ASSESMENT OF PATTERNS AND OUTCOMES OF CHEST INJURY AMONG ADULT PATIENTS RECEIVED TRAUMA CARE AT TIKUR ANBESA SPECIALIZED HOSPITAL, ADDIS ABABA, ETHHIOPIA

A RESEARCH TESIS TO BE SUBMITTED TO DEPARTEMENT OF EMERGENCY MEDICINE, COLLEGE OF HEALTH SCIENCES, ADDIS ABEBA UNIVERSITY IN PARTIAL FULFILLMENT FOR REQUIREMENTS OF MASTERS OF SCIENCE DEGREE IN EMERGENCY MEDICINE AND CRITICAL CARE NURSING.

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JUNE, 2017 ADDIS ABEBA, ETHIOPIA

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ABSTRACT

Introduction: Globally, injury continues to be an important cause of morbidity and mortality both in the developed and developing countries. It is the major public health problem in every country across the world and causing approximately 5.8 million deaths per year. The Chest trauma is a disease that has worsened long with growing urbanization and industrialization; due to worldwide increases in violence, constructions and vehicle number.

Objective: The objective of this study was to assess the patterns and outcomes of chest injuries among adult patients admitted with chest trauma in Tikur Anbessa specialized teaching hospital (TASTH) over one year period between January 1, 2016 to December 31, 2016.

Methods and Materials: Hospital based retrospective descriptive cross- sectional study designs were used to assess magnitude and outcomes of chest injury among patients admitted to TASTH. The collected data were to Epi data software version 3.3.1. Then, the entered data was exported to SPSS, version 21 for analyses. Descriptive statistics was used to present the results. Logistic regression was used to determine association between dependent and independent variables. Association between variables was taken as statistically significant for all variables resulted in p-value of <0.05 on multiple logistic regression.

RESULTS: A total of 192 chest injury patients were treated at TASTH. Fifty three of them were died during treatment. Age [AOR 8.9(95% CI, 1.51-53.24)], time of presentation to hospital after injury [AOR 4.6(95% CI, 1.19-18.00)], Length of stay in hospital [AOR 0.12(95% CI, 0.02-0.58)], presence of extra-thoracic associated body region injury [AOR 25(95% CI, 4.18-150.02)] and development of complications [AOR 23(95% CI, 10-550)] were determinant of mortality in the present study.

Conclusions and recommendations: Chest trauma predominantly affects the male and economically productive age group with high morbidity and mortality in this environment. Road traffic accident was the leading cause of chest trauma in this study outcome. The study calls for early recognition and management of complications, awareness creations to society on their health seeking behavior, adequate provision of ambulance service and road traffic accidents prevention to reduce the morbidity and mortality resulting from chest injuries.

Key Words: Injuries, Chest injuries, Tikur Anbessa Specialized Teaching Hospital, Ethiopia

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LIST OF ABBREVIATIONS AND ACRONYMS

ED - Emergency Department

LOS - Length of hospital stay

OR - Operation Room

RERC - Research Ethics Review Committee

RTA/C- Road Traffic Accident / crushes

SPSS- Statistical Packages for Social Sciences

TASTH - Tikur Anbessa Specialized Teaching Hospital

USA- United States of America

UAE- United Arab Emirates

WHO- World Health Organizations

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1. INTRODUCTION

1.1. Background

Globally, injury continues to be an important cause of morbidity and mortality both in the developed and developing countries (1). It is the major public health problem in every country across the world and causing approximately 5.8 million deaths per year; abut 16,000 deaths per day (2). Injury is affecting and putting a significant health burden on all populations, regardless of age, sex, income, or geographical region (3). Traffic accidents make up 1.3 million deaths, suicides responsible for 844,000 whereas homicides responsible for 600,000 deaths globally and they are considered as the leading cause of traumatic deaths. Approximately, 91% of these deaths occur in developing countries including Ethiopia (4).

The Chest trauma is a disease that has worsened along with growing urbanization and industrialization; due to worldwide increases in violence, constructions and vehicle number. The later results in increments of road traffic accidents (5). It is a major health problem especially for young males (6). Globally, chest trauma is the third important cause of mortality and morbidity preceded by cancer and cardiovascular diseases (3)(7). It is responsible for 10% of all trauma admissions and 25% of trauma-related deaths across the world (8) (9) .

In Europe and United states, the mortality rate as a result of blunt trauma can be as high as 60%(10). However, appropriate and timely diagnosis of chest traumas can decrease the mortality and morbidity(11)

Injury, including chest trauma, is the major public health problem in Ethiopia. In 2010, road traffic accident alone was the ninth cause of premature death in Ethiopia while interpersonal violence was seventeenth in rank (12).

Despite chest injury can cause a serious and fatal problem, chest injuries can be prevented by identifying the cause of chest injury and giving intervention focused to the underlying cause such as improving road safety and implementation of strict traffic laws enforcement like seat belt (6) (13).

1.2. Statement of the problem

Injury is reported to be the leading cause of death, hospitalization, and long-term disabilities in economically productive age group worldwide (14). Person aged 24 - 44 years are more likely to experience accidents such as road traffic accident, falls, and fights than other age groups (15). Trauma is responsible for 11% of all disability-adjusted life years in middle and low income countries (16). As study in South Korea identified, chest trauma accounts for 13% of all injuries (17).

Hospital based studies continue to show as chest trauma is a major cause of morbidity and mortality in Africa (18) (19) (20). For instance, It is responsible for 27.4% of trauma-related deaths in South Africa and about 88.8% of chest injury related deaths was as a result of penetrating trauma (18).

In Ethiopia, trauma is the major public health challenges (21). For example, according to study conducted in Tikur Anbessa Specialized Teaching Hospital (TASTH), Ethiopia by Hunchak et al., traumatic injury was responsible for 30.1% of death in emergency department (22). Another study at TASTH identified that; from a total of 230 road traffic accident victims surveyed over three month period chest trauma accounts for 13.9% of road traffic related injuries (23). Moreover, as study conducted in Zewditu memorial hospital revealed; chest region is the fourth mostly affected region by RTA and accounts for 9.5% of all body region injured as a result of RTA (24).

