injury in Nekemte Referral Hospital.

**Method:** A half year institution based prospective cross-sectional study design was conducted at Nekemte referral hospital on 183 patients with chest injury. Data were collected by using interviewer administrated structured questioners by trained data collectors and analysis was done using SPSS version 22. Descriptive analysis was performed to describe number and percentage and logistic regression model was fitted to assess the effect of independent variable on the dependent variable.

**Result:** Chest injury was found to be 4%(n=183) in the hospital. And most victims ware males 88.5% with the pick age range in between 20-29 years 41%. And fighting was the leading cause of chest injury witch accounts 31.1%. And patients who sustained animal injury were 6.8 times more likely to have bad outcome than patients who sustained chest injury by smuggling. Penetrating type of chest injury was the prevalent 53%. And 35.5% of the patients had associated injury, commonly head injury 33.8%. Hemopneumothorax is the leading diagnosis with was made on 27.9% of the patients. 56.8% of the patients managed only by inserting chest tube. 131 (72%) had good outcome having been improved without complication. And 6(3.3%) patients died. Anemia is the prevalent post injury complications 14.8%. And 43.7% patients were stayed for 2 to 7 days in the hospital.

### **Conclusion & Recommendation:**

Fighting founded to be the major etiological factor with a higher rate of penetrating chest injuries. The majority of the patients were successfully managed by tube Thoracotomy. Urgent preventive measures targeting at reducing the occurrence of inter personal violence and avoidance of Sharpe materials handling by the civilians, RTA, animal injury, and occupational injuries, and also improve management of surgical emergencies from the place of accident to the hospital will decrease the overall morbidity and mortality.

**Key words:** Chest injury, Prognostic factors, Nekemte referral hospital, outcome.

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## **List of Acronyms and abbreviations**

AOR	Adjusted Odd Ratio
CBC	Complete Blood Count
CI	Confidence Interval
COR	Crude Odd Ratio
CXR	Chest X-Ray
Hgb	Hemoglobin
IEOS	Integrated Emergency Obstetrics, Gynecology and General surgery
MRN	Medical Record Number
NRH	Nekemte Referral Hospital
RTA	Road Traffic Accident
SPSS	Statistical Package for the Social Sciences
SSI	Surgical Site Incision
Us	Ultrasound
V/S	Vital Signs
WHO	World Health Organization
#	Fracture



# CHAPTER ONE: INTRODUCTION

## 1.1 Background

Trauma, or injury, is defined as cellular disruption caused by an exchange with environmental energy that is beyond the body's resilience which is compounded by cell death due to ischemia/reperfusion (1).

Globally more than 5 million people die each year as a result of injuries. This accounts for 9% of the world's deaths, nearly 1.7 times the number of fatalities that result from HIV/AIDS, tuberculosis and malaria combined. Every day the lives of more than 14,000 people are cut short as a result of an injury. Every six seconds someone in the world dies as a result of an injury (4).

Injuries affect all age groups but have a particular impact on young people and people in their prime working years. For people between the ages of 15 and 29 years, Road traffic injuries are the leading cause of death in this age group. About 90% of injury related deaths occur in low- and middle-income countries (2).

Despite growing awareness of the prevalence of the problem, attention to injury prevention and control among policy-makers and those funding global public health programming remains disproportionately low. Deaths from many communicable diseases are declining more rapidly than injury-related deaths. It will be possible to lower the current, unacceptably high burden of injury globally by following the steps in the prevention and control of injuries: SURVEILLANCE: Using data to understand the extent and nature of the injury problem then, RISK FACTOR IDENTIFICATION: Researching the causes of particular injuries, then INTERVENTION DEVELOPMENT: Developing strategies to address the causes and evaluating the effects of these measures, and finally IMPLEMENTATION: Putting into place effective prevention programs (2).

Globally 10% of all trauma admissions result from chest injuries and 25% of trauma-related deaths are attributable to chest injuries (3).

## 1.2 Statement of the problem

According to Incidence, mortality and burden of disease of injuries in 2013, injuries accounted for 10.1% of the global burden of disease in 2013. And it estimated that 973 million people sustained injuries that warranted some type of healthcare and 4.8 million people died from injuries (4).

According to global statistics, thoracic injury accounts for 25% of all injuries. In a further 25%, it may be a significant contributor to the subsequent death of the patient. In most of these patients, the cause of death is haemorrhage. Chest injuries are often life-threatening, either in their own right or in conjunction with other system injuries (5). And the majority of these deaths 91% occur in underdeveloped countries (6). In Africa a study in Nigeria shows chest injury constitutes about 40% of the workload of most thoracic surgery units and accounts for about 20% of deaths in thoracic surgery units (7). Chest injuries are one of the three leading causes of trauma-related deaths in South Africa with a rate of 27.4% (8). A study in Egypt shows from all trauma related death, chest injuries accounts 17.7% (9). In Ethiopia studies shows that 7% of the patients died due to chest injuries (10), (11).

Prevention of injuries is an essential part of primary health care. Treatment is relatively expensive, often lingering and not always successful in preventing permanent disability. It is therefore, essential to strengthen the efforts of injury prevention.

In Ethiopia chest trauma is not well studied even if it is a major public health problem. Therefore, the present study attempted to contribute in filling the gap by determining the management outcome and prognostic factors of chest injury.

## CHAPTER TWO: LITERATURE REVIEW

### 2.1 Overview of chest injury

On a global scale every minute nine people die from traumatic injuries; approximately 5.8 million people die every year from non-intentional traumatic injuries and violence. Traffic accidents make up 1.3 million, suicides 844,000, and homicides 600,000 are the leading cause for these numbers. The majority of these deaths (91%) occur in underdeveloped countries (6). And it is responsible for an estimated 6% of all years lived with disability and also it is the leading cause of death worldwide among those aged 15–29 years (2). The incidence of trauma in urban and rural areas was 47.4% and 52.6%, respectively. Blunt chest trauma constituted 47.8% and 83.3% of all injuries in urban and rural areas, respectively, and penetrating chest injuries were 52.2% and 16.7%, respectively (12).

Thoracic injuries are the primary factor in up to 75% of all trauma related deaths in USA (13). In the European Union about 25% of traumatic deaths are secondary to thoracic injuries (14). In UK from all trauma patients admitted 4.57% patients had chest injury (15). In Korea it accounts 13.4% of all trauma and 33.6% died due to this (16). A study in Iran shows the prevalence of chest injuries was 35.5% (12). A study in India shows from all trauma patients 45% of the patients were admitted primarily because of chest injury (17). A study in South Africa shows 27.4% died due to chest injuries (8). In Nigeria at University of Uyo Teaching Hospital chest injury is 40% of cardiothoracic unit workload (7). A study in Egypt shows from all trauma related death, chest injuries accounts 17.7% (9). In Ethiopia according to WHO Proportional mortality of non-communicable diseases, injury accounts 10% of the cause of mortality (18).

