

**CAUSES AND OUTCOMES OF CHEST INJURY IN PATIENTS
ADMITTED TO SURGICAL WARDS OF JUSH: A
RETROSPECTIVE LONGITUDINAL STUDY**

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**A RESEARCH THESIS TO BE SUBMITTED TO DEPARTEMENT
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ABSTRACT

Background-chest injuries constitute a continuing challenge to the trauma or general surgeon practicing in developing countries. This study was conducted to outline the etiological spectrum, injury patterns and short term outcome of these injuries in our setting

Objective -The main goal of this study was to analyse the patterns and outcomes of chest injury in patients admitted to the surgical wards of JUSH from 2014 - 2015 G.C.

Method - a cross sectional study was conducted through a retrospective analysis of patients admitted to JUSH from 2014-2015 G.C. The data was collected from patient's charts and OR log books. All patients sustaining chest injury and admitted to surgical wards in the study period were included. A structured check list was used to collect data. Data was analysed by SPSS version 20 computer software.

Result - a total of 140 chest injury patients were studied. Males outnumbered females by a ratio of 10.6:1. Their ages ranged from 7 to 60 years (mean = 27.24 years). The majority of patients were (57.1%) penetrating chest injuries. Accidents were the most common cause of injuries affecting 57.1% of patients. More than one injury, rib fractures, and viscus injury were the most common associated injuries accounting for 32.1%, 21.4% and 14.3% respectively. The majority of patients (46.4%) were treated successfully with non-operative approach. 34 patients (24.3%) had complications. The mean length of hospital stay was 7.2 days and mortality rate was 14.3%.

Conclusion-chest injuries resulting from accidents (RTCs) remain a major public health problem in this part of the country. Urgent preventive measures targeting at reducing the occurrence of RTCs is necessary to reduce the incidence of chest injuries in this region.

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LIST OF ABBREVIATION

ALTS- Advanced Life Trauma Support

JUSH - Jimma University Specialized Hospital

LOS – length of hospital stay

OR - Operation Room

RTA/C- Road Traffic Accident / crushes

US- United States

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CHAPTER ONE

INTRODUCTON

BACKGOURND INFORMATION

Trauma continues to be an enormous public health problem worldwide and it is associated with high morbidity and mortality both in developed and developing countries. Trauma is reported to be the leading cause of death, hospitalization, and long-term disabilities in the first four decades of life. Globally, 10% of all trauma admissions result from chest injuries and 25% of trauma related deaths are attributable to chest injuries (2,3).

Trauma including chest injuries continues to be one of the leading causes of morbidity among the young and old with an estimated mortality of 40% (4). Chest trauma has been commonest cause of surgical admission and contributes significantly to high morbidity and mortality (5).

The cause and pattern of chest injuries have been reported in literature to vary from one part of the world to another partly because of variations in infrastructure, civil violence, wars and road traffic crashes (RTCs). These are the commonest cause of chest injuries in civilian practice accounting for up to 70% in some series (6,7). With increasing use of firearms, arrows and spears the incidence of penetrating chest injuries increased in civil society (8). They are often associated with other extra-thoracic injuries particularly to the abdomen and long bones (8, 9).

Studies have shown that most chest injuries can be treated by non-surgical approach with relatively simple methods, such as tube thoracostomy, appropriate analgesics management, and good pulmonary toilet (10, 11). The accurate identification of a patient at high risk for major chest injuries is

necessary to avoid delays that may lead to significant morbidity and mortality (12).

Aggressive management of the chest trauma along with prompt treatment of associated injuries is essential for optimal patient outcome (13). The majority of chest injuries are preventable. A clear understanding of the causes, injury patterns and outcome of these patients is essential for establishment of prevention strategies as well as treatment protocols (14). Such data is lacking in our environment as there is no study done specifically in our study area.