Though there is no recent study in Ethiopia on chest injury, there were few studies conducted in Ethiopia (25) (26)(27). To the best of investigator knowledge there is no published finding on pattern and outcome of chest injury in TASTH as well as in Ethiopia since the last study conducted by Adem et al., in 1999 (27). So, the aim of this study is to examine patterns and outcome of chest trauma at a single center in Addis Ababa, Ethiopia through data gained from hospital's registry and to analyze chest trauma patients in order to find the predictors for patients' outcome.

1.3. SIGNIFICANCE OF THE STUDY

The finding from this study has the following advantages. It will help to understand the causes, pattern and outcome of chest trauma patients in the study area which could be essential for establishment of prevention strategies as well as treatment protocols. It can be used as reference data for the policy makers to make evidence based decision. Moreover, it will be used as base line data for a researches interested to conduct further studies on chest injury, especially for those in the areas of public health, emergency medicine and surgery.

Hence, this study was conducted to describe pattern and outcome of chest injury at TASTH

2. LITERTURE REVIEW

Study in German by Ried et al identified traffic accident as the major cause for chest injury, 74% of the cases while blast injury and falling accident responsible for 17% and 8% respectively. Male is more frequently affected by chest trauma than female and the mean age was 32 ± 14 years. The overall survival rate was 79% after sustaining chest injury (28).

Study in North West England showed that; chest injury is more common in male than female, male (88.4%) predominance was noted. Penetrating cardiothoracic trauma accounts for 54.1% of the cases while 45.9% sustained blunt trauma. The overall prevalence of in hospital mortality was 35.6%. Besides, the most common associated injury were; abdominal injury (33%), severe head injury (13%), and spinal cord injury (4.1%) (29).

A research done in United Arab Emirates (UAE) on chest injuries found that; from the study subject about 90% of the victims were male and about 66% of the injury was as a consequences of road traffic collision followed by falling accident which accounts 23.4% of chest injury the patients in Al-Ain City. In addition, 63.5% of the subject sustained associated injuries on their head (27.4%), lower limbs (25.1%), and upper limbs (24.9%) whereas 36.5% patients sustained isolated chest injury. Moreover, almost all (99.2%) of the chest injury was blunt trauma and only 0.85% of the victims sustained penetrating lung injuries (13).

As stated in study conducted in Syria; the leading cause of chest trauma was violence (41%) followed by road traffic accident (33%). The most common types of chest injury were; pneumothorax (51%), hemothorax (38%), rib fractures (34%), and lung contusion (15%). In addition, extra-thoracic injuries occurred in 35% of the patients; of which extremities injury occurred in 19% of the patient while visceral in 13% and 8.4% neurologic. The overall mean hospital length of stay (LOS) was 4.5 ± 4.6 days. However, it is increased in extra thoracic injuries (5.4 ± 4.6 days) when compared to pure thoracic injuries (4.2 ± 4.5 days), with p-value of 0.0004. Moreover, Blunt trauma victims stayed in hospital for longer time (5.2 ± 0.2 days) than penetrating trauma patients (3.9 ± 0.2 days) ($P < 0.0001$). Tube thoracostomy was performed in 56% of the cases while extra-thoracic intervention performed in 18% of the cases; mostly laparotomy in 12.5%. Treatment complications occurred in 8.7% of the patients. The most common complications were prolonged air leak (4.4%), followed by clotted hemothorax

(1.7%) and atelectasis (8%). Mortality occurred in 1.8% of the patients and it was highest in traffic accidents comparing to other causes of trauma (P = 0.045) (6)

A cross sectional study from Trauma Centers of Isfahan Province of Iran found that; men sustained chest injury four times more often than women and the mean age and standard deviation of chest injury patients were 24.7 ± 3.1 years. In addition, blunt trauma was more common than penetrating trauma (65% VS 35%). The most common cause for blunt trauma were car accident (72%) followed by falling accident (5%) and motor cycle accident (3%) whereas the most common cause of penetrating trauma were stabbing (74%). Furthermore, regarding the type of chest injuries 41% of the patients have hemothorax, while pneumothorax, rib fracture and subcutaneous emphysema accounts for 35%, 34% and 32% respectively. The average length of hospital stay was 12 ± 3.2 days while the length of hospitalization was 7.2 ± 3.2 days for blunt and 10.1 ± 3.1 days for penetrating chest traumas. Withal, head injuries aff ected 25% of the patients and 4% were accompanied by abdominal trauma (30)

Another study in Iran at Poursina teaching hospital identified that; blunt trauma accounts for 64.6% of the cases whereas penetrating trauma accounts for 35.4% of chest trauma. The average length of hospitalization was 10.78± 12.53 days in patients with blunt chest trauma, while 5.74 ± 3.73 days in patients with a penetrating chest injury (P < 0.002). Moreover, among chest injury patients the prevalence of hemothorax was 65.3%, while pneumothorax 2.7%, lung contusion 4% and emphysema 1.3%, respectively according to their descending order (31).

According to the study conducted in India, chest injury is common in male than female and affects the age group of 21-40 than the others. From a total of 105 chest injury patient about ninety five patients (90.4%) improved and discharged while seven patients (6.6%) died in hospital (32).

Another study conducted in India by Afshar et al., revealed that; majority (97.6%) of chest trauma patients were male and about 53% of the victims were in the age group of 20-29. Moreover, the length of hospital stay was within a range of 1-13 days. The most common types of chest injuries were; pneumothorax, hemothorax and tamponade with percentage of 37 %, 35% and 26% respectively. About 93% of the chest trauma patients treated with chest tube and out of 828 evaluated patients, about 0.84% of the patient died in the hospital and the remained treated

successfully Furthermore, the most common complication were bleeding (11%), emphysema (4.26%) and bronchial fistula (2.55%) (33).

As study conducted in Benin City, Nigeria, indicated chest trauma predominantly affects the youth with high morbidity and mortality. Accordingly, the mean age of the respondent sustained chest injury was 31.5 years while the median age was 29 years. Most of the patients (95%) presented within six hours of injury while 26% of the patients presented within an hour of chest injury. The major causes for chest injury was road traffic accident (52%) and about 43%% were due to violence or assaults. Motorcycle accidents accounts for 15% while vehicles like cars, buses, vans and trucks accounted for 37% of the chest injuries. Moreover, Penetrating trauma accounted for 43% of which gunshot wounds accounted for 25%, and stab injuries accounted for 18% of the cases. Regarding the treatment, tube thoracostomy was offered in 51% of the patients while 9.6% patients had thoracotomy, and laparotomy was offered in 13.7% patients for associated injuries and about 2.7% of the patients died during course of treatment (20).