### 2.2 Risk factors of chest injury

#### 2.2.1 Socio demographic factors

Injuries affect all age groups but have a particular impact on young people and people in their prime working years. More males than females are killed by injuries and violence. Worldwide, about three-quarters of deaths from road traffic injuries, four fifths of deaths from homicide, and nine tenths of deaths from war are among men (2). In USA injury is one of the three leading causes of death for teenagers and young adults, elderly people have the highest rates of injury death. Males have higher rates of injury death than those for females, regardless of age group (19). In the

European Union, trauma is the most frequent cause of death in the population between 15 and 45 years (14). A study in India shows 62% patients was in the age group of 21-30 years and the next common decade was the 4<sup>th</sup> (i.e., 31-40) years which is 13.4% of which 88.22% are male and 11.78% female patients (17). A study in Malaysia shows thoracic trauma seen in victims with ages ranged from 1 to 89 years with a mean age of 39.67 years(SD=20.50). With a male to female ratio of 4.5:1 (20). A study in Brazil shows the patients' ages ranged between 13 and 89 years, with a mean of 37.9 years and a SD of 17.3. The mean age of the women was 43.2 years ( $\pm 20.0$  years) and of the men it was 36.4 years ( $\pm 16.3$  years). In this study the t-test demonstrated that women and older men had a statistically significant higher risk of being involved in accidents ( $P = 0.08$ ) (21). In Sudan 54.7% were males and 45.3% were females with a male to female ratio of 2.5:2.1, The age ranged from 4–80 years with a mean age of 27.41(SD  $\pm$  13.5 years) most of the patients were in the third decade of life (22). In Ethiopia the patients' ages ranged between 2-58 years with a mean of 25.3 years. The majority of patients were aged between 11- 30 years accounting for 70.8% of all cases (10). In another Ethiopian study Majority of the chest injury victims were males 90.9% and the young were mostly involved (11).

### **2.2.2. Cause & Mechanism of injury**

In UK Road traffic accidents were overall the most common mechanism of injury accounting for 57.01% of the patients (15). A study in India also shows RTA were the most common reason for blunt chest injuries 79.72% followed by fall from height 11.50% and assault 6.43% (17). A study in Malaysia shows Commonest cause of chest injury was involvement in RTA, making up 84.3% of the cases, followed by falls 11.5%, and assault 4.2% (20). A study in Brazil shows the causes of thoracic trauma are secondary to 24.4% car crashes, 20.1% falls, 12.3% motorbike accidents, 10.7% stabbings, 5.9% accidents involving pedestrians, 5.6% bicycle accidents, 4.6% shootings, and 14.5% other types of accident (21).In Sudan 73% of the patients were involved in road traffic accident 37.3% were either driver or occupant and 36% were pedestrians. While 14 % are involved in attacks and 8% in stab wounds, 4% sustained trauma from falls and 0.7% was a gunshot (22). In Ethiopia homicides accounted for 74.2% of the patients (11).

In Sudan 94.7% presented to the hospital in the time period of 1 to 6 hours, while 4% presented in less than one hour and 1.3% presented in more than six hours (22). In Ethiopia Most patients 71.2% arrived later than two hours from the time of injury (11).According to WHO in over 40%

of the countries in the world, fewer than half of seriously injured people are transported to hospital by ambulance. In over a quarter of countries, 10% or less of the seriously injured was transported by ambulance (23).

In Malaysia As for the mechanism of injury, 97.0% of the patients had blunt trauma, whereas only 3.0% had penetrating injury (20). A study in Pakistan shows 58% of patients had blunt chest injury as compared to 42% who had penetrating injuries (24). In Iran Among the patients with chest trauma, 35.4% had penetrating and 64.6% blunt lesions (12). In Ethiopia Penetrating injuries were the predominant types of injuries 72.7%-75% (11) (10).

In India the right side was involved in 70%, left side in 22.3% patients and bilateral involvement in 7.7% patients with blunt injury (17).

A study in Malaysia shows 72.6% patients had associated extra thoracic injuries. Most common was musculoskeletal 54.4% involving vertebral spine, pelvis and long bones 30.6% patients had neurotrauma and 11.5% patients had intraabdominal injury as the common association (20). In Sudan 26.7% of the cases were isolated thoracic injuries while 73.3% were multiple injuries, 37.3% the injuries included the extremities, 19.3% in the abdomen, 13.3% were in the head and neck, the head was 9.3% while the neck 4%, 2.7% the pelvis was involved and 0.7% had injury to the spine (22). In Ethiopia 50% had associated injuries the commonest being to the extremities (11). In Ethiopian another study about 30% of our cases has associated injuries to other organs (25). Also In another Ethiopian study 19.4% had associated injuries. Abdominal injuries occurred in 5.6%, skeletal in 5.6% and neurological injuries in 4.2% (10).

A study in India shows Chest pain and dyspnea were the most common symptoms at presentation whereas tenderness over the chest wall, bone crepitation and subcutaneous emphysema were the most common findings on physical examination (17). In Sudan Most of the were clinically stable 61.3%, while 26.7% experienced Dyspnea and 12% were shock, no patient reported as cyanosed at the time of presentation (11). In Ethiopia the presenting clinical features are chest pain 100.0%, shortness of breath 91.7%, bleeding from injury site 34.7%, fever 6.9% and cough 4.2% (10).

### 2.3 Management Outcome of chest injury

A study in India shows a Mean hospitalization time was 7.5 days, ranging from 1 to 35 days (17). In Iran The average length of hospitalization was  $10.78 \pm 12.53$  days in patients with blunt chest trauma, and  $5.74 \pm 3.73$  days in patients with a penetrating chest injury ( $P < 0.002$ ) (12). A study in Malaysia Overall LOS (length of stay) ranged from 1 to 94 days with a mean stay of 10.2 days ( $SD=12.4$ ) (20). In Sudan The duration of hospital stay was 12% stayed less than 3 days while 48% stayed between 3 to 7 days, 6% stayed for 8 to 14 days Only 1.3% required a hospital stay of more than 2 weeks (11). In Ethiopia LOS ranged between 4 and 60 days, with a mean of 11.8 days. 55.5% of the patients had a hospital stay of 10 days or less. Only two patients stayed in hospital for longer than 40 days (10) (12).

In Iran the outcome of patients at discharge was 95.7% recovery and 4.3% mortality. Overall, 4.9% of patients with blunt and 2.2% with penetrating chest traumas died (12). In India From chest injury patients, 84.25% patients were discharged in satisfactory condition within 7-9 days, while hospital stay was prolonged in 13.42% patients because of multiple rib fracture associated with other extra thoracic injury and various complication (17). In Malaysia the overall mortality was 6.9% (20). In Sudan 87.3% had uneventful course while 10.7% developed complications and deaths accounted for 2%. The complication which were 3.3% developed pneumonia, 3.3% had non-functioning chest tube, 2.7% developed surgical emphysema, 2% had sepsis and 1.3% developed wound infections. Those who sustained rib fracture 62.6%, 18.8% of them developed complications while those with Haemopneumothorax 35.1%, 6.5% died and 23.9% developed complications, 6.3% of patients with flail chest or diaphragmatic injuries developed complications. The causes of death were as follows one patient developed pulmonary embolism, one died from septicaemia and one patient had brain death (11). In Ethiopia 7.6% died. 83.2% of the patients recovered fully without any residual effects. 9.8% had complications (Pumonia+sepsis 2.8%, Empyema 2.8%, Pneumonia alone 1.4%, Medastinitis 1.4%, Epidural haematoma + coning 1.4%). There were 5 deaths, giving a mortality rate of 7% (10).