STATEMENT OF THE PROBLEM

Trauma is a major worldwide public health problem. It is one of the leading causes of death and disability in both industrialized and developing countries. Globally, injury is the seventh leading cause of death with 5.8 million deaths attributable to trauma in 2006. In the United States, trauma is the leading cause of death in children and adults up to 44 years of age, and it kills more Americans who are 1 to 34 years of age than all disease combined. Injury fatalities, however, represent only a small fraction of the scope of injury. During 2003, there were 148,000 injury related fatalities in the United States. Another 2.5 million patients were hospitalized for their injuries, and still another 40.4 million were treated at local emergency departments. An estimated 89.9 million patients were treated by primary Care physician or self-doctored at home. The total cost of injury in the Unites States is estimated to be more than \$200 billion per year, and this cost is continuing to rise (15).

Thoracic injuries account for 20% to 25% of all trauma related deaths, and complications of chest trauma contribute to another 25% of all deaths. Considering immediate deaths after motor vehicle accidents, the most frequent injuries leading to a fatal outcome include blunt cardiac injuries with chamber disruption and injuries to the thoracic aorta. Early deaths (within the golden hour) are caused by airway obstruction, major respiratory problems such as tension pneumothorax or massive hemothorax, and cardiac tamponade. These clinical situations are easily managed if recognized promptly. Chest wall trauma is the most frequent injury after blunt thoracic trauma. The majority of thoracic injuries are managed with simple procedures such as clinical observation, thoracentesis, respiratory support, and adequate analgesia. Tube thoracostomy is the most common procedure performed in the management of

thoracic trauma. In fact, 85% of patients sustaining chest injuries can be managed with tube thoracostomy and only few will require thoracotomy for definitive repair of major intrathoracic injuries (15).

Trauma kills 150,000 Americans every year. It is the most common cause of death in the population who are <40 years of age. Of these, one fourth of deaths are specifically related to chest trauma, mainly occurring in the prehospital setting (16).

Most persons, who experience torso trauma, whether blunt or penetrating, sustain some degree of associated injury of the chest. Thoracic injuries are a primary or contributing cause of death in nearly half of all cases of torso trauma. Fortunately, many thoracic injuries can be treated effectively, and often definitively, by relatively simple maneuvers than can be learned and performed by most physicians involved in early trauma care. Approximately one in six patients, however, has life threatening conditions. These extremis in injury severity are unique to the chest and require a correspondingly broad range of knowledge and skills on the part of the treating surgeon.(17).

SIGNIFICANCE OF THE STUDY

Trauma is a leading cause of death, hospitalization and long term disabilities in the first four decades of life. Of all trauma deaths, 25% result from chest injuries alone.

As we know, our nation, Ethiopia has one of the highest figures in the occurrence of road traffic accident. So, this study will assist to fill the knowledge gap and help us to know the most frequent types of injuries in our setup which in turn could help us to develop our own guidelines on how to approach patients presenting with chest trauma and serve as baseline data for further studies.

The majority of chest injuries are preventable. A clear understanding of the causes, injury patterns and outcome of these patients is essential for establishment of prevention strategies as well as treatment protocols. Such data is lacking in our environment as there is no local study which has been done so far. Hence, this study will be conducted in our setting to describe our own experience in the management of chest injuries, outlining the etiological spectrum injury patterns and outcome of chest injuries in our local setting. The study results will also provide basis for planning of prevention strategies and establishment of treatment protocols.

CHAPTER TWO

LITERATURE REVIEW

Research done by the University of Southern California from 1993 to 2002 involving a total of 34,120 trauma patients over 9 years showed 65% sustained blunt trauma, while 35% had penetrating trauma. Their overall hospital mortality was 7.8%. Of these deaths, 3.7% resulted from blunt trauma and 4% from penetrating trauma. The most common body areas with critical injuries were the head (43%), chest (28%), and abdomen (19%) (16).

A retrospective study which was done on 90 patients with chest injuries in India showed 55.6% were less than 40 years of age and 92% were male. Blunt injuries were seen in 56 (62.2%) and penetrating injuries in 34(37.7%). Multiple rib fractures with hemopneumothorax was the most frequent presentation with orthopedic and head injuries being most commonly associated. The Mortality rate was 6.8%, mainly due to respiratory insufficiency. The mean hospital stay was 9.5 days (21).