Similarly, a prospective study conducted in Northwestern Tanzania found that; the mean age of the victims sustained chest injury was 32.17 years. Majority of the victims sustained blunt injuries while road traffic accident is responsible for about 50.7% of chest injury. The most common types of injuries were chest wall wounds (30%), hemothorax (21.3%) and rib fractures (20.7%). More than half of the patients (55.3%) were treated successfully by non-operative approach. However, 26 % of the victims had developed complications. The most complications of chest injuries were wound sepsis (14.7%) and complications of long bone fractures (12.0%). Moreover, about 56% of the patients had extra-thoracic injuries mainly involved head/neck (33.3%), musculoskeletal injuries (26.7%) abdomen (5.3%) and pelvic injuries (3.3%) (19).

A retrospective study conducted in TASTH, Ethiopia also found that; from a total of 72 chest injury patients admitted to TASTH between February 1996 and February 1999, 40.3% of the patients were within the age group of 21 to 30 while 30.5% of the patients were within the age group of 11 to 20. Approximately, 92% of the chest injury patients were male. About 75% of the patients sustained penetrating injury as result of stub injury (50%), bullet (22.3%) and blast (2.8%) while 25% sustained blunt injuries. Furthermore, 83.2 % of the patients were successfully treated without complication, 9.8% developed complication and 7% of them died while on the course of treatment in the hospital. The most common complications were; Pneumonia with

sepsis and empyema. About 83.2% of the patients were treated by chest tube alone whereas laparotomy with chest tube (9.8%), skeletal traction with chest tube (4.2%), traction with burr holes and chest tube (1.4%), and thoracotomy (1.4%) was done as treatment modalities (27).

3. OBJECTIVE

3.1. General Objective

To assess the patterns and outcomes of chest injuries among adult patients admitted with chest trauma in TASTH over one year period (January 1, 2016 to December 31, 2016).

3.2. Specific Objectives

- To determine pattern of chest injuries in TASTH from January 1, 2016 to December 31, 2016
- To determine the outcome of adult patients who sustained chest injury at TASTH from January 1, 2016 to December 31, 2016
- To determine factors associated with death among adult patients who sustained chest injury at TASTH from January 1, 2016 to December 31, 2016

4. METHODS AND MATERIALS

4.1. Study Area and Study period

The study was conducted in Tikur Anbesa specialized Hospital Addis Ababa Ethiopia. TASH was established in 1964. The hospital provides a tertiary level health care service and administered by Addis Ababa University. It is the largest and oldest teaching hospital in the country. It offers medical services approximately for 370,000-400,000 patients per year in all the wards (34).

The study was conducted by reviewing records of patients with chest injury who were seen in TASTH from January 2016 to January 2017 and the study period was from December, 2016 to July 2017.

4.2. Study Design

Hospital based retrospective quantitative descriptive cross- sectional study designs were used to assess pattern and outcomes of chest injury at TASTH.

4.3. Population

4.3.1. Source Population

The source population was entire adult chest trauma patients admitted to TASTH from January 1, 2016 to December 31, 2016.

4.3.2. Study Population

The study population was all adult chest trauma patients presented to TASTH that fulfill the inclusion criteria, from January 1, 2016 to December 31, 2016.

4.4. Inclusion and exclusion criteria

4.4.1. Inclusion criteria

All selected chest injury records of adult patients visited TASTH during the study period, who aged 12 years and above was included to the study.

4.4.2. Exclusion criteria

- Chest injury patients' chart that had incomplete data, greater than 20% of the variables, was excluded.

- Chest injury patients' chart which were lost from record office due to consultation, transfer or any other medical reason at the time of data collection were excluded.
- Chest injury patients who were died at arrival prior to any interventions were excluded
- Chest injure patients who were aged <12 years were excluded

4.5. Sample Size determination and Sampling Technique

The sample size of the study was all patients who are admitted to TASTH with a diagnosis of blunt and penetrating chest trauma during study period. Since the entire patient (192) during the study period was included, no need to calculate sample size and no need to use sampling procedures.

4.6. Variables

4.6.1. Dependent Variables

Pattern and Outcomes of chest injury

4.6.2. Independent variables

- Age
- Sex
- Duration of presentation
- Length of hospital stay
- Mechanism of injury
- Types of chest injury
- Associated injury,
- Treatment modalities
- Premorbid disease

4.7. Data Collection instrument

Patients who were admitted with a diagnosis of chest trauma were initially identified from the log books of the triage, intake and procedure room of emergency department of TASTH. To extract relevant information from the patient records about sex, age, duration of presentation, duration of hospital stay, circumstance of injury, identified chest injury, post-procedure complication of patients and outcome English language check list was developed by reviewing certain literatures (19) (20)(31)(33) (13) .

4.8. Data Quality Control

The supervisors and data collectors were trained by principal investigator for one day. The qualifications of data collectors were BSc Nurses and they were recruited based upon their data collection experiences and competence. Pretest was done at St. Paul Millennium Medical College prior to data collection and possible corrections to the check list were made. The collected data were first checked for completeness and edited every day after data collection by the principal investigator and supervisors. Then, double entered to Epi data software version 3.3.1.with two data clerks independently and consistency between the two data sets was checked. Then mismatched data were cross checked with the hard copy and were corrected accordingly.

4.9. Data processing and Analysis

The data entered to Epi-data software version 3.3.1 then was exported to SPSS, version 21 for analysis. Descriptive statistics was used to present the results. Logistic regression was used to determine association between outcome of the patient and entire independent variables. Association between variables were taken as statistically significant at p-value of <0.05 on multivariate logistic regression analysis.

4.10. Ethical Consideration

To adhere to ethical issues formal ethical approval letter were taken from Addis Ababa University College of Health sciences, Department of Emergency Medicine Research Ethics Review Committee (RERC). Then, TASTH administration officials were asked for a written and signed informed consent to conduct the study in their institution. The study ensured individual information undisclosed and kept confidential. Personal unique identifiers such as name of study participants were not taken.