## 2.4 Significance of the Study

This study is help full to have knowledge on complex problem of chest injury and to gain information about the injury characteristics and its burden in the area of study and the county at large. It could help to develop countermeasures that could reduce the number and severity of accidents. In addition, the study may provide base line information to carry out further researches on chest injury. The data obtained in this study, may be used by concerned bodies for planning and evaluating on preventive measures. The recommendations given if considered are going to benefit the public at large on prevention of chest injury.

Medical personnels must therefore understand not only the incidence of the disease but also the patterns of injury, the management outcome of chest injury and how to prevent complications peculiar to their environment. This would aid not only individual patient's management, but also help in the formulation of policies geared towards preventive measures from deductions from the studies. This formed the basis for this study.

### Conceptual framework



Figure 1: Conceptual framework

## **CHAPTER THREE: OBJECTIVES**

### **3.1 General objective**

The objective of this study is to assess the management outcome and prognostic factors of chest injury in Nekemte referral hospital, Oromia region, Ethiopia.

### **3.2 Specific objectives**

- To determine the prognostic factors of chest injury in Nekemte referral hospital, Oromia region, Ethiopia.
- To assess the management outcome of chest injury in Nekemte referral hospital, Oromia region, Ethiopia.



## **CHAPTER FOUR: METHOD AND PARTICIPANTS**

### **4.1 Study area and period**

The study was conducted in Nekemte referral hospital which was found in Nekemte town 331 km. from the capital Addis Ababa to the west. The hospital was serving for a total population of about 2.1 million peoples of Nekemte town, East wollega zone, parts of west wollega zone, Horoguduru zone and west shoa zone. Currently Nekemte Referral hospital had 208 beds and 326 total numbers of staffs. The Hospital provides Medical treatment, ophthalmic treatment, Psychiatric treatment, major and minor operation, inpatient services, MCH, control of HIV, laboratory, X-ray and ultrasound, drug and pharmacy, training services and physiotherapy to the population.

This study was conducted starting from February, 1<sup>st</sup> 2017 to July,30 2017.

### **4.2 Study design**

Institution based prospective cross-sectional study design was used.

### **4.3 Population**

#### **4.3.1 Source population**

All trauma patients who presented and managed in Nekemte referral hospital.

#### **4.3.2 Study population**

All chest injured patients who presented and managed in Nekemte Referral hospital during the study period.

### **4.4 Sampling technique**

Consecutive sampling technique was used in which all presented patients with chest injury included in the study.

### **4.5 Inclusion & Exclusion Criteria**

#### **4.5.1. Inclusion criteria**

- All chest injured patients who presented and managed in Nekemte referral hospital starting from February, 1<sup>st</sup>/2017 to July, 30/2017 G.C was included in this study.

#### **4.5.2 Exclusion criteria**

- There are no exclusion criteria.

## **4.6 Study variables**

### **4.6.1 Dependent variable:**

- Management outcome (Good/Bad)

### **4.6.2 Independent variables:**

- Socio demographic variables (Sex, age, marital status, occupation, educational status, residence)
- Mechanism of chest injury (RTA, Fighting, Animal injury, Falling down accident, Violence, Smuggling)
- Type of chest injury (Blunt, Penetrating)
- Associated injuries (Head injury, Abdominal injury, Fracture, None)
- Length of hospital stay (6hrs-1day,2-7days, >1wks)

## **4.7 Data collection tools and technique**

Data were collected using a pre-tested structured questionnaire that was developed by adapting from the World Health Organization's injury surveillance guideline and it includes socio-demographic variables, cause and mechanism of injury, management outcome.

Patients who met the inclusion criteria were offered explanations about the study and requested to consent before being enrolled into the study. The diagnosis of chest Injury was made by clinical history, physical examination and abnormal chest radiographs at the Emergency department. The length of hospital stay, complications and mortality as measures of outcome of chest injury patients was recorded at the end of follow up period.

## 4.8 Data collectors and techniques

The quality of data was assured by properly designing and pre-testing of the questionnaire, proper training of the interviewers and supervisors of the data collection procedures, proper categorization and coding of the questionnaire. Every day, questionnaires was reviewed and checked for completeness by the supervisors and principal investigator and the necessary feedback was offered to data collectors.

## 4.9 Data analysis

The collected data was checked for its completeness, entered and analyzed using SPSS version 22.0 database programs. Data analysis and association tables between variables was done to assess the relative effect of determinants. Association between dependent and independent variables was checked by using binary logistic regression and statistical significant association was tested at a P-value of  $< 0.05$ .

## 4.10 Data quality management

To assure the quality of the data, data collectors and supervisors was trained and a regular supervision and follow up was made by supervisors. In addition, regular checkup for completeness and consistency of the data will also be made on daily basis.

## 4.11 Ethical consideration

Ethical clearance and permission letter was obtained from Ethical committee of Jimma University institute of health, medical faculty post graduate research program and letter of cooperation was sent to the institution from JU Administrative office.

## 4.12 Operational definitions and definition of terms

1. **Chest injury:** A chest injury is any form of physical injury in a region between the neck and abdomen which includes both chest wall and thoracic cavity organs injury.
2. **Chest wall injuries.** Lacerations of the chest without pleural space involvement require simple irrigation, debridement, and closure.
3. **Flail chest:** The result of two or more ribs being fractured in two places or are fractured posteriorly with sternochondral dislocation anteriorly. The flail segment renders the chest wall unstable interfering with the mechanics of ventilation.

4. **Pericardial tamponade:** The presence of blood into the pericardial sac, to such an extent that heart function is impaired.
5. **Lung contusion:** Injury to lung parenchyma resulting in edema and hemorrhage.
6. **Tube Thoracostomy:** Urgent insertion of chest tube in the plural cavity.
7. **Length of hospital stay:** the duration of time from admission to discharge or death of the patient.
8. **Management outcome:** the condition of the patient after the procedure that means whether he developed complication or not, discharged alive or died in the hospital.
  - a. **Good outcome:** -favorable final outcome of patient after treatment like discharge after improvement without any complication.
  - b. **Bad outcome:** - unfavorable final outcomes who develop complications like (anemia, sepsis, pneumonia, malfunction tube, SSI) and Death following treatment.
9. **Postoperative pneumonia:** suspected in a patient with clinical findings of infection including fever, cough or purulent sputum in the post-operative period.
10. **Surgical site infections (SSI):** Infection following surgical incisions and classified as
  - a. **Superficial Incisional SSI:** Infection occurs within 30 days after the operation and involves only skin or subcutaneous tissue of the incision.
  - b. **Deep Incisional SSI:** Infection occurs within 30 days after the operation and infection involves deep soft tissues (e.g., fascial and muscle layers) of the incision.
11. **Urban:** Peoples from Nekemte town.
12. **Rural:** Peoples from outside Nekemte town.

## CHAPTER FIVE: RESULTS

### 5.1 General characteristics of injury

In Nekemte referral hospital trauma is the first cause of emergency attendance, second cause of morbidity next to Acute febrile illness in OPD & IPD, and the sixth cause of morality in the hospital. In the study period a total of 66,700 patients seen at EOPD of this a total of 7,850 patients admitted. From the total of patients seen at EOPD 4,715 (7%) patients wear trauma victims and from those 974 (21%) managed as inpatient. And form all trauma patients 183 (4%) patients were chest injured patients, 54(29.5%) ware managed at EOPD level and 129 (70.5%) patients admitted.

