

## Original Research Article

# Comprehensive study of thoracic trauma at tertiary health care centre: a retrospective observational study

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### ABSTRACT

**Background:** Thoracic injuries account for a substantial proportion of all injury-related admissions, morbidity and mortality in all tertiary health care centres. The study was conducted to do comprehensive study of chest trauma at a tertiary health care centre.

**Methods:** In this retrospective study we included all polytrauma patients with chest trauma admitted to Geetanjali medical college and hospital, Udaipur for a period of 2 years, from January 2017 until January 2019. Clinical details of the patients were recorded from their case sheets and were analyzed with reference to their age, sex, mode of injury, type of injury, severity of injury, treatment modalities, complications and final outcome.

**Results:** Prevalence of chest trauma was 16.61% out of total cases of polytrauma. Males were predominantly involved (79.61%). Majority were in the age group of 21-30 years. Road traffic accidents (RTA) was the most common mode of injury (68.93%). A total of 53.40% patients required inter costal tube drainage (ICTD). About 17.47% of patients developed complications during treatment in the hospital.

**Conclusions:** Chest trauma occurs in a significant number of polytrauma patients and majority of victims are males of 21-30 years of age. Majority of these patients were treatable with simple procedures like tube thoracostomy or ICU based treatment.

**Keywords:** Chest trauma, Flail chest, Thoracic trauma, Haemothorax, Inter costal chest tube drainage, Thoracotomy

### INTRODUCTION

Trauma is one of the most widely recognized reasons for death and is responsible for third most number of deaths after cardiovascular diseases and cancers among the causes of death in adults worldwide.<sup>1</sup> The deaths due to accidents in India are higher in number than in western countries.<sup>2</sup> In patients of polytrauma, thoracic injuries occur as the major component and also constitute significant percentage of all deaths due to trauma in reproductive age group.<sup>3</sup> Thoracic trauma adds heavily to these figures which may either be present as isolated injury or as a part of polytrauma. In thoracic injuries, blunt trauma is more common than penetrating injuries

and is thought to result from combination of crushing, compression, stretching and shearing forces.<sup>4</sup> RTA are the most common cause of blunt trauma followed by blunt assaults, stab injuries and fall from height.<sup>5</sup> Use of seat belt is considered to provide protection and may lead to a significant reduction in the incidence of thoracic injuries in RTA.<sup>6</sup> The diagnosis requires intelligent interpretation of the history, the physical findings and the findings of available radiological procedures. Management of blunt chest trauma focuses on a combination of effective analgesia, surgical fixation, chest physiotherapy, respiratory care and early mobilization. On the other hand, the accurate identification of a patient at high risk for major chest

trauma is essential for regulation of over and under triage within a trauma system.<sup>7</sup> The present study focuses on blunt chest injuries, especially rib fractures and associated injuries. In spite of the high mortality rates, about 90% of the patients with life-threatening thoracic injuries can be managed by a simple intervention like intercostals tube drainage and non-invasive ventilation.

## METHODS

After obtaining approval from Geetanjali university human research ethics committee (HREC) on 1 February 2019 this retrospective study was conducted at Geetanjali medical college and hospital (GMCH) Udaipur for a period of 2 years from January 2017 to January 2019.

### Source of data

All patients admitted from the emergency department and diagnosed with thoracic trauma at Geetanjali medical college and hospital, Udaipur.

### Study type

This study was a retrospective observational study.

### Study duration

The study was done for a period of 2 years from January 2017 to Jan 2019.

### Sample size

The number of patients admitted in GMCH during the study period was 103 (n=103).

### Inclusion criteria

All polytrauma patients with thoracic trauma admitted in GMCH, Udaipur were included in the study.

### Exclusion criteria

Any rib fracture caused due to any reason other than trauma was excluded from the study.

The following data was recorded from the patient's case sheets and was analyzed with reference to age, sex, mode of injury, type of injury, treatments employed, complication and final outcome. The results were calculated with the help of statistics, tables and graphs.

