

## Blunt Trauma Chest; a Study on Clinical Presentation, Pattern and Outcome.

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### Abstract

**Background:** A thoracic injury is any form of physical injury to the chest including the component of chest wall (ribs) and thoracic cavity (heart, oesophagus, pleura, vessels and lungs). Thoracic injury accounts for 25% of all deaths from traumatic injury and it causes death in additional 50% of multiple trauma patients, usually as a result of hypoxia and hypovolemia. Blunt chest trauma is associated with a high risk of morbidity and mortality.

**Aim:** To assess the frequency of different types of injuries caused by blunt trauma chest with special reference to Rib fracture and its outcome.

**Material and methods:** We carried out a prospective observational study to assess the prevalence of chest injury patients in Department of general surgery and Department of Cardiothoracic and Vascular Surgery (CTVS) at Assam medical college and hospital (AMCH), Dibrugarh for a period of one year from June 2018 to May 2019. Documentation of all relevant data, which included identification, history, trauma type were done. All the patients were clinically examined with reference to their age, sex, mode of injury, severity of injury, etiology of trauma, clinical findings, diagnostic test, operative procedures (thoracotomy and tube thoracostomy), and complications during the stay in the hospital and during subsequent follow-up period, were recorded.

**Results:** RTA (63.33%) was the most common mode of injury. Most frequent sign was chest tenderness found in 91.11% (82) patients. Rib fracture was found in 82.22% (74) patients followed by surgical emphysema in 46.67% (42) patients. In our study, 5 patients (5.68%) sustained a mild chest injury (AIS thorax =1), 13 patients (14.77%) a moderate chest injury (AIS thorax =2), while a serious thoracic trauma (AIS thorax =3) is recorded in 43 patients (48.86%). There were 27 patients (30.68%) with severe chest trauma (AIS thorax =4). There were no patients with AIS thorax score of 5 or 6. 38 patients are managed conservatively and 52 patients (57.78%) required tube thoracostomy. Emergency thoracotomy required in one patient for diaphragmatic hernia, while late thoracotomy is carried out in 9 patients.

**Conclusion:** The study suggested that blunt thoracic trauma was most common caused by RTA. Proper history, clinical examination and judicious use of radiological investigations help in early diagnosis. The commonest injury was rib fracture (82.22%). Chest x-ray was done in all cases and CT thorax in required cases. Majority of the cases were treated conservatively with tube thoracostomy. : length of hospital stay, percentage of tube thoracostomy, duration of thoracostomy tube, thoracic surgery, associated injuries and mortality were higher in AIS thorax score-4. Mortality in chest trauma has been associated with the presence of >3 rib fractures, flail chest, B/L hemopneumothorax, ISS Score > 24 and with associated cranio-cerebral injury.

**Keywords:** Blunt thoracic trauma, Rib fracture, Injury severity score (ISS), Abbreviated injury severity score (AIS).

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Date of Submission: 15-06-2021

Date of Acceptance: 30-06-2021

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### I. Introduction

Trauma refers to physical injury caused by external force which is defined as damage to the body caused by an exchange with environmental energy that is beyond the body's resilience or individual's ability to cope<sup>1</sup>. 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. Road Traffic accidents (RTA) make up 1.3 million, suicides 844,000, and homicides 600,000 are the leading cause for these numbers<sup>2</sup>. The World Report on Road Traffic Injury Prevention indicates that by 2020, RTA will be a major killer accounting for half a million deaths and 15 million Disability Adjusted Life Years (DALYs) lost<sup>3</sup>. The World Health Organization has revealed in its first ever Global Status Report on Road Safety that more people die in road accidents in India than anywhere else in the world<sup>4</sup>.

A thoracic injury is any form of physical injury to the chest including the component of chest wall (ribs) and thoracic cavity (heart, oesophagus, pleura, vessels and lungs). Thoracic injury accounts for 25% of all

deaths from traumatic injury and it causes death in additional 50% of multiple trauma patients, usually as a result of hypoxia and hypovolemia<sup>5</sup>. Blunt chest trauma is associated with a high risk of morbidity and mortality<sup>6</sup>.