### 5.2 Socio demographic characteristics of chest injured patients

In this study the peak age incidence of chest injury was seen in between 20-29 years 41%(n=75). It is more dominated in males 162(88.5%). And also it was common among married patients 45.9%(n=84), employees 32.2%(n=59), and college/TTI educational status leveled individuals 22.4%(n=41). And 113(61.7%) were from rural residency (Table 1).

**Table 1: Socio-demographic characteristics of Chest injured patients in Nekemte referral hospital from February, 2017-July, 2017.**

Variables	Labels	Frequency	Percent (%)
Sex	Male	162	88.5
	Female	21	11.5
Age	0-15	15	8.2
	16-19	39	21.3
	20-29	75	41
	30-39	29	15.8
	>40	25	13.7
Marital status	Underage	21	11.5
	Single	56	30.6
	Married	84	45.9
	Divorced	13	7.1
	Widowed	9	4.9
Occupation	Student	37	20.2
	Employee	59	32.2
	Farmer	34	18.6
	Merchant	19	10.4
	Unemployed	34	18.6

Educational level	Illiterate	21	11.5
	Can read and write	40	21.9
	Primary school	13	7.1
	Secondary school	27	14.8
	Preparatory school	26	14.2
	College or TTI	41	22.4
	Higher education	15	8.2
Residence	Rural	113	61.7
	Urban	70	38.3

### 5.3 Causes and mechanism of chest injury

In this study the majority of the injuries were happened in the afternoon and in the evening 63(34.4%) & 59(32.2%) respectively. Among studied patients fighting is the leading cause of chest injury which accounts 31.1%(n=57) next to this RTA 29.5%(n=54). And those injuries were happened 39.9%(n=73) in the streets. 72(39.3%) chest injured victims came to hospital less than 6 hrs. And 134(73.2%) patients came to the hospital directly from the scene. And from those who came from health facilities only 21.3%(n=39) of the patients received pre-referral treatment, which was 18(46.2%) patients given first aid. 48.1%(n=88) of the patients arrived to the hospital carried (Table 2).

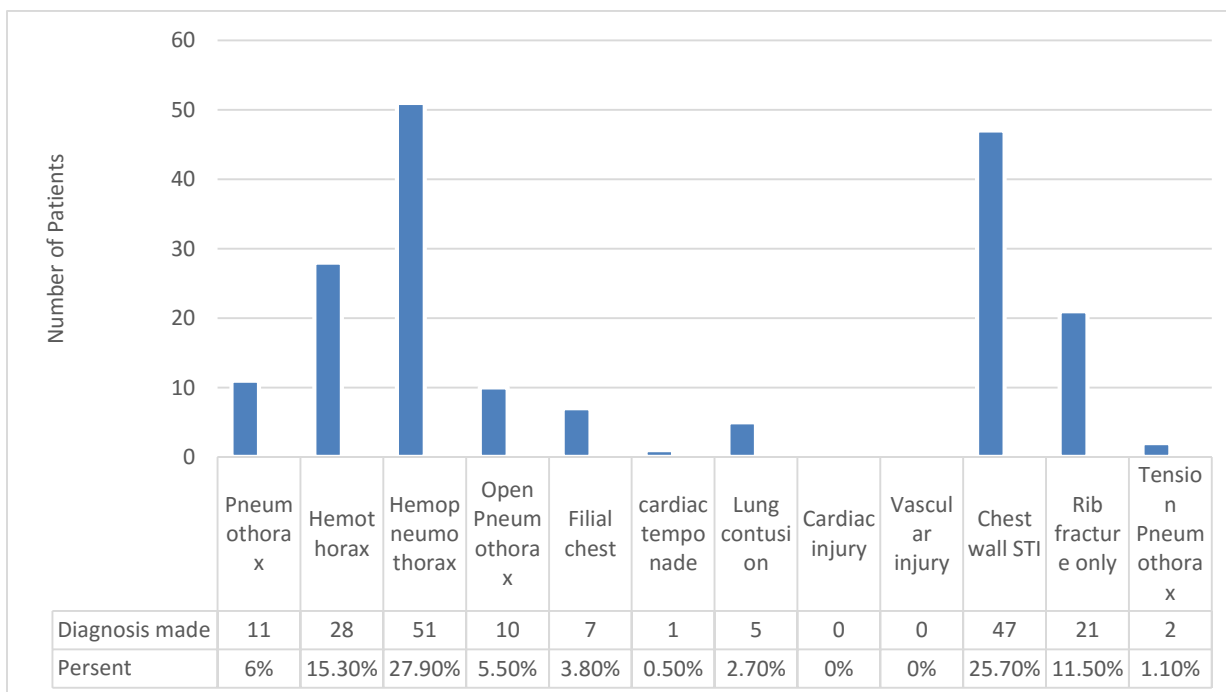
Among 183 patients 53%(n=97) of the patients sustained penetrating type of chest injury and 47%(n=86) sustained blunt type of chest injury. And 96(52.5%) patients injured on the anterior right side of their chest. 35.5%(n=65) of the patients had associated injury to the other sites, which was 38.5%(n=25) of the patients had associated head injury. 74(40.4%) patients presented with a chief complaint of bleeding. And for 133(72.7%) patients chest x-ray and hemoglobin done as part of investigation. From the x-rayed patients 62(38%) had rib fracture among them 50(80.6%) had less than 3 rib fracture. And from lab investigated patients 46.4%(n=70) of the had hemoglobin value between 8-12 gm/dl (Table 2).

Hemopneumothorax is the leading diagnosis with was made on 27.9% of the patients (Fig. 2). From 183 chest injured patients for 56.8%(n=104) of the patients managed only by inserting chest tube (Table 3).

**Table 2: Cause & mechanism of chest injury in Nekemte referral hospital from February, 2017-July, 2017.**

Variable	Label	Frequency	Percent
Time of injury	In the morning	63	34.4%
	In the afternoon	59	32.2%
	In the evening	34	18.6%
	After midnight	27	14.8%
Mechanism of injury	Road traffic accident	54	29.5%
	Fighting	57	31.1%
	Animal injuries	18	9.8%
	Fall down accident	9	4.9%
	Machinery	6	3.3%
	Violence	9	7.7%
	Smuggling	25	13.7%
The place of injury occurred	Home	30	16.4%
	Street	73	39.9%
	Transport	32	17.5%
	Work area	10	5.5%
	Farm area	34	18.6%
	Construction site	4	2.2%
Duration from accident(in hrs)	< 6 hrs	72	39.3%
	6-12 hrs	68	37.2%
	12-24 hrs	33	18%
	> 24 hrs	10	5.5%
From where the patient come to the hospital	From the scene	134	73.2%
	From hospital	4	2.2%
	From health center	35	19.1%
	From private clinics	8	4.4%
	Unknown	2	1.1%
Pre referral management	Chest tube insertion	2	5.1%
	First aid	18	46.2%
	Resuscitation	11	28.2%
	Medications	8	20.5%
Means of transportation to the hospital	Ambulance	25	13.7%
	Other vehicles	65	35.5%
	Carried	88	48.1%
	By foot	5	2.7%
Site of chest injury	Anterior Right side of chest	96	52.5%
	Anterior Left side of chest	3	1.6%
	Posterior Right side of chest	58	31.7%
	Posterior Left side of chest	16	8.7%
	Multiple sites	10	5.5%