## RESULTS

A total of 620 patients of polytrauma were admitted in various departments of GMCH, Udaipur. Out of 620 patients of polytrauma, 103 patients were having chest trauma. This gives a prevalence of 16.61% (Table 1).

The no. of male cases is much more than the no. of female cases. The ratio of male to female cases is 4:1. Out of a total of 103 cases of chest trauma, maximum of 26 cases (25.24%) were in the age group of 21-30 years (Table 2).

Out of total 103 patients of chest trauma, 90 patients (87.38%) were of blunt trauma and 13 patients (12.62%) were of penetrating trauma (Table 3).

The most common mode of injury is RTA seen in 71 out of 103 patients (68.93%) followed by fall from height in 18.44%, assault in 7.76% and fall in bathroom in 4.85% cases (Table 4).

Most common type of injury was pneumothorax which accounted for 45 out of 103 cases, while 21 had hemothorax, while 10 patients had hemo/pneumothorax, 28 of them developed surgical emphysema, 18 had lung contusion, 10 of them had lung laceration and 64 patients had other associated injuries (Table 5). Most common associated injury was to extremity and pelvis with 25 out of 103 patients followed by 20 patients having intraabdominal injuries, 9 had cranial injury, 6 patients had facial trauma, 3 had spinal trauma and 1 patient had diaphragmatic injury.

Out of total 103 patients of chest trauma, 90 had ribs fracture. Of which, 55 patients were having more than 2 ribs fractured, 23 had 2 ribs fractured, 12 patients had single rib fractured. 21 of the patients having 2 or more ribs fractured had bilateral involvement and 11 developed flail chest (Table 6).

46 out of 103 patients (44.66%) were treated conservatively, while 55 patients (53.40%) required ICTD insertion and only 2 patients (1.94%) needed thoracotomy (Table 7). Out of the 46 patients who were treated conservatively 17 (36.96%) had ribs fracture without hemo/pneumothorax, 15 (32.60%) had ribs fracture with mild hemo/pneumothorax and 14 (30.43%) had ribs fracture with mild hemoperitoneum. Out of the 55 patients who needed ICTD insertion, 31 patients had ribs fracture with moderate hemo/pneumothorax and 24 patients were having ribs fracture with severe hemo/pneumothorax.

ICTD insertion was required in the emergency room itself in 13 out of the 55 patients, while it was inserted in ICU in 27 patients and in ward in 15 patients. 40 out of 55 patients required unilateral ICTD placement of which 20 were inserted on the right side and 27 on the left side, while 8 patients required bilateral ICTD placement. 10 patients developed complications after ICTD insertion. Residual hemothorax was seen in 7 of them and recurrent pneumothorax was seen in 3 patients.

**Table 1: Prevalence of chest trauma in polytrauma patients.**

Total polytrauma cases	Chest trauma	Prevalence of chest trauma (%)
620	103	16.61

**Table 2: Distribution of patients of chest trauma according to age group.**

Age group (in years)	Number of cases	Percentage (%)
<20	15	14.56
21-30	26	25.24
31-40	16	15.53
41-50	15	14.56
51-60	17	16.50
>60	14	13.59
Total	103	100

**Table 3: Type of injury in patients of chest trauma.**

Type of injury	Number of cases	Percentage (%)
Blunt trauma	90	87.38
Penetrating trauma	13	12.62
Total	103	100

**Table 4: Mode of injury in patients of chest trauma.**

Causes	Number of cases	Percentage (%)
RTA	71	68.93
Fall from height	19	18.44
Assault	8	7.76
Fall in bathroom	5	4.85
Total	103	100

**Table 5: Nature of injury in patients of chest trauma.**

Nature of injury	Number of cases	Percentage (%)
Hemothorax	21	20.39
Pneumothorax	45	43.69
Hemo-pneumothorax	10	9.70
Surgical emphysema	28	27.18
Lung contusion	18	17.47
Lung laceration	10	9.70
Other associated injuries	64	62.13