Management of blunt and penetrating trauma injuries is guided by the principles taught in the American College of Surgeons Committee on Trauma Advanced Trauma Life Support (ATLS) course<sup>7</sup>. In an era of increasing super specialisation all health care providers should be trained in trauma life support and be able to provide evidence based treatment to all injured patient. Thoracic injuries should be of prime concern not so much because of their significantly high and ever increasing incidence, or because they are usually inflicted at unpredictable hours in areas far away from medical care facility but principally because it is a dire emergency if not treated promptly often leads to rapid death. Any thoracic injury no matter how minor must be considered grave until proven otherwise.

## II. Aims And Objective

To assess,

- 1) The frequency of different types of injuries caused by blunt trauma chest.
- 2) The various mechanisms by which chest injuries are sustained.
- 3) Rib fracture and its outcome.

## III. Material And Methods

We carried out a prospective observational study to assess the prevalence of chest injury patients in Department of general surgery and Department of Cardiothoracic and Vascular Surgery (CTVS) at Assam medical college and hospital (AMCH), Dibrugarh for a period of one year from June 2018 to May 2019.

**Study design:** hospital based prospective observational study

**Study location:** This study done in Department of General Surgery and CTVS, AMCH, Dibrugarh, Assam, India.

**Study duration:** June 2018 to May 2019.

**Sample size:** 90 patients.

**Inclusion criteria:** All cases coming for evaluation of blunt trauma chest specially closed chest injuries, in OPD, IPD, casualty under all units in Department of General Surgery and Department of Cardiothoracic and Vascular Surgery, AMCH.

**Exclusion criteria:** Patients with penetrating/open chest injury, head injury and orthopedic injuries who require surgical intervention. Pediatric age group (12 years or below). Patients who declined to give consent, who did not complete their treatment in the hospital and who were lost to follow-up.

**Procedure methodology:** Documentation of all relevant data, which included identification, history, trauma type were done. All the patients were clinically examined with reference to their age, sex, mode of injury, severity of injury, etiology of trauma, clinical findings, diagnostic test, operative procedures (thoracotomy and tube thoracostomy), and complications during the stay in the hospital and during subsequent follow-up period, were recorded.

**Statistical analysis:** Data was analyzed using SPSS software version 25.

## IV. Results And Observations

90 patients with blunt thoracic trauma admitted in Department of Surgery, Department of CTVS of AMCH fulfilling the inclusion and exclusion criteria have been included in the present study.

The study included patients from >15 years of age with a mean age of 38.39 years. Most of the cases were noted between the age group of 25-34 years(35.56%), followed by 45-54 years (18.89%) and least cases were noted between 75-84 years of age.

Maximum blunt thoracic trauma occurred in males (84.44%) while the rest were females (15.56%).

**Mechanism of injury:** RTA (63.33%) was the most common mode of injury followed by fall from height. Other modes of injury are shown in table 1.

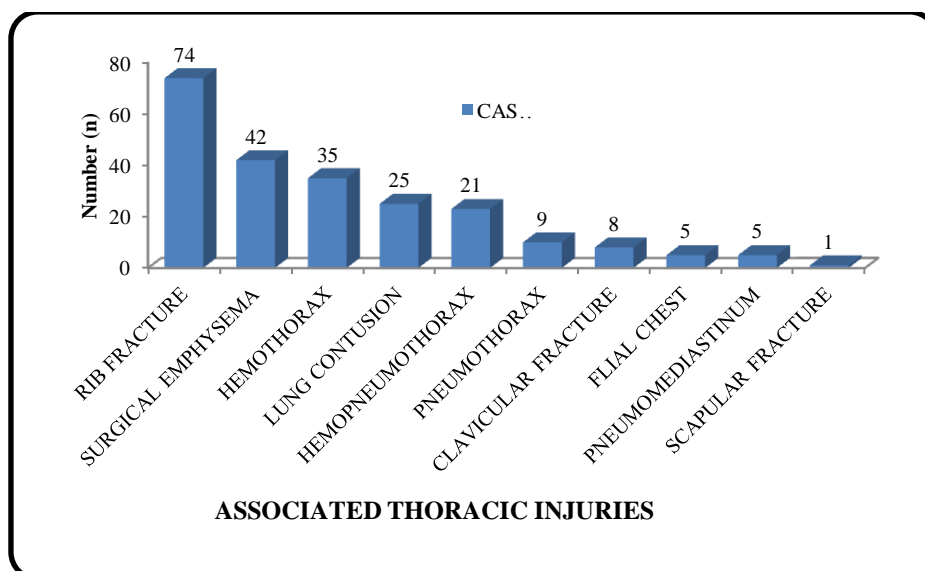
MOI	CASES	PERCENTAGE
ANIMAL ATTACK	2	2.22
PHYSICAL ASSAULT	5	5.56
FALL FROM HEIGHT	18	20
OCCUPATIONAL TRAUMA	6	6.67
RTA	57	63.33
COLLAPSED UNDERWEIGHT	2	2.22
TOTAL	90	100