4.11. Dissemination Plan

The findings of the study will be presented during final thesis defense at Addis Ababa University health and medical science college. Copies of the final thesis will be sent to libraries of Addis Ababa University and School of Graduate Study office. It will also be disseminated to; Federal ministry of health, Addis Ababa city administration health bureaus and to TASTH included in the study either in form of hard copy or as public presentation. It will be presented in national

and international research symposiums. Lastly possible effort will be made to publish the finding on national and international journals.

4.12. Operational definition

- Death:- any patient admitted and started treatment at Tikur Anbessa Specialized Teaching Hospital as a result of chest injury regardless of its cause but lost his/her life in the hospital during the course of treatment before discharged from the hospital
- Alive: any patient admitted and started treatment at Tikur Anbessa Specialized Teaching Hospital as a result of chest injury regardless of its cause and discharged either cured with or without disability or referred to other hospitals for further treatment but not died in TASTH were considered alive.
- Adult patient: a patient aged 12 years and above

4.13. Limitation of the study

This study has several limitations, as it is a retrospective chart review of the medical records which may contain missing, incomplete, or conflicting data. However, pretest of the questionnaire, training of data collectors and supervisors, close supervision of data collecting process minimized these effects.

Moreover, this study used only Tikur Anbessa Specialized Teaching Hospital. This may contribute to a selection bias and limits the generalizability of this hospital-based epidemiology results to the overall population or other healthcare sites. Lastly, patients didn't seek health care or died prior to receive health care at TASTH were not included to the study. So, this underestimated true morbidity and mortality related to chest injury.

5. RESULTS

A total of 192 chest trauma patient was enrolled to the study. The mean ± SD of respondent age were 35.5± 15.2. Age has statistically significant association with outcome of the patient (P=0.000). Nearly three fourth 141(73.4%) of chest trauma patients were male. Majority of chest trauma patient arrived to health care facilities within 2 to 6 hours of trauma. Time of arrival has statistically significant association with outcome of injury, (P=0.001). The average duration for hospital stay was 8.4±6.3 but majority 92(47.9%) of them stayed in hospital for 3 to 7 days. Concerning outcome of the patient 53(27.6) died in TASTH while taking treatment.

Table 1Basic characteristics of chest trauma patient received trauma care at TASTH, January 1, 2016 to December 31, 2016, Addis Ababa, Ethiopia

Variables	**Categories**	**Frequency**	**Outcome**		x^2
			Dead	Alive	
Age	12 to 20	26(13.5)	3	23	0.000
	21 to 35	96(50)	23	73	
	36 to 50	36(18.8)	8	28	
	>50	34(17.7)	19	15	
Sex	Male	141(73.4)	36	105	0.286
	Female	51(26.6)	17	34	
Time of presentation to health care facilities in hour	<2	63(32.8)	8	55	0.001
	2 to 6	67(34.9)	29	38	
	7 to 24	62(32.3)	16	46	
Length of stay in days	≤2	25(13)	14	11	0.004
	3 to 7	92(47.9)	14	78	
	8 to 14	39(20.3)	10	29	
	15 to 21	23(12)	9	14	
	>21	13(6.8)	6	7	
Patients Outcome	Death	53(27.6)	-	-	
	Alive	139(72.4)	-	-	

Table 2 shows that road traffic accident were the most common cause of chest injury followed by violence. They accounted for 85(44.5%) and 67(34.9%) of the cases respectively. More than one fifth 44(22.9%) of patients sustained chest injury had comorbid chronic medical condition and it has statistically significant association with patient outcome on cross tabulation, P=0.001. Cardiovascular disease 25(13%) were the commonest comorbid medical condition followed by diabetic mellitus 23(12%).

Blunt trauma was the dominant type of chest injury in present study, accounted for 123(64.1%) of chest trauma cases while 69(35.9%) was penetrating chest trauma. Most of chest injury cases were pure chest injury 136(70.8%) while 56(29.2%) were thoraco-abdominal.

Table 2 Description of patients characteristics based on mechanism of injury, injury type and chronic medical illness at TASTH, Addis Ababa, Ethiopia, Jan. to Dec., 2016

Variables	Categories	Frequency And percentage	Outcome		x^2
			Dead	Alive	
Mechanism of chest injury	Road traffic accident	85(44.3)	17	68	0.06
	Violence	67(34.9)	25	42	
	Falling down	40(20.8)	11	29	
Presence of chronic illness	Yes	44(22.9)	21	23	0.001
	No	148(77.1)	32	116	
Type of chronic medical condition	Diabetic Mellitus	23(12)	13	10	0.014
	Cardiovascular disease	25(13)	12	13	
	Others	7(3.6)	3	4	
Types of injury based on mechanism	Penetrating	69(35.9)	19	50	0.987
	Blunt	123(64.1)	34	89	
Types of injury based on region involved	Pure chest injury	136(70.8)	26	110	0.000
	Thoraco-abdominal injury	56(29.2)	27	29	

As indicated in table 3 rib fracture was the commonest types of chest in injury, it accounted for 62(32.3%) of chest injuries followed by hemopneumothorax 35(18.2%) and pulmonary contusion 28(14.6%). Types of chest injury has no statistically significant association with patient outcome on cross tabulation, (P=0.087).

Table 3 Pattern of Chest injury, at TASTH, Addis Ababa, Ethiopia, Jan. to Dec., 2016

Variables	**Categories**	**Frequency**	**Outcome**		x^2
			Dead	Alive	
Pattern of Chest injury	Hemothorax	24(12.5)	4	20	0.087
	Pneumothorax	20(10.4)	3	17	
	Hemo-pneumothorax	35(18.2)	10	25	
	Pulmonary contusion	28(14.6)	8	20	
	Rib fracture	62(32.3)	23	39	
	Clavicular fracture	18(9.4)	3	15	
	Others	5(2.6)	2	3	

With regard to associated body region injured extremities were the commonest region, accounted for 93(48.4%). Abdomen, head and neck, pelvic and spinal cord injury were 67(34.9%), 53(27.6%), 31(16.1%) and 19(9.9%) respectively. **Table 4**

Table 4 description of associated Chest injury Patients at TASTH, Addis Ababa, Ethiopia, Jan. to Dec., 2016

Variables	Categories	Frequency and percentage	Outcome		x^2
			Dead	Alive	
Head and Neck	Yes	53(27.6)	37	16	0.000
	No	139(72.4)	16	123	
Extremities	Yes	93(48.4)	34	59	0.007
	No	99(51.6)	19	80	
Abdomen	Yes	67(34.9)	22	45	0.235
	No	125(65.1)	31	94	
Pelvic	Yes	31(16.1)	16	15	0.001
	No	161(83.9)	37	124	
Spinal cord	Yes	19(9.9)	12	7	0.001
	No	173(90.1)	41	132	

Concerning intervention given 66(34.4) patients were treated non-operatively. Chest tube were inserted to 119(62%) of chest injury patients. Twenty-five (13%) patients were treated by laparotomy while thoracotomy was done in 7(3.6%) cases.

