

Profile of patients with chest injuries in a teaching hospital in Gandaki province Nepal: An observational study

Karki OB¹  

¹Om Bahadur Karki, Associate Professor, Department of Surgery, Manipal College of Medical Sciences, Pokhara, Nepal

ABSTRACT

Introduction: Chest is one of the common sites of injuries in trauma with significant morbidity and mortality. Thoracic trauma may be classified as chest wall, pleura, pulmonary and mediastinum injury. However, data on chest injuries are scarce.

Objective: This study aimed to review the clinical profiles of patients with traumatic thoracic injury and to analyze the management approaches and outcome.

Methodology: An observational study was carried out for chest injury patients in Manipal teaching hospital for eighteen months duration. Demographic profile, mode of injury, management, and outcomes were studied. Descriptive statistics like frequencies and percentage was used to describe the patient profile and logistic regression was used to assess the outcome and mortality risk factors. P-value of <0.05 was considered statistically significant.

Results: Total 112 patients were studied with mean age 47.98 ± 19.57 years. Road traffic accidents (59.8 %) remained the most common cause of trauma followed by fall injuries (34.8%). The pattern of injuries observed were: rib fracture only in 27(24.1%), fractured rib with pneumothorax 35(31.3%), hemopneumothorax 22(19.6%), hemothorax 13(11.6%), flail chest 5(4.5%). Right 48(42.9%), left 29(25.9%) while 35(31.3%) of the patients had bilateral chest injuries. Mortality was in 4(3.6 %) patients. Hospital stay >5 days was significantly associated with presence of extra thoracic ($p=0.023$) and mechanism of injury ($p=0.017$)

Conclusion: Young males are usually affected in chest trauma. Road traffic accidents are common cause of it however, most patients can be managed conservatively and length of hospital stay is dependent on presence of associated injuries and mechanism of injury.

Keywords: Flail chest; Hemothorax; Pneumothorax; Rib fracture; Thoracic injuries.

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Address for correspondence

Dr. Om Bahadur Karki
Associate Professor, Department of Surgery, Manipal College of Medical Sciences, Pokhara, Nepal
Phone number: +977-9846080576
E-mail: karki10@gmail.com

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INTRODUCTION

Chest trauma implies trauma to either or combination of different thoracic structures: chest wall, pleural space, lung parenchyma and the mediastinum.^{1,2} Being a part of torso, chest injuries accounts for about 10% of all trauma admissions and 25–50% of trauma deaths globally.³

Chest injuries have a direct attribution in 25% of trauma related mortality and as a contributing factor in another 25%; large number of patients (80%) can be managed with analgesics, respiratory support and intercostal chest tube drainage.^{3,4} Only a few of them require thoracotomy or video assisted thoracoscopic surgery (VATS).⁵ The incidence of chest injuries has been increasing mainly because of road traffic accidents (RTAs). High speed motor vehicle accidents lead to life-threatening conditions such as fracture of ribs, tension pneumothorax, massive hemothorax, flail chest and injury to larger vessels. Chest injuries can be classified as

open (penetrating) and closed (blunt), the latter being more prevalent, with prevalence of 70-90%.⁶⁻⁷

This study aims to review chest injury experience in a tertiary care center of western Nepal, to profile the clinical presentations, type and mode of injury and to analyze the outcome of such patients, so as to optimize their management strategy.

METHODOLOGY

This is a prospective longitudinal observational study conducted in department of surgery, Manipal Teaching Hospital, Pokhara, Nepal. The approval for the study was obtained from the Institutional health Research Ethics Committee with registration number IRC 155-156/GA. The total duration of study was from December 2022 to June 2024 and purposive non-probability sampling technique was used. The sample size was calculated by using the formula: $n = z^2 pq / d^2$, where prevalence ($p=8\%$ from previous study by Sah SP et al.⁸) 95% confidence interval ($z=0.95$) and margin of error ($d=0.03$) was found to be approximately 74. We included 112 patients admitted during the study period so as to avoid anticipated dropouts or loss to follow up. Parameters including demographic profile, mode of injury, management, and outcomes were studied. After admission all the patients were evaluated with detail history and systemic physical examination, relevant laboratory and radiological investigations including chest X-rays (CXR) and computed tomography (CT scan). CXR was done in all the patients of suspected chest injuries and CT scan was indicated whenever patients had severe chest pain, dyspnea, hypoxia, altered mental status with equivocal /inconclusive CXR findings, severe associated injuries, or when there was suspicion of major thoracic trauma like aortic injury, diaphragmatic tear, or significant pulmonary contusion. Inter costal drainage tube was inserted when required in patients with pneumothorax, hemothorax or hemopneumothorax as per surgeon's discretion to remove air, blood or pleural fluid. Antibiotics were administered for patients with chest tube insertion, lung contusions, or other open injuries. Pain management included oral or intravenous nonsteroidal anti-inflammatory drugs, oral or intravenous paracetamol and loco-regional anesthesia such as intercostal nerve blocks and thoracic epidural analgesia. General in-hospital care including monitoring of respiration, heart rate, arterial blood pressure, urine output, thoracic drainage, arterial blood gas analyses were provided to the patients as required. Patients with chest trauma and admitted in Manipal Teaching Hospital with length of stay >24 hours and those who