**Table 1:** Table showing various mechanism of injury.

Most frequent sign was chest tenderness found in 91.11% (82) patients. Tachypnea was found in 61.11% (55) patients. Palpable rib fracture noticed in 54.44% (49) patients, while bony crepitus in 51.11% (46) and subcutaneous emphysema in 46.66% (42) of patients, while each of paradoxical respiration and tracheal deviation were found in <4 % patients.

**Associated chest injuries:** After radiographic evaluation (Chest x-ray /CT THORAX) of all the patients following results were found as given in chart-1.

Rib fracture was found in 82.22% (74) patients followed by surgical emphysema in 46.67% (42) patients, hemothorax in 38.89% (35) patients, and lung contusion in 27.78% (25) patients, hemopneumothorax in 23.33% (21) patients and pneumothorax in 10% (9) patients.



**Chart-1:** Bar chart showing outcome of blunt thoracic trauma.

**Rib fracture:** 74 (82.22%) patients were diagnosed with rib fractures and were divided into following six groups for better analysis of rib fracture and their associated injuries ;

- Group 1: no rib fracture.
- Group 2: 1 rib fracture.
- Group 3: 2 rib fracture.
- Group 4: 3 rib fracture.
- Group 5: >3 rib fracture.
- Group 6: flail chest.

Rib fracture	No of cases	Percentage
Group 1	16	17.78
Group 2	8	8.89
Group 3	15	16.67
Group 4	14	15.55
Group 5	32	35.56
Group 6	5	5.55
Total	90	100

**Table 2:** Division of rib fracture into different groups.

Single rib fracture (group 2) was found in 8 cases, out of which, 5 cases had right sided rib fracture and 3 had left sided rib fractures. Group 3 (2 rib fracture) had 15 (16.67%) patients (11 right sided and 4 left sided rib fracture). Group 4 (3 rib fracture) had 14 (15.55%) cases (9 left sided and 5 right sided). Highest number of patients (32 cases, 35.56%) were seen in group 5 (>3 rib fracture). Out of which 11 cases had isolated right sided rib fracture (4 fractured ribs in 9 patients and 5 fractured ribs in 2 patients on the right side) and 13 patients had isolated left sided rib fracture (2 patients having 5 fractured ribs and other 11 patients having 4 fractured ribs each on the left side). Bilateral rib fracture was found in 8 cases of group 5. While Flail chest (group 6) was found in 5 patients. 16 (17.78%) patients did not have any rib fracture.

ASSOCIATED CHEST INJURIES	RIB FRACTURE GROUP						TOTAL
	NONE	1 RIB#	2 RIB#	3 RIB#	>3 RIB #	FLAIL CHEST	
HEMOTHORAX	2 (5.71)	2 (5.7)	4 (11.4)	9 (25.7)	14 (40)	4 (11.42)	35
HEMOPNEUMO-THORAX	1 (4.7)	1 (4.7)	5 (23.8)	5 (23.8)	7 (33.3)	2 (9.52)	21
PNEUMO-THORAX	3 (33.3)	0	1 (11.1)	0	5 (55.5)	0	9
LUNG CONTUSION	2 (8)	1 (4)	2 (8)	4 (16)	11 (44)	5 (20)	25
SURGICAL EMPHYSEMA	3 (7.14)	1 (2.4)	6 (14.3)	8 (19.0)	19 (45.2)	5 (11.90)	42
PNEUMO-MEDIASTINUM	1(20)	0	0	0	1(20)	3(60)	5

**Table 3:** Associated chest injuries in relation to different rib fracture group. # signifies fracture. All figures in bracket are in percentage.