Associated injuries	Head injury	25	38.5%
	Abdominal injury	18	27.7%
	Fracture	22	33.8%
Presenting symptoms	Difficulty of breathing	37	20.2%
	Bleeding	74	40.4%
	Loss of consciousness	23	12.6%
	Chest Pain	48	26.2%
Investigations done	Chest x-ray + Hemoglobin	133	72.7%
	Hemoglobin only	17	9.3%
	CXR only	29	15.8%
	No investigation done	4	2.2%
No of Rib fracture	< 3 ribs	50	80.6%
	> 3 ribs	12	19.4%
Hemoglobin result	< 7 g/dl	15	9.9%
	8-12 g/dl	70	46.4%
	> 12 g/dl	66	43.7%



**Figure 2: Diagnosis made for Chest injured patients in Nekemte referral hospital from February, 2017-July, 2017.**

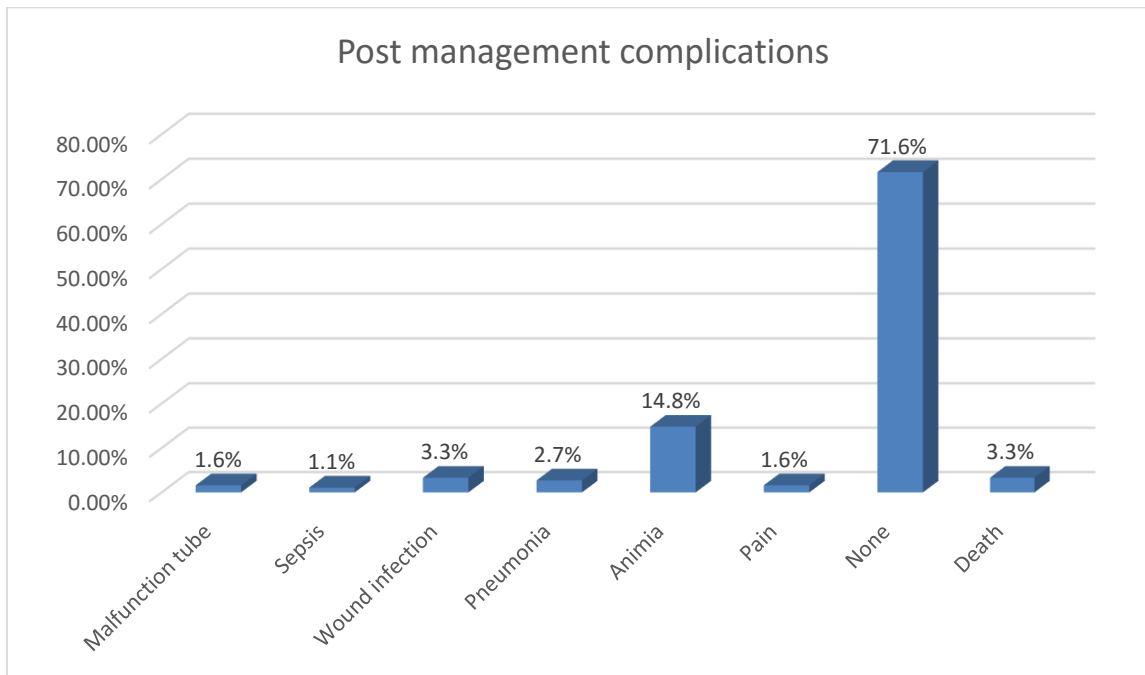


**Table 3: Management of Chest injured patients in Nekemte referral hospital from February, 2017-July, 2017.**

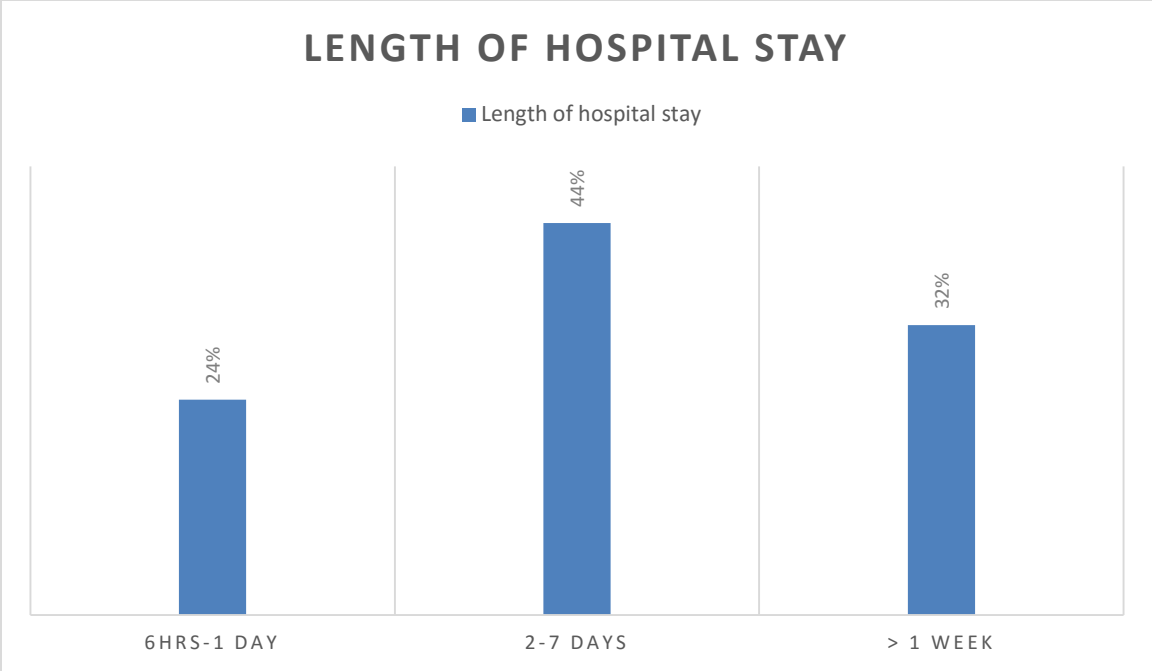
Patient managed with		
	Frequency	Percent
Chest tube insertion only	103	56.3%
Thoracotomy + Chest tube insertion	1	0.5%
Pericardio synthesis	1	0.5%
Fracture management + chest tube insertion	11	6.0%
Fracture management + medications	14	7.7%
Medications only	40	21.9%
Exploratory laparotomy + chest tube insertion	13	7.1%
Total	183	100.0%