Table 5 Types of intervention given to chest injury patients at TASTH, Addis Ababa, Ethiopia, and January to December, 2016

Variables	Categories	Frequency And percentage	Outcome		P-Value
			Dead	Alive	
Non-operative	Yes	66(34.4)	5	61	0.000
	No	126(65.6)	48	78	
Chest tube	Yes	119(62)	41	78	0.007
	No	73(38)	12	61	
Thoracotomy	Yes	7(3.6)	3	4	0.358
	No	185(96.4)	50	135	
Laparotomy	Yes	25(13)	8	17	0.598
	No	167(87)	45	122	

Table **6** depicts complications developed by chest injury patients. Interestingly, 134(77.1%) patients treated without complications while 58(22.9%) developed treatment related complications. The most common complications were pneumonia followed by wound sepsis. They accounted for 40(20.8%) and 13(6.7%) respectively.

Table 6 Description of Complications Developed by Chest injury Patients at TASTH, Addis Ababa, Ethiopia, Jan. to Dec., 2016

Variables	**Categories**	**Frequency**	**Outcome**		**P-Value**
			Dead	Alive	
Patient developed	Yes	58(22.9)	25	33	0.016
complication	No	134(77.1)	28	120	
Pneumonia	Yes	40(20.8)	15	25	0.018
	No	152(79.2)	38	127	
wound sepsis	Yes	13(6.7)	3	10	0.694
	No	183(95.3)	50	133	
Atelectasis	Yes	9(4.7)	7	2	0.000
	No	184(95.8)	46	138	

Note; Total response is greater than 58 due to multiple responses

Factors associated with death among Chest injury Patients

Initially, cross tabulation were done for all variables to see existence of association between dependent and independent variables. Then, bivariate and multivariate analyses were done to determine factors associated with death among chest injury patients.

Age of study subjects determines outcome of chest trauma patients. Accordingly, those aged 50 years and above were 8.9 times more likely to die from chest injury than those aged 12 to 20 years and below even after adjustment for potential confounders, AOR 8.9(95% CI; 1.51-53.24).

Mortality was high in chest trauma patients arrived to health care facilities within 3 to 6hours of injury when compared with those presented within 2 hours of accident. Interestingly, chest injury

patients presented to healthcare facilities within 3 to 6 hours were more likely to die than those presented within two hours of injury, AOR 4.6(95% CI; 1.19-18.00).

Lengths of hospitalization were strongly associated with patients' death. For instance, patient hospitalized for 3 to 7 days were 88% less likely to die than those hospitalized for ≤2 days, AOR 0.12(95% CI; 0.02-0.58). Moreover, those stayed in hospitals for 8 to 14 days were 81% less likely to die than those stayed ≤ 2days with AOR of 0.19(95% CI; 0.05-0.69) .

Presence of comorbid chronic medical condition determines outcome of patients in bivariate analysis, COR 3.3(95% CI; 1.63-6.73). However, the association was not significant after controlling for other confounders, AOR 1.8(95% CI; 0.42-7.83).

Chest injury involved abdomen was 12 times more likely to cause death than those involved thoracic region alone, AOR 12.3(95% CI; 3.08-48.67).

Chest injury associated with other body injury predicts patients' outcome. For example, chest injury associated with head and neck injury were 25 times more likely to cause death than those without head and neck injuries, AOR 25(95% CI; 4.18-150.02). Furthermore, chest injury associated with spinal cord injury were 11 times more likely to cause death than those didn't associated with spinal cord injury, AOR 10.7(95% CI; 3.17-36.32).

With regard to complication chest injury patient developed atelectasis were 23 times more likely to die than those didn't developed atelectasis with AOR of 23(95% CI; 10-550).

Table 7 Factors associated with death among Chest injury Patients at TASTH, Addis Ababa, Ethiopia, Jan. to Dec., 2016

Variable	Categories	Outcome		COR(95% CI)	AOR(95% CI)
		Death	Alive		
Age	12 to 20	3	23	1	
	21 to 35	23	73	2.42(0.66-8.78)	2.85(0.40-20.14)
	36 to 50	8	28	2.2(0.52-9.22)	4.9(0.47-50.39)
	>50	19	15	9.71(2.44-38.62)	8.9(1.51-53.24)**
Duration of arrival to health facilities after injury	<2	8	55	1	1
	2 to 6	29	38	5.2(2.16-12.71)	4.6(1.19-18.00)*
	>6	16	46	2.4(0.94-6.09)	1.7(0.34-8.33)
Length of stay in days	≤2	14	11	1	1
	3 to7	14	78	0.14(0.05-0.37)	0.12(0.02-0.58)**
	8 to 14	10	29	0.27(0.09-0.79)	0.19(0.05-0.69)*
	15 to 21	9	14	0.5(0.16-1.6)	0.46(0.12-1.77)
	>21	6	7	0.67(0.17-2.59)	0.63(0.01-3.27)
Presence of chronic illness	Yes	21	23	3.3(1.63-6.73)	1.8(0.42-7.83)
	No	32	116	1	1
Type of chest injury based on region involved	Pure chest injury	26	110	1	1
	Thoraco-abdominal	27	29	3.9(2.00-7.75)	12.3(3.08-48.67)***
Associated injuries	-	-	-	-	-
Head and neck	Yes	37	16	17.8(8.11-38.95)	25(4.18-150.02)**
	No	16	123	1	1
Extremities	Yes	34	59	2.4(1.26-4.67)	2.3(0.72-7.37)
	No	19	80	1	1
Pelvic injury	Yes	16	15	3.57(1.61-7.91)	2.93(0.77-11.17)
	No	37	124	1	1
Spinal cord injury	Yes	12	7	5.5(2.04-14.940	10.7(3.17-36.32)**
	No	41	132	1	1
Complications	-	-	-	-	-
Pneumonia	Yes	15	25	2.4(1.15-4.94)	1.71(0.61-4.79)
	No	38	127	1	1
Atelectasis	Yes	7	1	21(2.52-175.25)	23(10-550)***
	No	46	138	1	1

*P<0.05, **P<0.01, ***P<0.001

6. DISCUSSION

This section discusses the finding from present study with other literatures. It mainly focused on Pattern and outcome of chest injury as well as factors associated with outcome of chest injury patients.