31 (34.44%) patients had isolated right sided rib fracture, 33 (36.67%) had isolated left sided rib fracture and bilateral rib fracture were found in 10 (11.11%) patients. Isolated typical ribs fracture was seen in 76.67% patient. 5 patients have combined typical and atypical rib fracture, were as isolated atypical rib fracture was not found in any cases.

**Associated extra-thoracic injuries:** The most common injury associated with chest trauma was head injury (craniocerebral injury) seen in 18.89% (17) patients followed by fasiomaxillary injury 12.22%, extremity fracture 11.11%, clavicular fracture 8.89%, abdominal injury 2.22%, pelvic injury 2.22% and scapular fracture 1.11% respectively. As a whole, 37.78% (34) patients had associated injuries while 62.22% (56) patients had isolated thoracic injury.

**Abbreviated injury severity scores (AIS):** Chest injuries are classified into 6 groups according to the AIS. In our study, 5 patients (5.68%) sustained a mild chest injury (AIS thorax =1), 13 patients (14.77%) a moderate chest injury (AIS thorax =2), while a serious thoracic trauma (AIS thorax =3) is recorded in 43 patients (48.86%). There were 27 patients (30.68%) with severe chest trauma (AIS thorax =4). There were no patients with AIS thorax score of 5 or 6. The distribution of patients AIS thorax 1, 2, 3 and 4 are shown in Table-4.

Clinical characteristics	ABBREVIATED INJURY SEVERITY SCORES (AIS): THORAX			
	AIS-1	AIS-2	AIS-3	AIS-4
N-88(%)	5(5.68)	13(14.7)	43(48.8)	27(30.6)
LOS (MEAN)	1	2.38	11.04	15.70
TUBE THORACOSTOMY	0	1(7.69)	27(62.79)	24(88.8)
DURATION OF TUBE THORACOSTOMY	0	9	13.51	15.58
THORACICSURGERY	0	0	4(9.3)	5(18.5)
MORTALITY	0	0	1(2.3)	2(7.4)
HEAD INJURY	0	0	9(20.93)	8(29.62)
FACIOMAXILLARY INJURY	1	1	4(9.3)	5(18.5)
ABDOMINALINJURY	0	0	1(2.3)	1(3.7)
CLAVICULAR #	0	0	5(11.62)	3(11.11)
SCAPULAR #	0	0	0	1(3.7)

**Table 4:** AIS score of various charecteristic features. All figures in bracket are in percentage.

The percentage of patients requiring a chest tube insertion was significantly higher among the AIS thorax 4 group (88.88%) in comparison with the AIS groups 1, 2 and 3 (0, 7.69% and 62.79% respectively).

Similarly the percentage of patients with associated injury like head injury, fasiomaxillary injury, abdominal injury, clavicular and scapular fracture was significantly higher among the AIS thorax 4 group (29.62%, 18.5%, 3.7%, 11.11% and 3.7%) in comparison with the AIS group 3 (20.93%, 9.3%, 2.3%, 11.62% and 0 % respectively) as expected. Interestingly the severity of chest trauma did correlate with number of operative interventions carried out for complications (9.3% and 18.5%) and mortality (2.3% and 7.4%) for AIS Thorax group 2 and 3 respectively.

**Injury severity score (ISS):** ISS is calculated to categorize the degree of total severity of injury. According to the calculated ISS, patients are stratified into two groups (ISS: 0–24 and >24). A very severe injury (ISS>24) was observed in 6 patients (6.67%).

ISS GROUP	ISS SCORE	NO OF CASES	MORTALITY
GROUP -1	0-24	84 (93.33%)	0
GROUP-2	>24	6 (6.67%)	3
TOTAL		90	

**Table 5:** Division of ISS scores.

There was a significant association between the mortality rate and the ISS, as all 3 deaths were in the ISS group with score of >24.