#### 5.4 Management outcome

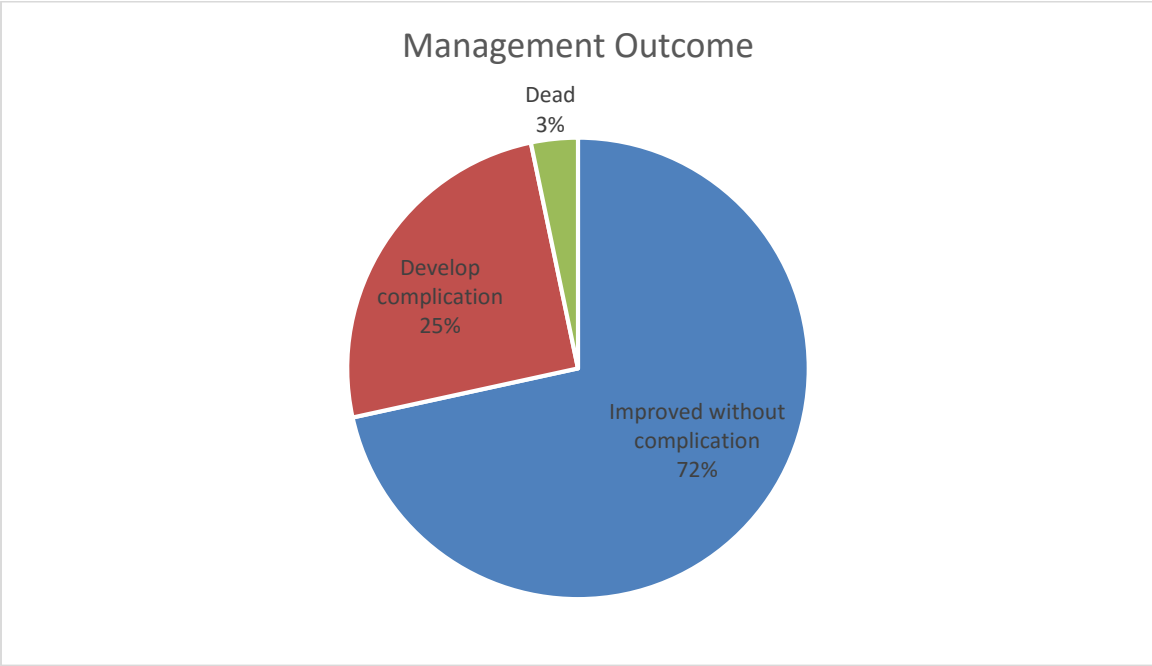
Among the 183 managed cases of Chest injury, 131 (72%) had good outcome having been discharged without complication, whereas 46 (24.6%) develops complication, 6(3.4%) patients are dead. Anemia is the prevalent post injury complications 27 (14.8) (Fig-3). 80 (43.7%) patents ware stayed for 2 to 7 days in the hospital (Fig-4). 131(72%) had good management outcome and 52(28%) had bad management outcome.



**Figure 3: Types of complications developed after the management of chest injury at Nekemte referral hospital from February, 2017-July, 2017.**



**Figure 4: Length of hospital stay of Chest injured patients in Nekemte referral hospital from February, 2017-July, 2017.**



**Figure 5: Management outcomes of chest injured patients at Nekemte referral hospital from February, 2017-July, 2017.**

## 5.5 Prognostic factor of management outcome of chest injury

To identify the factors associated with management outcome of chest injury, binary logistic regression was performed on dichotomous dependent variables with P-value of  $\leq 0.05$  (95% CI). And it shows that patients with age greeter than 40 years ware 91% less likely to have bad outcome than patents with age between 0-15 years. Married patients 97% less likely to have bad outcome than patents who are under age for marriage. Patients who sustained animal injury were 6.8 times more likely to have bad outcome than patients who sustained chest injury by smuggling.

**Table 4: Regression table of Chest injured patients in Nekemte referral hospital from February, 2017-July, 2017.**

Variables	Label	Management outcome		COR	P-value	AOR (95% CI)	P-value
		Bad	Good				
Sex	Male	44(24%)	118(64.5%)	1			
	Female	8(4.4%)	13(7.1%)	1.65(0.6-4.3)	0.299		
Age	0-15	7(3.8%)	8(4.4%)	1	0.034	1	
	16-19	8(4.4%)	31(16.9%)	0.3(0.1-1.1)	0.061	0.000(0.000)	0.999
	20-29	26(14.2%)	49(26.8%)	0.6(0.2-1.9)	0.382	2.2(0.3-14.1)	0.425
	30-39	2(1.1%)	27(14.8%)	0.08(0.02-0.5)	0.006	1.9(0.5-7.2)	0.33
	>40	9(4.9%)	16(8.7%)	0.64(0.2-2.4)	0.506	0.09(0.01-0.78)	<b>0.028</b>
Marital status	Underage	7(3.8%)	14(7.7%)	1	0.143	1	
	Single	14(7.7%)	42(23%)	0.67(0.2-1.98)	0.466	0.000(0.000)	0.999
	Married	23(12.6%)	61(33.3%)	0.75(0.3-2.1)	0.59	0.03(0.003-0.3)	<b>0.003</b>
	Divorced	2(1.1%)	11(6%)	0.36(0.06-2.1)	0.26	0.08(0.01-0.5)	<b>0.009</b>
	Widowed	6(3.3%)	3(1.6%)	4(0.8-20.9)	0.101	0.05(0.003-0.8)	<b>0.033</b>
Occupation	Student	12(6.6%)	26(14.2%)	1	0.601		
	Employee	15(8.2%)	44(24%)	1.3(0.5-3.5)	0.603		
	Farmer	12(6.6%)	20(10.9%)	0.74(0.3-1.8)	0.51		
	Merchant	6(3.3%)	14(7.7%)	0.93(0.3-3)	0.902		
	Unemployed	7(3.8%)	27(14.8%)	0.56(0.2-1.6)	0.294		
Educational status	Illiterate	7(3.8%)	14(7.7%)	1.1(0.4-3.3)	0.802		
	Can read and write	10(5.5%)	30(16.4%)	0.76(0.3-1.9)	0.565		
	Primary school	5(2.7%)	8(4.4%)	1.4(0.4-5)	0.573		
	Secondary school	6(3.3%)	21(11.5%)	0.66(0.2-1.9)	0.44		
	Preparatory school	7(3.8%)	19(10.4%)	0.85(0.3-2.4)	0.751		
	Higher education	17(9.3%)	39(21.3%)	1	0.883		

Residence	Urban	33(18%)	80(43.7%)	1			
	Rural	19(10.4%)	51(27.9%)	0.9(0.5-1.76)	0.764		
Mechanism of injury	RTA	15(8.2%)	39(21.3%)	1.2(0.4-3.6)	0.724	1.9(0.5-7.3)	0.336
	Fighting	15(8.2%)	42(23%)	1.1(0.4-3.4)	0.825	1.5(0.4-5.4)	0.567
	Animal injury	9(4.9%)	9(4.9%)	3.2(0.86-11.6)	0.083	6.8(1.2-37.2)	<b>0.027</b>
	Fall down accident	1(0.5%)	8(4.4%)	0.4(0.04-3.8)	0.424	0.3(0.02-3.8)	0.35
	Machinery	1(0.5%)	5(2.7%)	0.63(0.06-6.5)	0.701	0.78(0.06-10)	0.846
	Violence	5(2.7%)	9(4.9%)	1.8(0.4-7.3)	0.438	2.2(0.4-12.2)	0.36
	Smuggling	6(3.3%)	19(10.4%)	1	0.410	1	0.234
Associated injury	Head injury	10(5.5%)	15(8.2%)	1.9(0.8-4.6)	0.172	1.4(0.4-4.3)	0.604
	Abdominal injury	7(3.8%)	11(6%)	1.8(0.6-5)	0.271	1.8(0.5-6.2)	0.375
	Fracture	4(2.2%)	18(9.8%)	0.62(0.2-2)	0.424	0.49(0.1-1.8)	0.239
	None	31(16.9%)	87(45.5%)	1	0.270	1	
Type of chest trauma	Blunt	20(10.9%)	66(36.1%)	1		1	
	Penetrating	32(17.5%)	65(33.5%)	1.6(0.8-3.1)	0.147	0.88(0.4,2.1)	0.77
LOS	6hrs-1day	7(3.8%)	37(20.2%)	1	0.113	1	0.198
	2-7days	25(13.7%)	55(30.1%)	2.4(0.9-6.1)	0.066	2.6(0.8-8.6)	0.108
	>1 week	20(10.9%)	39(21.3%)	2.7(1-7.2)	0.044	1.4(0.4-4.9)	0.589

## CHAPTER SIX: DISCUSSION

### 6.1 Socio-Demographic Characteristics of chest injured patients

In this study a total 183 chest injuries cases presented in the study period and it shows a male predominance of 88.5% and it is consistent with other studies <sup>(2), (11), (19), (14), (17))</sup>. The most affected patients wear; patients whose age is between 20-29 years 41% and it is consistent with all the studies reviewed<sup>(10), (22), (21), (20), (17), (14), (2))</sup>. Explanations for these observations include the young and males are more mobile and engaging in high risk activities more than females and old.