According to a study done in Tanzania, males outnumbered females by a ratio of 3.8:1. Their ages ranged from 1 to 80 years (mean = 32.17 years) and blunt injuries account for 72.7%. Road traffic crush was the most common cause of injuries affecting 50.7% of patients. Chest wall wounds, hemothorax and rib fractures were the most common type of injuries accounting for 30.0%, 21.3% and 20.7% respectively. Associated injuries were noted in 56.0% of patients and head/neck (33.3%) and musculoskeletal regions (26.7%) were commonly affected. The majority of patients (55.3%) were treated successfully with non-

operative approach. Underwater seal drainage was performed in 19.3%. One patient (0.7%) underwent thoracotomy due to hemopericardium. Thirty nine patients (26.0%) had complications ,of which wound sepsis (14.7%) and complication of long bone fracture (12.0%) were the most common complications. The mean hospital stay was 13.17 days and mortality rate was 3.3 % (18,19).

A respective study done in Cameroon on 354 patients admitted to an emergency unit for chest trauma showed 231 cases of blunt and 123 cases of penetrating trauma to the chest; their mean age was 41.86 years, and the male: female ratio was 4.2:1. The majority (n=226) of the injuries were happened in road traffic accidents, and the most common lesions were rib fractures (50.3%) and haemothorax (38.7%). The study also showed that associated lesion was found in 73.45% patients. Most patients were managed conservatively (n=303); thoractomy was performed mostly for penetrating trauma patients. Morbidity occurred in 49 patients, mainly affecting those treated with thoracic drainage, and 27 patients (7.6%) died (20).

A Study done in Nigeria on chest trauma patients showed 69% of all chest injuries were following blunt trauma. The Mean age was 38.3 +/- 15 years and the male: female ratio was 4.1. Majority of the blunt chest injuries were minor chest wall injuries (68%) , 7.6% had major but stable chest wall injuries,and 10.8% had flial chest injuries. Thoracic injuries without fractures of bony chest wall occurred in 13.6% patients . 59.1% had associated extra-thoracic injuries of this 426 patients (54.1%) were having two or more extra-thoracic systems involved. Orthopedic injuries (69.5%) were the most frequent extrathoracic injuries associated with blunt chest trauma, and craniospinal injury (31.9%) was more common injury among the patients with severe or life threatening chest trauma. The most common extra thoracic operation was laparotomy (221 patients). Nine hundred and seventy patients (72.9%) had either closed thoracostomy drainage or clinical observation, 361 patients (27.1%) had major thoracic surgical intervention (emergent in 134 patients, late in 227 patients). Most of the severe lung contusion that needed ventilator care (85 patients) featured among patients with bony chest wall injury, 15 were without chest

wall injury. Majority of patients 63.2% (835 patients) had no significant complications, 486 patients (30.8%) of 1321 survivors had complications. The commonest complications were atelectasis (201 patients) and pleural space complications (26) patients. Overall mortality was 36.2% (154 patients) (8).

From the study done in TikurAmbessa Hospital, Ethiopia, records of 72 patients were reviewed. In this study, all but one patient were treated with chest drainage. Approximately all of the patients were successfully treated with chest drains leaving no residual defects. This simple, effective and affordable equipment should be made available in all hospitals. Chest drainage is a life-saving procedure for patients with chest injuries which all doctors should be confident with. The majority of the patients had the haemopneumothorax diagnosed by clinical and X-ray findings. Fourteen patients (19.4%) had associated injuries. Abdominal injuries occurred in 7(5.6%), skeletal in 4 (5.6%) and neurological injuries in three (4.2%). Moreover, all patients required chest tube drainage of whom 60 (83.2%) were treated with chest tube drainage alone while 7 (9.8%) had a laparotomy in addition to the intrapleural drainage. Four (5.6%) of the patients had skeletal traction, one of whom had a skeletal fracture treated with traction and a head injury for which burr holes were done. One patient had a delayed thoractotomy. Sixty (83.2%) of the patients recovered fully without any residual effects and seven (9.8%) had complications. There were 5 deaths, giving a mortality rate of 7%. Hospital stay ranges between 4 and 60 days, with a mean of 11.8 days. Over half (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. (22).