RIB FRACTURE	INJURY SEVERITY SCORE (ISS):		
	0-24	>24	ISS MEAN
0 RIB #	16	0	6.25
1 RIB #	8	0	6.12
2 RIB #	15	0	12.13
3 RIB #	14	0	14
>3 RIB #	28 (33.33%)	4 (66.67%)	14.94
FLAIL CHEST	3 (3.57%)	2 (33.33%)	22.2
TOTAL	84	6	

**Table 6:** ISS score of rib fracture groups

There is a significant association between the rib fracture and the ISS. Highest mean ISS was for flail chest (22.2) followed by for rib fracture group 5 (14.94). In patients with ISS >24, 4 patients (66.67%) had >3 rib fracture and 2 patients (33.33%) had flail chest, when compared to ISS group 0-24 which had >3 rib fracture in 28 patients (33.33%) and flail chest in 3 patients (3.57%) respectively, with other minor rib fracture groups found only in ISS group 0-24 signifying that high energy impact are associated with higher number of fractured ribs, higher flail chest, higher mortality rate and in turn higher ISS score.

**Management:** The study population consists of a total of 90 patients, out of which 38 patients are managed conservatively with analgesics, chest physiotherapy, postural drainage and bronchodilators (in the form of tablets and nebulisation). 52 patients (57.78%) required tube thoracostomy, out of which 45 patients required U/L tube thoracostomy and 7 patients required B/L tube thoracostomy. Emergency thoracotomy required in one patient for diaphragmatic hernia, while late thoracotomy is carried out in 9 patients for complications such as empyema, retained clot/hemothorax, loculated hemothorax, fibro-thorax and incomplete lung expansion.

RIB FRACTURE	CASES	TUBE THORACOSTOMY			
		U/L	B/L	TOTAL	NONE
0 RIB #	16	5	0	5 (31%)	11
1 RIB #	8	1	0	1(12%)	7
2 RIB #	15	9	0	9(60%)	5
3 RIB #	14	9	1	10(71.42)	5
>3 RIB #	32	18	5	23(71.87)	9
FLAIL CHEST	5	3	1	4(80%)	1
TOTAL	90	45	7	52	38

**Table 7:** Tube thoracostomy in different rib fracture groups

The study show that as the number of fractured ribs increased, the percentage of patients requiring tube thoracostomy also increased significantly (TABLE-7).

Majority of the patients with associated injuries are managed conservatively. 17 patients with intracranial injuries were managed conservatively with analgesics and anti epileptics (i.v and oral phenytoin). Out of 11 patients with faciomaxillary injury, 7 patients who had undisplaced facial bone fractures were treated conservatively, while 4 patients who had displaced fracture required plate fixations (open reduction and internal fixation of maxilla, frontal bone and zygomatic process). 3 patients expired pertaining to mortality rate of 3.33%. Mechanism of injury of all 3 cases was RTA. All three patients had ISS score of > 25 pertaining to high velocity impact.

**Complications:**

COMPLICATION	NO OF CASES	PERCENTAGE
SSI	5	5.56%
EMPYEMA	1	1.11%
EMPYEMA WITH SSI	2	2.22%
RETAINED HEMOTHORAX	4	4.44%
LOCULATED HEMOTHORAX	1	1.11%
FIBROTHORAX	1	1.11%
COUGH WITH PNEUMONIA	3	3.33%
TOTAL	17	18.88%

**Table 8:** Complications of present study

RIB FRACTURE	LENGTH OF HOSPITAL STAY	
	CASES	MEAN LOS
0 RIB #	16	4.87
1 RIB #	8	4.62
2 RIB #	15	11.6
3 RIB #	14	12.42
>3 RIB #	32	12.56
FLAIL CHEST	5	14.4
TOTAL	90	

**Table 9:** Hospital stay of rib fracture group.

This study shows that, as the traumatic force increases, the number of fractured ribs also increased, so are the mean ISS score and mean length of stay (LOS). Lowest mean LOS of 4.62 days was found for group 1 (single rib fracture) which gradually increased as the number of rib fracture increased (Table 9). Highest mean LOS was for flail chest group with 14.4 days.