**Table 6: Distribution of patients according to type of ribs fracture.**

Type of rib fracture	Number of patients
Single rib	12
2 rib fracture	23
More than 2	55
Bilateral ribs	21
Flail chest	11

**Table 7: Treatment modalities.**

Treatment	Number of patients	Percentage (%)
Conservative treatment	46	44.66
ICTD	55	53.40
Thoracotomy	2	1.94
Total	103	100

**Table 8: ICU requirement in patients of chest trauma.**

ICU requirement	
<b>Number of patients</b>	50
<b>Average duration of stay in ICU (in days)</b>	12.5

**Table 9: Complications during the treatment period.**

Complications	Number of cases
<b>Pneumonia</b>	7
<b>Recurrent Pneumothorax</b>	3
<b>Atelectasis</b>	5
<b>Sepsis</b>	3
<b>Total</b>	18

**Table 10: Final outcome.**

Final outcome	Number of patients
<b>Discharge</b>	82
<b>Complication</b>	18
<b>Death</b>	3
<b>Total</b>	103

Only 2 patients required thoracotomy and out of the 2 patients, 1 was having vascular injury and the other one was having bronchial rupture.

Number of patients who required ICU admission was 50 out of 103 patients of chest trauma and their average duration of stay in the ICU was 12.5 days (Table 8). Out of the total 50 patients admitted in the ICU, 15 required oxygen support, while 23 patients needed NIV and 12 patients were intubated and required ventilator support.

A total of 18 patients developed complications of which 7 patients developed pneumonia, 5 had atelectasis, 3 of them developed recurrent pneumothorax and 3 patients developed sepsis (Table 9). 82 out of 103 patients were discharged satisfactorily without any complications, while 18 patients developed certain complications and their duration of hospital stay was increased and 3 patients succumbed to the injuries (Table 10).

## DISCUSSION

Young males in the reproductive period of life are mostly affected by trauma.<sup>8-10</sup> Blunt trauma was more frequent than penetrating trauma in our series which is compatible with other series.<sup>11-14</sup> The current study is an institutional report and this result cannot be generalized until epidemiological or multi-institutional study is performed. Seat belt is the most effective method for reducing injuries due to traffic accidents.<sup>15</sup>

In the current study, out of a total of 103 cases of chest trauma, 82 (79.61%) were males and 21 (20.39%) were females which show a male to female ratio of 3.90:1.

Vécsei et al also reported this dominance of males over females in their study (2.19:1). In our study, out of a total of 103 cases of chest trauma, maximum 26 (25.24%) patients were of age group 21-30 years, followed by 17 (16.50%) in the age group of 51-60 years. Minimum patients were seen in the very young and very old group of patients. Dalal et al documents in his study that out of total of 402 patients, the maximum number of cases (139) were in the 3rd decade of life that is, 21-30 years and the next common decade was the 4th that is, 31-40 years, with 98 patients. So, more than half of the patients were in the 3rd and 4th decade of life and the incidence was low for extremes of ages.

In the current study, it was observed that 90 (87.38%) out of 103 patients had blunt trauma to the chest, whereas, remaining 13 (12.62%) had penetrating injury. Dongel et al observed in their study that 1090 (95.7%) out of total 1139 patients had blunt thoracic trauma, whereas 49/1139 (4.3%) presented with penetrating injuries.

Out of total 103 patients of chest trauma in our study, RTA was the most common mode of injury 71 (68.93%), followed by fall from height (18.44%), assault (7.76%) and fall in bathroom (4.85%). Mean age of different modes of injury that is, RTA, fall from height, assault, fall in bathroom were 31.5, 41.2, 35.1 and 62.3 respectively. Sharma et al also opined that maximum patients that is 284/500 (56.8%) had vehicular accidents, followed by 154 (30.8%) patients of assault, 51 (10.2%) of bull horn injury and 11 (2.2%) patients due to fall from height.