A prospective study was done in North Gondar administrative zone, Northwest Ethiopia, to assess the magnitude, pattern, outcome and burden of injuries. All of 37,026 patients registered, 1982 (5.4%) presented with injury as main complaint. Trauma constituted about 46% of surgical patients, which shows a significant burden to the institutions. Seventy three percent of the injured

patients were males. The leading cause of injury was assault (48.5%) followed by fall down injury (18.6%) and road traffic injuries (14.7%). Of the vehicle related injuries, 59.6% were caused by commercial vehicles(23).

From a retrospective study done in JUSH, 1102 (8.2%) were injury cases. The commonest mechanism of injury was blunt assault, 34(30.9%), followed by road traffic accident, 334 (30.3). Fracture was the leading outcome of injury,

454 (41.2%), followed by bruise or skin laceration, 404 (36.7%). Significantly more males had cut injuries compared to females. Most, 715 (95.8%), patients were presented to the hospital within one week. The commonest functional limitations were; difficulty to use hands, 312 (28.33%) and difficulty to use legs, 217(17.7%). Eighty three, (7.5%) of the patients died and road traffic accident alone accounted for almost half, 179(49.7%) of the severe injuries (24).

CHAPTER THREE

OBJECTIVE

3.1 General Objective

To assess the causes and outcomes of chest injuries in patients admitted with chest trauma in JUSH from August 2013 to July 2015.

3.2 Specific Objectives

- To determine the outcomes of chest injuries
- To identify the cause and type of chest injuries
- To assess the duration of presentation, length of hospital stay of patients

CHAPTER FOUR

METHODES AND MATERIALS

4.1. Study Area and period

The study was conducted in Jimma University specialized Hospital. JUSH is a hospital found in Jimma town and serves as a referral hospital for the whole south west Ethiopia serving for more than 20,000,000 population.

The study was conducted from November 1-14, 2015 by reviewing records of patients with chest injury seen at JUSH from August 2013 to July 2015.

4.2. Study Design

A longitudinal retrospective study design was used.

4.3. Population

4.3.1. Source Population

The source population was all trauma patients admitted to the surgical wards of JUSH from August 2013 to July 2015

4.3.2. Study Population

The study population was all patients in the two years period with a diagnosis of blunt and penetrating chest trauma.

4.4. Sampling Technique and Sample Size

The sample size of the study was all patients who are admitted to surgical wards of JUSH with a diagnosis of blunt and penetrating chest trauma

4.5. Variables

4.5.1. Dependent Variables

Outcomes of chest injury

4.5.2. Independent variables

Age, Sex, duration of presentation, length of hospital stay, circumstance of injury, types of chest injury, associated injury, types of intervention.

4.6. Data Collection Instruments

A check list was developed by English language 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 operative complication of patients and outcome.

4.7. Data Collection Process

Patients that were admitted with a diagnosis of chest trauma was initially identified from the log books of the surgical wards and operation theatre of JUSH. The log books contain patients name, age, sex , date of operation and card number which was used to locate the card in the record office. The necessary information such as duration of presentation of patients, circumstance of injury, mode of injury, associated injury, post operative complication and outcome of surgery was identified form the card and entered in the data collection check list.

4.8. Data Collectors

The data was collected by the primary investigator

4.9. Data Quality Control

The collected data was first checked for completeness and edited every day after data collection by the primary investigator and advisors.

4.10. Data Analysis Interpretation

After collection, data was entered into a computer software (SPSS, version 20) for analysis. Percentages, means, median, and range was used for expressing results. Data was presented by frequency tables and figures. Association between categorical variables was done by using chi square test and statistical significance was tested with $p < 0.05$ as statistically significant.

4.11. Ethical Consideration

Ethical clearance was obtained from the Jimma University College of Health Sciences Research and Postgraduate coordinating office. All information obtained from the patients card records are anonymous.

4.12. Dissemination Plan

The finding of the study was disseminated to all relevant stakeholders through presentation and publication. Copies of the research was given to Jimma University from which data was collected and to the faculty of public health graduate program and the department of surgery.