**Follow up:** The follow up period in this study was 1 week, 1 month and 3 month following discharge. 70(77.78%) had complete recovery while 8 (8.89%) patients had persistent chest pain, 3(3.33%) patients had empyema (2 patients had associated SSI), 3 (3.33%) had cough with pneumonia, 5 (5.9%) patients had SSI while 1 (1.11%) patients had incomplete lung expansion.

**V. Discussion**

Our study showed that blunt thoracic trauma was more common in males with a male: female ratio of 5.4: 1. Most of the cases were noted between the age group of 25-34 years (35.56%) which is consistent with available literature<sup>8,9</sup>.

RTA is the leading cause of chest trauma in most of researches, which is no different in India which accounts for almost 6% of global RTA<sup>10-12</sup>. The present study also showed similar result with RTA (63.33%) being the leading cause of injury followed by fall from height. Our study also showed some mechanism of injuries which are peculiar to developing nations like ours, especially in rural India, such as fall from height (20%), occupational injuries (6.67%), physical assault (5.56%), and animal attack (2.22%) and collapsed under weight (2.22%).

In our study, rib fracture which was found in 82.22% of patients were the most common injury which is in accordance with the previous literature<sup>13-16</sup>, followed by surgical emphysema (46.67%), hemothorax (38.89%), lung contusion (27.78%), hemopneumothorax (23.33%) and pneumothorax (10%). We observed that 38.89% of patients had hemothorax in our study and 94.3% of them were associated with rib fracture which is consistent with the available literature<sup>13-17</sup>.

Rib fractures constitute a major part of blunt chest trauma. Each additional rib fracture in the elderly population increases the odds of mortality by 19% and of developing pneumonia by 27%<sup>18,19</sup>. Srimali et al (2003)<sup>20</sup> found that the greater the number of fractured ribs, the higher the associated morbidity and mortality. Similarly Fligel et al<sup>21</sup> reported 10% mortality in patients with more than four rib fractures which increased to 34% in patients with eight or more fractures.

In the present study, no rib fracture was observed in 17.78% (n=16) patients, single rib fracture in 8.89% (n=8), 2 fractured ribs in 16.67% (n=15), 3 fractured ribs in 15.55% (n=14), >3 fractured ribs in 35.56% (n=32) patients and flail chest in 5.55% (n=5) patients which was comparable with the available literature<sup>22-25</sup>. (Table-10)

RIB FRACTURE	STUDIES				
	Chrysou K et al (2017) <sup>22</sup>	Chien C Y et al (2017) <sup>23</sup>	Kuman BA et al (2017) <sup>24</sup>	Sharma PP et al (2016) <sup>25</sup>	PRESENT STUDY
0	NA	NA	22	NA	17.78
1	22.64	32.8	4	7.67	8.89
2			58	25.47	16.67
3	71	64.3	58	56.17	15.55
>3					35.56
FLAIL CHEST	6.36	2.9	6	2.4	5.55

**Table-10:** Comparative analysis of number of rib fracture in different studies.

Present study showed that with increase in number of rib fractures, there was increase in percentage of various types of chest injuries (table-3), associated extrathoracic injuries, rate of tube thoracostomy (table-7), length of hospital stay (table-9), AIS score (table-4), ISS score (table-6) and hence mortality. These findings were consistent with findings of available literature<sup>18-25</sup>.

In our study, associated extra-thoracic injuries (37.78 %) were comparable to literature (). Head injury was the most common associated injury (18.89 %) which is in contrast to the available literature<sup>10-12</sup>. Other commonly associated injuries were maxillofacial (12.22%), extremity fractures (11.11%), clavicular fracture (8.89%), abdominal injury (2.22%) and pelvic injury (2.22%). Shorr and colleagues found associated injuries in more than 75 % of thoracic trauma patients<sup>26</sup>.