### 6.2 Causes and mechanism of chest injury

In this study fighting is the leading cause of chest injury witch accounts 31.1% next to this RTA 29.5%, smuggling 13.7%, animal injury 9.8%, violence 7.7%, falling down accident 4.9% and machinery accident 3.3%. which is different from most studies in those study RTA is the leading cause <sup>(15), (17), (20), (21), (22))</sup>.

In this study 39.3% chest injured victims came to hospital less than 6 hrs, 37.2% came within 6 to 12 hrs, 18% came within 12 to 24 hrs and 5.5% came after 24 hrs. which is less than from Sudan and Ethiopian study <sup>(22)(11)</sup>. This could be due to low ambulance service. In this study 13.7% of the patients arrive to the hospital by ambulance, which is nearly equivalent to WHO study <sup>(23)</sup>.

In this study penetrating type of chest injury is prevalent 53% than blunt type of chest injury 47%, which is the same as previous Ethiopian studies <sup>(11)(10)</sup> but different from Sudan <sup>(22)</sup>, Malaysia<sup>(20)</sup>, Pakistan<sup>(24)</sup> and Iran studies <sup>(12)</sup> where blunt is more prevalent. The high incidence of penetrating chest injury in this study is explained by the fact that those patients who had penetrating injury were happened due to fighting which associated with inappropriate sharp material handling in this environment.

In this study 52.5% patients injured on the anterior right side of their chest, 31.7% on the posterior right side, 8.7% on the posterior left side, 1.6% on anterior left side and 5.5% of the patients injured on multiple sights. Which is similar with Indian study <sup>(17)</sup>.

In this study 35.5% of the patients had associated injury to the other sights and the most common associated injury is head injury which is lower than all other studies and in those study fracture is

the most common<sup>(20), (22), (11)</sup>. The reason for this is in those study blunt type of chest injury and the mechanism is RTA but in our case fighting is the leading cause.

In this study 40.4% patients presented with a chief complaint of bleeding which is different from study in India which shows chest pain and dyspnea were the most common symptoms at presentation<sup>(17)</sup> and In Ethiopia the main presenting clinical features was chest pain<sup>(10)</sup>. Hemopneumothorax is the leading diagnosis with was made on 27.9% of the patients. And 56.8% of the patients managed only by inserting chest tube which is less than from all other studies. This is due to increased incidence of soft tissue injury of the chest wall which is managed accordingly.

### **6.3 Management outcome**

In this study among 183 managed cases of Chest injury, 72% had good outcome having been discharged without complication, whereas 24.7% improved with complication. Which is lower than from most studies<sup>(11), (10), (12), (17)</sup>. And 3.3% patients wear dead due to chest injury which is much lesser than a study done in South Africa and Egypt and Ethiopia<sup>(8), (9), (10)</sup>, but slightly increased from Sudan study<sup>(11)</sup>. The reason for low mortality rate in the present study is that most of the patients were not severely injured except when there was a major associated extra-thoracic injury. In this study 43.7% stayed for 2 to 7 days, which is greater than a study done in Sudan<sup>(11)</sup> and Ethiopia<sup>(10) (12)</sup> it is explained by increased incidence of extra thoracic injuries. In this study Anemia is the prevalent post injury complications 14.8%, 3.3% wound infection, 2.7% pneumonia, 1.6% malfunction tube and 1.1% had sepsis and this result is greater in anemia, wound infection and pneumonia but less than in malfunction tube and sepsis from Sudan and Ethiopia studies<sup>(10)</sup>,<sup>(11)</sup> this could be due to increased incidence of penetrating type of injury.

## 6.4 Limitations of the study

- This study was conducted in a six consecutive months so this could make it seasonal.
- Low availability of major thoracic surgical services in the hospital.

## **CHAPTER SEVEN: CONCLUSIONS AND RECOMMENDATIONS**

### **7.1 Conclusions**

In conclusion, fighting founded to be the major etiological factor for chest injuries with a higher rate of penetrating chest injuries and the commonly affected victims are young adult males in their productive and reproductive age group. There was delay in hospital arrival, less ambulance service and majority of the patients came directly from the scene rather than visiting near by health institutions. Urgent preventive measures targeting at reducing the occurrence of inter personal violence, quarrel, RTA, animal injury, and occupational injuries is necessary to reduce the incidence of chest injuries in this region. The majority of the chest traumas are successfully managed by tube Thoracotomy and supportive measures as well. The associated extra thoracic injuries constitute a major prognostic factor in among patients with chest injuries. It is likely that better organization of health systems and improved management of surgical emergencies from the place of accident will increase the rate of severe trauma that can be managed properly, and so decrease overall mortality.

### **7.2 Recommendations**

Based on the finding the following recommendation can be forwarded

1. Paying special attention for young adults as a group at risk for chest injuries and related deaths is recommended.
2. Improvement in general security.
3. Availability of a well-equipped set up for proper management of such injuries should also be given due emphasis.
4. Increasing public awareness on manifestations of the disease and improving the knowledge of mid and low level health professionals on detection and management as well as importance of early referral to higher center with appropriate referral management.
5. Governments and NGOs should pay more attention to trauma with respect to prevention.
6. The hospital should be well organized for early and prompt management of patients in case of emergency like blood transfusion and thoracotomy.
7. There should be:
  - a) Training and retraining of health personnel involved in trauma management.



- b) Provision of EMS on our major roads at every 20-30km distance.
- c) Computerization of health information system and employment of more skilled hands.
- d) Enforcement of road safety measures and educating road users adequately on these safety measures.
- e) Provide appropriate health and safety training for workers, beginning with the first day of their employment and strength strict supervision of workplace and working conditions.
- f) Aproprate animal handling.

When enforced, these recommendations would reduce the incidence of chest trauma and improve on the outcome of management.

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## ANNEX

### Questionnaire

**JIMMA UNIVERSITY, INSTITUTE OF HEALTH, MEDICAL FACULTY,  
POSTGRADUATE STUDY PROGRAMME DEPARTMENT OF INTEGRATED  
EMERGENCY SURGERY**

#### Consent Form

My name is \_\_\_\_\_. I am working with Abel Mebratu who is doing a research on management outcome and prognostic factors of chest injury in Nekemte referral hospital. We are interviewing victims and/or relatives to assess the management outcome and prognostic factors of chest injuries among victims who sustained chest trauma. I am going to ask you some questions that could be important for organizations working on chest injuries and related accident preventions. Your name will not be written in this form and the information you give will be kept confidential. If you don't want to answer all of or some of the questions, you do have the right to do so. However, your willingness to answer all of the questions would be appreciated.