In the current study, out of total 103 patients of chest trauma, 45 (43.69%) patients had pneumothorax, 28

(27.18%) had surgical emphysema, 21 (2.39%) had hemothorax, 10 (9.70%) had hemo/pneumothorax, 18 (17.47%) had lung contusion, 10 (9.70%) had lung laceration and 64 (62.13%) patients had other associated injuries. Al-Koudmani et al observed in their study that 51% of the patients of chest trauma had pneumothorax, 38% had hemothorax and 15% had pulmonary contusion.

In the current study, 90 out of total 103 patients had ribs fracture. Out of these 90 patients, 12 had single ribs fracture, 23 had 2 ribs fracture and 55 had more than 2 ribs fracture. 21 of them had bilateral ribs fracture and 11 had flail chest. Dalals et al observed that out of a total of 402 patients of chest trauma, 40 had single rib fracture, two ribs were fractured in 61 patients and 210 patients had multiple ribs fracture. In 31 patients of multiple ribs fracture, flail chest was seen.

Out of the total 103 patients of chest trauma included in our study, 46 (44.66%) were treated conservatively, 55 (53.40%) of them required tube thoracostomy i.e. ICTD insertion, while 2 (1.94%) patients required thoracotomy. Khan MLZ et al stated that out of total 103 patients of chest trauma, 30 patients did not require any operative intervention and were treated conservatively, 64 patients needed ICTD placement and 9 patients required thoracotomy.

In the current study, out of the 55 cases in whom ICTD was placed, 10 had complications. 7 of them had residual hemothorax and recurrent pneumothorax was seen in 3 patients. Residual hemothorax patients were treated conservatively and recurrent pneumothorax patients needed re-insertion of ICTD. Khan et al stated in his study that 15 out of 64 patients who had tube thoracostomy developed complications. 8 of 15 developed pneumonia, 5 had wound infection and 2 of them developed empyema.

In the current study it is observed that 18 patients developed complication during treatment period. 7 of them developed pneumonia, 5 of them had collapse of lung (atelectasis) due to injury while performing bronchoscopy, 3 patients developed recurrent pneumothorax which required re-insertion of ICTD, rest 3 landed up in sepsis. Al-Koudmani et al concluded in the study that complications developed in 78 (total=888) patients out of which most common complication was prolonged air leak among 39 cases, followed by clotted hemothorax in 15 patients, atelectasis in 7 cases, pneumonia in 5, empyema in 5, ARDS in 3, surgical bleeding in 2 and peptic ulcer in 2 patients.

In the current study, out of the total 103 patients of chest trauma, 82 (79.61%) patients were cured and discharged without any complication, 18 (17.47%) patients had complications during treatment and 3 (2.91%) patients were deceased giving a mortality rate of 2.91%. Ismail et al opined in their study that 405 out of 472 patients (85.80%) were cured and discharged without having any

complications during treatment whereas, 33 (6.99%) patients had complications and 34 patients (7.2%) died out of which 6 patients died due to thoracic injury alone whereas, in 28 patients cause of death was polytrauma. 20 patients died due to cranial injury and 8 patients due to abdominal trauma.

### Limitations

The study was retrospective, hence it relied on accuracy of written record and important data may not be available. Our study was solely based on in patient data hence data of patients treated on an outdoor basis could not be included in the study. As our study is a single centre study without the possibility to transfer the results to a general population, hence further studies are needed to evaluate the influence of different methods of treatment and follow up on the outcome of patients with severe thoracic injuries.

### CONCLUSION

The extent of thoracic trauma, a life threatening condition is a common risk factor for mortality and morbidity in polytrauma victims. This risk has been associated with the presence of rib fractures, younger age group and associated head and abdominal injuries. Mortality varies on the etiological factors, type of injury, mode of injury, additional systemic pathology and treatment facilities. Hence a multidisciplinary approach is required in patients with severe thoracic trauma and also to highlight the fact that majority of these patients were treatable with simple procedures like tube thoracostomy or ICU based treatment and thoracotomy which is rarely indicated and will significantly reduce the morbidity and mortality. Hence, we conclude that the severity of chest wall injury in polytrauma patients directly correlate with the overall outcome of trauma patients and timely intervention can add to the overall survival and better quality of life of these patients.

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