Majority of our patients in the study were managed conservatively which is in agreement with previous studies<sup>15, 27-29</sup>. Tube thoracostomy was the mainstay of treatment for the majority (57.78%) of patients. Thoracotomy was done in only 11.11% of patients which was carried out for mainly for complications like empyema, retained clot/hemothorax, loculated hemothorax, fibro-thorax and incomplete lung expansion, Mechanical ventilation was required in 6.66% of patients. These figures are similar to the published literature<sup>12, 13, 17</sup>. Richardson observed that less than 5 % of patients sustaining blunt chest trauma had indications for thoracotomy<sup>30</sup>. Average duration of chest tube was 4.5 days in a study by Locurto et al<sup>31</sup>. In our series, the mean duration of ICD was 14.6days. The increased length of ICD was probably due to severity of injury.

The present study showed a mortality of 3.33% which is similar to a study by Lema et al.<sup>32</sup> with a mortality rate of 4.7 %.

## VI. Conclusion

- Blunt thoracic trauma is mainly caused by RTA, followed by fall from height. It commonly affects the age group of 25-34 years with a Male: female ration of 5.4:1.
- The commonest injury was rib fracture (82.22%) followed by surgical emphysema (46.67%) and hemothorax (38.89%). Lung contusion (27.78%) was the most common parenchymal lung injury.
- Majority of the patients suffered from more than 3 rib fractures. With increase in the number of rib fractures, the incidence of hemothorax, pneumothorax, hemopneumothorax, lung contusion and surgical emphysema increased and also did the associated extra-thoracic injuries like head injury, faciomaxillary injury, abdominal injuries and other orthopedic fractures. These were significantly associated with >3 fractured ribs and flail chest.
- The majority of patients with blunt thoracic trauma can be managed by simple intervention i.e. tube thoracostomy and supportive measures which resulted in good outcome in majority of patients.
- Chest physiotherapy as a means of internal fixation is the main stay of conservative treatment in patients with rib fractures and flail chest. Ventilator support in critical cases of rib fracture and flail chest were reserved in event of respiratory failure.
- Thoracotomy was required mainly for complications like empyema thoracics, retained hemothorax, loculated hemothorax and incomplete chest expansion and also for diaphragmatic hernia.
- Pain management plays a vital role in blunt thoracic trauma because good analgesia can reduce the respiratory mechanics, improve ventilator function and decrease pulmonary complications which dramatically improve course of recovery.
- On applying AIS thorax score: length of hospital stay, percentage of tube thoracostomy, duration of thoracostomy tube, thoracic surgery, associated injuries and mortality were higher in AIS thorax score-4 followed by AIS thorax score-3 which was in relation to number of rib fracture.
- There is a significant association between number the rib fracture and the ISS.
- The predictors of prolonged hospital LOS were: number of fractured ribs, associated extra-thoracic injuries, and complications.
- Surgical site infection (SSI) was the most common complication followed by residual hemothorax, cough with pneumonia and empyema thoracic.

- Mortality in chest trauma has been associated with the presence of >3 rib fractures, flail chest, B/L hemopneumothorax, ISS Score > 24 and with associated cranio-cerebral injury.
- Regular monitoring of the patients by thorough clinical examination for early recognition of the pathophysiological changes; appropriate resuscitation, specific investigation, timely intervention and multidisciplinary care improves the outcome of patients with initial radiographic evidence. Early detection of high risk cases in emergency department plays a vital role in efficient management of blunt thoracic trauma cases which is supplemented by detailed history, thorough clinical examination and quick radiological assessment. Early interventions in the form of thoracostomy tube drainage, thoracotomy, ICU care and ventilator support can ensure better management and outcome. Further study for a longer duration focusing on other modalities like early surgical fixation of a multiple rib fracture and flail chest, Video Assisted Thoracoscopic Surgery and pain management with PCA, intercostal nerve blockage and paravertabral block with multidisciplinary management of polytrauma that are more effective and less susceptible to complications would help to come to some important conclusions regarding newer surgical interventions and pain management.

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Dr. Sunil M. Naik, et. al “Blunt Trauma Chest; a Study on Clinical Presentation, Pattern and Outcome.” *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(06), 2021, pp. 54-62.