This study found that prevalence of death among chest injury patients over one year were 53(27.6%). This figure was far greater than the result reported by studies conducted in Syria and United Arab Emirates, they reported 1.8%) and 7.2% respectively (6)(13). The difference might be due to difference in prehospital care, ambulance services, health care services and health seeking behavior of the victim which could be the reason for their late presentation to hospital.

In this study chest trauma predominantly affected male and economically productive age group. In agreement with the present study other studies reported similar finding (19)(20)(29) (30)(31). The reason for male predominance in present study could be male participated in dangerous work and violence than female. Furthermore, age of the victim determine outcome of chest injury. Patients aged >50 years were 9 times more likely die from chest injury than those aged 12 to 20 years, [AOR 8.9(95% CI, 1.51-53.24)]. In line with this study other studies reported increased mortality from chest injury with increased age (35)(36)(37). Liman et al. have shown that an age of more than 60 years significantly associated with increased mortality from chest trauma(37).

Early presentation after a chest injury coupled with prompt and effective management at a trauma center is the key to a good outcome (38). However, this study found that most of patients were presented to health care facilities within six hours of injury. This finding was in agreement with study conducted in Nigeria (20). Moreover, late presentations to hospital were highly associated with mortality in the present study. This could be as a due to grossly inadequate ambulance service that usually resulted in a long interval between the accident and the arrival of the victims at the hospital in Ethiopia.

Road traffic accident was the leading cause of chest injury in this study followed by Violence. Consistent with the present finding study from Tanzania reported RTA as the leading cause of chest injury (19). Mechanism of injury was a significant predictor of mortality as reported in

previous studies (6)(35). In contrast, in our study mechanism of injury didn't predict outcome of chest injury which was in agreement with study conducted in Tanzania (19).

Blunt chest trauma were more frequent than penetrating chest injuries in present study. Similarly, the same pattern reported from previous studies in Tanzania, Iran, and Syria (6)(19)(30)(29). In contrast previous study from Ethiopia reported penetrating chest injury as the dominant type(27). The high incidence of blunt chest injuries in this study is explained by the fact that those patients who had blunt injuries were mostly involved in road traffic crush inconsistent to previous study in Ethiopia which reported stab and bullet injury as the commonest cause of chest injury (27).

Concerning pattern of chest injury majority of the patients sustained rib fracture 62(32.3%) followed by hemopneumothorax 35(18.2%) and pulmonary contusion 28(14.6) respectively. In agreement with the present finding study in England reported rib fracture as the most common type of chest injury(29). Contrasting to the present finding another study in Iran by Hemmati et al. reported hemothorax as the most common type of chest injury (31). Previous study in Ethiopia by Adem et al. also contrast the present finding, it reported hemopneumothorax as the commonest pattern of chest injury (27). The difference could be as a result of increased road traffic accident in present study which has a tendency to cause rib fracture when compared to study by Adem et al which reported stab injury as the commonest cause of chest injury (27).

Injury to extremities was the most common extra-thoracic associated body region injured among patient presented with chest injury. This finding was consistent with the study conducted in Syria(6). In agreement with other studies presence of associated extra-thoracic injury has statistically significant association with patient outcome (6)(19). Interestingly, injury to head and spinal cords associated with chest injury more likely increase mortality by 21 times and 11 times with AOR were 25(95% CI, 4.18-150.02) and 10.7(95% CI, 3.17-36.32) respectively.

Presence of chronic premorbid illness were reported as factor that determine outcome of chest injury in previous studies (19)(39)(40). However, in present study presence of premorbid illness have statistically significant association only on bivariate analysis not significant after potential cofounders adjusted. The crude and adjusted odds ratio were 3.3(95% C, 1.63-6.73) and 1.8(95% CI, 0.42-7.83) respectively.

Chest tube was the main treatment modalities in present study 119(62%) while thoracotomy was performed in 7(3.6%) of cases. When compared with other studies, patient treated by chest tube were relatively low in the present study (90-95%)(33)(41)(42). This could be due to more than one third (34%) of chest injury victims in present study treated by non-operative approach like pain management.

Mortality from chest injury was strongly associated with length of stay. Patients survived and stayed in hospital for the first 2 to 7 days were 88 % less likely to die from chest injury than those admitted to hospital and stayed for less than 48 hours, AOR 0.12(95% CI; 0.02-0.58). Though it didn't addressed the association, study in Syria reported that 56% of mortality happened within 48 hours of accident (6).

Pneumonia was the commonest complication developed by chest injury patient in the present study followed by wound sepsis. Contrasting the result of this study the study from Tanzania reported wound sepsis as the commonest complication from chest injury (19). This could be attributable to difference in quality of health care delivery system of both countries. Moreover, presence of complications predicts patient outcome according to studies from developing countries (19)(43). Similarly, the present study found statistically significant association between mortality from chest injury and presence of complications.

7. CONCLUSION AND RECOMMENDATION

This section conclude the main finding of the study based on the objective of the study and forwarded implications for policy makers and researchers interested to conduct further study.

7.1. Conclusion

Chest trauma predominantly affects the male and economically productive age group with high morbidity and mortality in this environment. A number of patients died from chest injury were immense. Majority of the patients were presented to hospital with in two to six hours of accident while less than one third of the patients presented to hospital with in the first two hour of injury.

Road traffic accident was the leading cause of chest trauma in this study. Majority of the patient sustained blunt chest injury. Rib fractures were the commonest pattern of chest injury while injury to extremities was the commonest associated body region injured in the present study.

Chest tube was the major treatment modalities in the present study though more than one third of the patient treated by non-operative approach like pain management.

Age greater than fifty, late presentation to hospital after injury, length of hospital stay, associated body region injured and presence of complications were predictors of chest injury related mortality in the present study.