4.13. Operational definition

Hemopneumothoracis: - Air and blood collection in the pleural cavity

Pneumothoracis:- Air collection in the pleural cavity

Chest tube :- A tube inserted in to the plural cavity for drainage

4.14. limitation of the study

- incomplete chart keeping
- incomplete record
- missing patients chart

Chapter five – Result

Out of the total 140 patients who were having chest injury and admitted to surgical wards in JUSH from 2014 to 2015, 128 (91.4%) were male and 12 (8.6%) were females . The mean age was 27.24 years and range 7 to 60 years old. As seen in table one,

Table :1 Age by sex distribution of chest injury patients admitted to surgical ward of JUSH, Oromia Zone, south Western Ethiopia.

		sex		Total
		male	female	
age in year	<= 18	20	10	30
	19- 35	82	2	84
	>35	26	0	26
Total		128	12	140

Table: 2 circumstance of injury in patients admitted with chest injury in JUSH, Oromia Zone, South western Ethiopia.

		Frequency	Percent
circumstance of injury	accident	80	57.1
	violence	60	42.9
	Total	140	100.0

Table: 3 identified mechanism of injury in patients admitted with chest injury in JUSH, Oromia Zone, South western Ethiopia.

		Frequency	Percent
	blunt	60	42.9
	penetrating	80	57.1
	Total	140	100.0

Table: 4 Sites of chest injury in patients admitted with chest injury in JUSH, Oromia Zone, South western Ethiopia.

		Frequency	Percent
	chest injury	79	56.4
	Thoraco-abdominal injury	61	43.6
	Total	140	100.0

Table:5 types of chest injury based on presentation of patients admitted with chest injury in JUSH, Oromia Zone, South western Ethiopia.

		Frequency	Percent
Types of chest injury	pneumothorax	10	7.1
	hemopneumothorax	117	83.6
	flail chest	10	7.1
	pulmonary contusion	3	2.1
	Total	140	100.0

Table: 6 intervention for chest injury in patients admitted with chest injury in JUSH, Oromia Zone, South western Ethiopia.

		Frequency	Percent
Types of intervention	laparotomy and chest tube insertion	59	42.1
	chest tube insertion and fixation	10	7.1
	chest tube insertion and burrholl	5	3.6
	chest tube insertion only	65	46.4
	thoracotomy	1	.7
	Total	140	100.0

Majority of the patients didn't develop complication 75.7% however 24.3% of them developed complication.

Table: 7 the occurrence of post-operative complication after management of patients admitted with chest injury in JUSH, Oromia Zone, South western Ethiopia.

		Frequency	Percent
Post-operative Complication	yes	34	24.3
	no	106	75.7
	Total	140	100.0

For 120 (85.7%) cases, the status of discharge was well improved and 20 (14.3%) were dead.

Table 8: The status of discharge after surgery of patients admitted with chest injury in JUSH, Oromia Zone, south western Ethiopia.

		Frequency	Percent
Outcome	improved	120	85.7
	died	20	14.3
	Total	140	100.0

Out the total death, 15 cases had more than one associated injuries and the rest had only extremity fracture.

Table 9: The association of associated injuries seen in patients with chest injury with their outcome in JUSH, Oromia Zone, South Western Ethiopia.

		Outcome		Total
		improved	died	
associated injury	No associated injury	20	0	20
	Viscus injury	20	0	20
	Rib fracture	30	0	30
	Extremity fracture	10	5	15
	Head injury	10	0	10
	More than one injury	30	15	45
Total		120	20	140

Table 10: The association of occurrence of post-operative complications and outcome of patients with chest injury in JUSH, Oromia Zone, South Western Ethiopia.

		Outcome		Total
		improved	died	
post operation complication	yes	32	2	34
	no	88	18	106
Total		120	20	140

15 death occurred on the late presentation >24 hours, 3 deaths occurred between 13 – 24 hours duration and the rest 2 cases happened less than or equals to 12 hours duration.

Table 11: the association of duration of presentation of patients and outcome of patients with chest injury in JUSH, Oromia Zone, South Western Ethiopia.

		Outcome		Total
		Improved	Died	
Duration of presentation In hours	<=12	100	2	102
	13-24	20	3	23
	>24	0	15	15
Total		120	20	140

Table 12:
the
associatio
n

circumstance of injury with mechanism of injury in patients with chest injury in JUSH, Oromia Zone, South Western Ethiopia.

		identified chest injury		Total
		blunt	penetrating	
circumstance of injury	accident	50	30	80
	violence	10	50	60
Total		60	80	140

Chapter six - Discussion

In this study, most of our patients were youth in their most productive years and showed a male preponderance. Similar demographic observation was also reported by other authors. The reason for male predominance among chest injury patients in this age group is probably that males are more mobile with active participation in high risk taking activities. Identification of risk taking behavior among trauma patients has potential significance for the prevention of injuries.