Would you participate in responding to the questions in this questionnaire?

Yes  No

Name of interviewer: \_\_\_\_\_ signature \_\_\_\_\_

Name of the supervisor \_\_\_\_\_ signature \_\_\_\_\_

Booklet code \_\_\_\_\_

Date of checking \_\_\_\_\_

Remark: 1. Complete 2. Incomplete

## Questionnaire

Interviewer-administered questionnaire for the assessment of management outcome and prognostic factors of chest injuries in Nekemte referral hospital, Oromia region, Ethiopia.

Date: -----

PART I .SOCIO DEMOGRAPHIC CHARACTERISTICS				
No	Question	Response	Code	Remark
101	Sex	1. Male 2. Female		
102	Age	1. 0-15 years 2. 16-19 years 3. 20-29 years 4. 30-39 years 5. >40 years		
103	Marital status	1. Underage 2. Single 3. Married 4. Divorced 5. Widowed		
104	Occupation	1. Student 2. Employee 3. Farmer 4. Merchant 5. Unemployed		
105	Educational level	1. Illiterate 2. Preschool 3. Can read and Write 4. Primary school 5. Secondary school 6. Preparatory school 7. College or TTI 8. Higher education		
106	Address	1. Rural 2. Urban		

Part II. Cause and mechanism of injury				
201	Time of injury	<ol style="list-style-type: none"> <li>1. In the morning</li> <li>2. In the afternoon</li> <li>3. In the evening</li> <li>4. After midnight</li> </ol>		
202	How does the injury occur?	<ol style="list-style-type: none"> <li>1. Road traffic accident</li> <li>2. Fighting</li> <li>3. Animal injuries</li> <li>4. Fall down accident</li> <li>5. Machinery</li> <li>6. Violence</li> <li>7. Smuggling</li> </ol>		
203	The place of injury occur	<ol style="list-style-type: none"> <li>1. Home</li> <li>2. Street</li> <li>3. Transport</li> <li>4. Work area</li> <li>5. Farm area</li> <li>6. Construction site</li> </ol>		
204	Duration from accident(in hrs)	<ol style="list-style-type: none"> <li>1. &lt; 6 hrs</li> <li>2. 6-12 hrs</li> <li>3. 12-24 hrs</li> <li>4. &gt; 24 hrs</li> </ol>		
205	From where does the patient come to the emergency department?	<ol style="list-style-type: none"> <li>1. From the scene</li> <li>2. From hospital</li> <li>3. From health center</li> <li>4. From private clinics</li> <li>5. Unknown</li> </ol>		
206	Before arriving to ED any treatment was given?	<ol style="list-style-type: none"> <li>1. Yes</li> <li>2. No</li> <li>3. Unknown</li> </ol>		
207	If yes to Q 207 Which type of treatment was given?	<ol style="list-style-type: none"> <li>1. Chest tube insertion</li> <li>2. First aid</li> <li>3. Resuscitation</li> <li>4. Medications</li> </ol>		
208	Means of transportation to the hospital	<ol style="list-style-type: none"> <li>1. Ambulance</li> <li>2. Other vehicles</li> <li>3. Carried</li> <li>4. By foot</li> </ol>		
210	Types of chest trauma	<ol style="list-style-type: none"> <li>1. Blunt</li> <li>2. Penetrating</li> </ol>		
211	Place of chest injury	<ol style="list-style-type: none"> <li>1. Anterior Right side of chest</li> <li>2. Anterior Left side of chest</li> <li>3. Posterior Right side of chest</li> <li>4. Posterior Left side of chest</li> <li>5. Multiple sites</li> </ol>		

212	Associated injuries?	<ol style="list-style-type: none"> <li>1. Head injury</li> <li>2. Abdominal injury</li> <li>3. Fracture</li> <li>4. None</li> </ol>		
213	Presenting symptoms	<ol style="list-style-type: none"> <li>1. Difficulty of breathing</li> <li>2. Bleeding</li> <li>3. Loss of consciousness</li> <li>4. Chest Pain</li> <li>5. Others(specify)_____</li> </ol>		
214	Investigations done (can have more than one option):	<ol style="list-style-type: none"> <li>1. Chest x-ray + Hemoglobin</li> <li>2. Hemoglobin only</li> <li>3. CXR only</li> <li>4. No investigation done</li> </ol>		
215	No of Rib fracture	<ol style="list-style-type: none"> <li>1. &lt; 3 ribs</li> <li>2. &gt; 3 ribs</li> <li>3. None</li> </ol>		
216	Hgb result	<ol style="list-style-type: none"> <li>1. &lt; 7 g/dl</li> <li>2. 8-12 g/dl</li> <li>3. &gt; 12 g/dl</li> <li>4. Not done</li> </ol>		
217	Type of chest injury the patient suffered	<ol style="list-style-type: none"> <li>1. Pneumothorax</li> <li>2. Hemothorax</li> <li>3. Hemopneumothorax</li> <li>4. Sacking wound</li> <li>5. Filial chest</li> <li>6. Cardiac temponade</li> <li>7. Lung Contusion</li> <li>8. Cardiac injury</li> <li>9. Vascular injury</li> <li>10. Chest wall STI</li> <li>11. Rib # only</li> <li>12. Others (specify)</li> </ol>		
218	What is done for the patient?	<ol style="list-style-type: none"> <li>1. Chest tube insertion only</li> <li>2. Thoracotomy + chest tube</li> <li>3. Pericardio synthesis</li> <li>4. Fracture mgt + chest tube</li> <li>5. Fracture mgt + medications</li> <li>6. Medications only</li> <li>7. Exploratory laparotomy + CT</li> <li>8. Exploratory laparotomy only</li> <li>9. Wound care</li> </ol>		

Part III. Outcome				
301	Length of Hospital Stay (in days)	<ol style="list-style-type: none"> <li>1. 6hr-1day</li> <li>2. 2-7 days</li> <li>3. &gt;1 week</li> </ol>		
302	Post treatment condition	<ol style="list-style-type: none"> <li>1. Improved without complication</li> <li>2. Developed complication</li> <li>3. Dead</li> </ol>		
303	What was the post treatment Complications?	<ol style="list-style-type: none"> <li>1. Malfunction Tube</li> <li>2. Sepsis</li> <li>3. Diaphragmatic injury</li> <li>4. Wound infection</li> <li>5. Pneumonia</li> <li>6. Anemia</li> <li>7. Pain</li> <li>8. None</li> <li>9. Death</li> </ol>		
304	Management outcome	<ol style="list-style-type: none"> <li>0. Good</li> <li>1. Bad</li> </ol>		

**Thank You!!**



## DECLARATION

I, the undersigned, declare that this thesis is my original work, has not been presented for a degree in this or any other university and that all sources of materials used for the thesis have been fully acknowledged.

Name: Abel Mebratu

Signature: \_\_\_\_\_

Name of the institution: Jimma University

Date of submission: \_\_\_\_\_

This research project has been submitted for examination with my approval as a University Advisor:

### **Name & Signature of first advisor**

Dr. Seifu Alemu (MD, General Surgeon, Pediatrics Surgeon)

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### **Name & Signature of second advisor**

Tsegaye Tewelde (BSc, MPH/Epidemiology, Assistant Professor)

\_\_\_\_\_

### **Name and signature of external examiners**

1. \_\_\_\_\_

2. \_\_\_\_\_