7.2. Recommendations for health care providers, policy and research

For health care providers; from finding of the present study mortalities were high among patients developed complications. So, the investigator recommends early recognition and management of complications following chest injury to reduce the morbidity and mortality resulting from chest injuries. Moreover, mortality was associated with patient length of stay especially high with in the first 48 hours of admission. So, this study recommends prompt follow up of the patient medical condition throughout their admission and strict follow up for the first 48 hours of their hospital admission.

For policy makers; time of presentations to hospital determine outcome of chest injury patients. So, awareness creations to society on their health seeking behavior, adequate provision of ambulance service were recommended. Furthermore, road traffic accidents prevention policy should be enhanced.

For researchers; the investigator recommends prospective study to determine the potential factors that predicts mortality among chest injuries patient. In addition the sample sizes for present studies were minimal, so large sample size was recommended for further studies.

References

1. Haagsma JA, Graetz N, Bolliger I, Naghavi M, Higashi H, Mullany EC, et al. The global burden of injury : incidence , mortality , disability-adjusted life years and time trends from the Global Burden of Disease study 2013. Inj Prev. 2016;22:3–18.

2. World Health Organization. Violence, Injuries, and Disability: Biennial 2006–2007 Report. Geneva, Switzerland; 2008.

3. Krug EG, Sharma GK, Lozano R. The Global Burden of Injuries. Am J Public Health. 2000;90(4):523–6.

4. McQueen KA, Hagberg C MM. The global trauma burden and anesthesia needs in middle and low income countries. Am Soc Anesth. 2004;78(6):16–9.

5. Whizar-Lugo V, Sauceda-Gastelum A, Hernández-Armas A, Garzón-Garnica FWhizar-Lugo V, Sauceda-Gastelum A, Hernández-Armas A, Garzón-Garnica F, Granados-Gómez M. Chest Trauma : An Overview. J Anesth Crit Care Open AccessCrit Care Open Access. 2015;3(1):82.

6. Al-koudmani I, Darwish B, Al-kateb K, Taifour Y. Chest trauma experience over eleven-year period at al-mouassat university teaching hospital- Damascus : a retrospective review of 888 cases. J Cardiothorac Surg [Internet]. BioMed Central Ltd; 2012;7(1):35. Available from: http://www.cardiothoracicsurgery.org/content/7/1/35

7. Mefre AC, Pagbe JJ, Fokou M, Nguimbous JF, Guifo ML, Bahebeck J. Analysis of epidemiology, lesions, treatment and outcome of 354 consecutive cases of blunt and penetrating trauma to the chest in an African setting. S Afr J Surg. 2010;48(3):90–3.

8. Wisner D. Trauma to chest. Sabist Spencer B Saunders Publ. 1995;6:456.

9. Miller DL, Mansour KA. Blunt Traumatic Chest Injuries. Thorac Surg Clin. 2007;17:57–61.

10. Clark GC, Schecter WP TD. Variables affecting outcome in blunt chest trauma: flail chest vs. pulmonary contusion. J Trauma. 1988;28:298–304.

11. Adegboye VO, Ladipo JK, Brimmo IA. Blunt chest trauma. Afr J Med Sci. 2002;

12. Institute for Health Metrics and Evaluation. GLOBAL BURDEN OF DISEASE PROFILE : ETHIOPIA [Internet]. Seattle, United States of America; 2010. Available from: http://www.healthmetricsandevaluation.org

13. Aleassa EM, Al-marashda MJ, Elsherif A, Eid HO, Abu-zidan FM. Factors affecting mortality of hospitalized chest trauma patients in United Arab Emirates. J Cardiothorac Surg [Internet]. Journal of Cardiothoracic Surgery; 2013;8(1):1. Available from: Journal of Cardiothoracic Surgery

14. Hoyt DB, Coimbra R PB. Management of Acute Trauma,In Sabiston Textbook of Surgery. JR T, editor. Philadelphia: Elsevier; 2004. 483-532 p.

15. Fararoei M, Sadat SJ, Zoladl M. Epidemiology of Trauma in Patients Admitted to an Emergency Ward in Yasuj. Trauma Mon inpress(inpress). 2016;(11):1–5.

16. Laxminarayan R, Mills AJ, Breman JG, Measham AR,Alleyne G CM. Advancement of global health: key messages from the Disease Control Priorities Project. Lancet. 2006;367:1193–2008.

17. Byun CS, Park IH, Oh JH, Bae KS, Lee KH, Lee E. Epidemiology of Trauma Patients and Analysis of 268 Mortality Cases : Trends of a Single Center in Korea. Yonsei Med J [Internet]. 2015;56(1):220–6. Available from: http://dx.doi.org/10.3349/ymj.2015.56.1.220

18. Moodley NB, Chb MB, Aldous C, Clarke DL, Bch MB, Sa FCS. An audit of trauma-related mortality in a provincial capital in South Africa. S Afr J Surg. 2014;52(4):101–4.

19. Lema MK, Chalya PL, Mabula JB, Mahalu W. Pattern and outcome of chest injuries at Bugando Medical Centre in Northwestern Tanzania. J Cardiothorac Surg [Internet]. BioMed Central Ltd; 2011;6(1):7. Available from: http://www.cardiothoracicsurgery.org/content/6/1/7

20. Su O, Okoro E, Pe I. CHEST TRAUMA IN A REGIONAL TRAUMA CENTRE TRAUMA DE LA POITRINE AU CENTRE RÉGIONAL DU TRAUMA. J West African

Coll Surg. 2012;2(2):74–84.

21. United Nations Economic Commission for Africa. Case Study : Road Safety in Ethiopia Final Report. 2009;(ECA/NRID/019). Available from: http://hdl.handle.net/10855/5250

22. Hunchak C, Teklu S, Meshkat N, Meaney C, Ritchie LP. Patterns and predictors of early mortality among emergency department patients in Addis Ababa , Ethiopia. BMC Res Notes. BioMed Central; 2015;8(605):1–9.

23. Seid M, Azazh A, Enquselassie F, Yisma E. Injury characteristics and outcome of road traffic accident among victims at Adult Emergency Department of Tikur Anbessa specialized hospital , Addis Ababa , Ethiopia : a prospective hospital based study. BMC Emerg Med [Internet]. ???; 2015;1–9. Available from: ???