Study showed that chest injury are more common in males than females, and also this study identified that the problem is more common in males than females (M:F ratio is 10.6:1). This is almost higher with figures reported by study done in Nigeria (M:F ratio 4:1) , in Cameron (M:F ratio 4.2:1) and in Tanzania (M:F ratio 3.8:1) (8,19,20). The mean age in this study was 27.24 years and its relatively smaller than the studies done in Tanzania 32.17 years and in Cameron 41.86 years (19,20).

In this study blunt injuries were seen in 60 (42.9%) and penetrating injuries in 80(57.1%).this finding is reversal to study done in India (Blunt injuries were seen in 56 (62.2%) and penetrating injuries in 34(37.7%)) (21).this shows that there is high violence in the area of our study .

Accident was the most common cause of injuries affecting 57.1% of patients. Which is slightly higher with Tanzania's finding 50.7 % (20). These could be due to poor infrastructures and high traffic load since the area is high crop (coffee and the like)

Hemopneumothorax 117(83.6) was the most frequent presentation and the mean hospital stay was 7,2 day , this finding was relatively similar to research done in India (9.5days) (20).

The pattern of associated extra-thoracic injuries in this study is in agreement with findings from other studies done elsewhere . The presence of associated injuries is an important determinant of

the outcome of chest injury patients. Associated injuries increase the risk of complications in patients with chest injuries. Early recognition and treatment of associated extra-thoracic injuries is important in order to reduce mortality and morbidity associated with chest injuries (19).

The majority of our patients 65 (46.4%) were managed by non-operative approach which is in agreement with other studies. This study has demonstrated that the majority of patients presenting with chest injury without associated injuries can be managed with procedures which can be readily performed in rural hospitals by well trained junior surgeons or experienced general practitioners using simple equipment such as chest tubes and underwater seal bottles. Thoracic surgeons generally agree that most patients with especially penetrating chest injuries could be managed adequately by closed thoracostomy tube drainage alone.

In this study the mortality were 20 patients (14.3%), when we compare with other studies like Nigeria our finding is smaller 154 patients (36.2%) (8), but when we compare with study done in Cameron, our finding is higher 27 patients (7.6%) (20). These could be explained by late presentation of patients and our hospital is teaching which is serving more than 15 million people.

Chapter seven - Conclusion and recommendation

Chest trauma is an important public health problem accounting for a substantial proportion of all trauma admissions at JUSH. The pattern of chest trauma and its management was almost similar to many series. Accidents continues to be the major etiological factor for chest injuries and the commonly affected victims are young adult males (19-35 years of age) in their productive and reproductive age group. Urgent preventive measures targeting at reducing the occurrence of accidents mainly road traffic is necessary to reduce the incidence of chest injuries in this region.

My recommendation goes to:

1. Surgery department: to follow proper recording of patients charts
2. Hospital management: to improve proper chart keeping
3. City administration: to create awareness about chest injuries and their morbidity to the
Community

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ANNEX –II

CHECK LIST/QUESTIONNAIRE

Checklist to collect data on retrospective analysis of chest injuries from august 2013 to july 2015 G.C in Jimma University Specialized Hospital, Jimma, Ethiopia.

1. Card No -----
2. Socio demography
 - Sex -----
 - Age-----
3. Duration of presentation -----
4. Length of hospital stay -----
5. Circumstance of injury-----
 - Accident -----
 - Violence -----
6. Identified chest Injury
 - Blunt
 - Penetrating
7. Is it
 - pure chest injury -----
 - thoracoabdomenal injury-----
8. Types of chest injury
 - Hemothoracis -----
 - Pneumothoracis -----
 - Flial chest -----
 - Pulmonary contussion -----
9. Associated injury -----
10. Types of intervention-----
11. Post procedure complication-----

12. Outcome of patient-----