24. Getachew S, Ali E, Silkondez W, Abebe D, Deressa W, Enquessilase F, et al. Public Health Action. 2016;I(2):66–71.

25. Gizaw T, Gebru W. Treatment of penetrating wound of chest. Ethiop Med J. 1980;18:81–9.

26. Lambrecth R, Nikodemos T. Penetrating chest injuries. Ethiop Med J. 1989;27(223–227).

27. Adem AA, R Ilagoa R, Mekonen E. Chest injuries in Tikur Anbessa Hospital , Addis Ababa : a three year experience. East Cent African J Surg Surg. 1999;6(1):6–9.

28. Ried M, Bein T, Philipp A, Müller T, Graf B, Schmid C, et al. Extracorporeal lung support in trauma patients with severe chest injury and acute lung failure : a 10-year institutional experience. Crit Care [Internet]. BioMed Central Ltd; 2013;17(3):R110. Available from: http://doi.org/10.1186/cc12782

29. Khorsandi M, Skouras C, Prasad S, Shah R. Major cardiothoracic trauma : Eleven-year review of outcomes in the North West of England. Ann R Coll Surg Engl [Internet]. 2015;97(4):298–303. Available from: http://doi.org/10.1308/003588415X14181254789169

30. Mohammadzadeh, M., Hosseinpour, M., Mirzadeh, A. S., Jazayeri, H., & Ghannaee Arani

M. Chest Injury Evaluation and Management in Two Major Trauma Centers of Isfahan Province, IR Iran. Arch Trauma Res [Internet]. 2012;1(2):5–8. Available from: http://doi.org/10.5812/atr.6542

31. Hemmati, H., Kazemnezhad-Leili, E., Mohtasham-Amiri, Z., Darzi, A. A., Davoudi-Kiakalayeh, A., Dehnadi-Moghaddam, A., & Kouchakinejad-Eramsadati. Evaluation of Chest and Abdominal Injuries in Trauma Patients Hospital- ized in the Surgery Ward of Poursina Teaching Hospital, Guilan, Iran. Arch Trauma Res [Internet]. 2013;1(4):161–165. Available from: http://doi.org/10.5812/atr.7672

32. M.Mohta, P.Kumar. R.Bhardwaj, A.Tyagi AKS. Expriences with Chest Trauma: Where Do We Stand Today. Indian J Crit care Med. 10(1):25–8.

33. Afshar MA, Mangeli F, Nakhaei A. Evaluation of Injuries Caused by Penetrating Chest Traumas in Patients Referred to the Emergency Room. Indian J Surg [Internet]. 2015;77(June):191–4. Available from: http://doi.org/10.1007/s12262-012-0757-4

34. About Tikur Anbessa specialized Hospital [Internet]. 2017. Available from: http://www.missbdesign.com/clients/TAAAC/ about_BlackLionHospital.html

35. Emircan S, Ozgüç H, Akköse Aydın S, Ozdemir F, Köksal O, Bulut M. Factors affecting mortality in patients with thorax trauma. Ulus Travma Acil Cerrahi Derg. 2011;17:329–333.

36. Kulshrestha P, Munshi I, Wait R. Profile of chest trauma in a level I trauma center. J Trauma. 2004;57:576–581.

37. Liman ST, Kuzucu A, Tastepe AI, Ulasan GN, Topcu S. Chest injury due to blunt trauma. Eur J Cardiothorac Surg. 2003;23:374–378.

38. Massaga FA, Mchembe M. The Pattern and Management of Chest trauma at Muhimbili National Hospital, Dar es Salaam. East Cent African J Surg. 2010;15:124–9.

39. Otieno T, Woodsfield J, Bird P, Hill A. Trauma in Kenya. Injury. 2004;35:1228–33.

40. Shorr RM, Crittenden M, Indeck M, Hartunian SL, Rodriguez A. Blunt thoracic trauma:

analysis of 515 patients. Ann Surg. 1987;206:200–5.

41. Yalcinkaya I, Sayir F, Kurnaz M, Cobanoglu U. Chest trauma: analysis of 126 cases. Ulus Travma Derg. 2005;6:288–291.

42. Rasmussen OV, Brynitz S, Struve-Christensen E. Thoracic injuries. A review of 93 cases. Scand J Thorac Cardiovasc Surg. 2005;20:71–74.

43. Ali N, Gali BM. Pattern and management of chest injuries in Maiduguri, Nigeria. Ann Afr Med. 2004;3:181–4.

ANNEXES

Annex 1. CHECK LIST

Checklist to collect data on retrospective analysis of chest injuries from January 2016 to January 2017 in TASH, Addis Ababa, Ethiopia

s.no	The study variables	Response	Remark
	Card number	_____.	
1. Socio-demography of the participants			
1.1.	Sex	1. Male 2. Female	
1.2.	Age	_____.	
2. History of the trauma patient who attended in the emergency ward			
2.1.	Duration of presentation in hour	_____	
2.2.	Length of hospital stay in days	_____	
2.3.	Presence of chronic medical condition	1. Yes 2. NO	If no skip to Q.No.2.5
2.4.	Types of chronic medical condition	1. Diabetes Mellitus 2. Cardio vascular disease 3. Asthma 4. Others (specify)_____ _____ _____	
2.5.	Circumstance of injury	1. Road traffic Accident 2. Violence 3. Fall down 4. Other(specify)_____	

		_____	
2.6.	Identified chest Injury	1. Blunt 2. Penetrating	
2.7.	Is it	1. Pure chest injury 2. Thoraco-abdominal injury	
2.8.	Types of chest injury	1. Hemothorax 2. Pneumothorax 3. Flail chest 4. Pulmonary contusion 5. Rib fracture 6. Clavicle fracture 7. Scapular fracture 8. Chest wall wound 9. Others_____ _____	
2.9.	What are the associated injuries	1. head injury 2. neck injury 3. abdominal injury 4. pelvic injury	
2.10.	The types of intervention given	1. Non operative approach 2. chest tube drainage 3. thoracotomy	
2.11.	Complications	1. Wound sepsis 2. Pneumonia 3. Atelectasis 4. Others (specify)_____ _____	
2.12.	Patients outcomes	1. Recovered 2. Death 3. Referred	

2.13.	If death, in which unit the patient was died?	1. ED 2. ICU 3. Operation room 4. Surgical ward	