agreed to participate in study were included in the study. Both blunt and penetrating injuries were included for study. Patients treated only in an outpatient setting or transferred to another institution, pregnant females, patients with severe head injury or major associated other injuries like vascular injuries that could complicate the evaluation and management of chest injuries or potentially impact the study results, were excluded from the study. Associated injuries were managed appropriately according to the type of injury.

Patients were followed up till discharge or death. The length of hospital stay and mortality as measures of outcome was recorded at the end of follow up period. The minimum follow-up period was thirty days. The analyzed data included demographic profile of patients, mode and mechanism of injury, types of chest injuries, management, and outcome. Morbidity was assessed in terms of length of hospital stay (>5 days), complications and mortality as mortality within 30 days of hospital admission.

Data were entered in proforma and then in excel sheet and analyzed using BM SPSS Statistics for Windows, version 21 (IBM Corp., Armonk, N.Y., USA). Descriptive statistics like frequencies and percentage were used to describe the patient profile, type of injury etc. and logistic regression was used to assess the factors associated with outcome and length of hospital stay. P -value of <0.05 was considered statistically significant.

RESULTS

There were 112 patients with chest injuries who were admitted in Manipal Teaching Hospital (MTH) over a period of one and half years (December 2022 to June 2024). Of the 112 patients, 95 (84.8%) were males while only 17 (15.2%) were female with the ratio of 5.58:1. The mean age of the patients was 47.98 ± 19.57 years and most of them, 42(37.5%) were of the age group 40-60 years. (Figure1). Manipal teaching hospital being a tertiary level hospital of the Gandaki province of Nepal, cases were referred from different districts of the province, still majority of the patients were resident of Kaski district 48(42.9%) followed by natives from Syangja 19(17.0%) and Tanahun 13(11.6%). Road traffic accident 67(59.8%) was common mode of sustaining chest injuries in our study. Among RTAs, in our study, motorized two-wheelers were the most affected victims 61(54.2%) followed by passengers of public jeeps or buses running in remote areas. This can be attributed to the poor road condition of the area and less compliance to the traffic rules by the drivers. There were significant number of

patients with fall injuries 39(34.8%) as well. We also had other modes of sustaining chest injury like physical assault five (4.5%), animal attack one (0.9%). Penetrating injuries as mechanism of trauma to chest was observed only in 10.7% of patients, while vast majority were due to blunt injury 100(89.3%) to thorax. About half the number of patients (n=58; 51.8%) had exclusive chest injuries only. Associated other systemic injuries like injury to abdominal organs 17(15.17%), vertebra injury 12(10.71%), minor or moderate head injury 11(9.81%), fracture of other bones 11(9.81%), diaphragmatic injury 4(3.57%) were witnessed in 55(49.1%) of the patients in the study. The pattern of chest injuries observed were: rib fracture with pneumothorax in 35(31.3%), simple rib fractures only in 27(24.1%), fractured ribs with hemopneumothorax 22(19.6%), hemothorax 13(11.6%), flail chest 5(4.5%). Right sided chest injuries were present in 48(42.9%), left sided in 29(25.9%) while 35(31.3%) of the patients had bilateral injuries. (Table 1) Most of the patients in our study group were managed conservatively 65(58.03%). Intercostal chest tube drainage was required for management in 41(36.60%) of the patients while

6(5.35%) only required thoracotomy. Video assisted thoracoscopic surgery (VATS) was performed in two patients in our study, one for control of bleeding in massive hemothorax and next for pleurodesis and drainage of pyothorax. Trained Cardiothoracic and vascular surgeon was however not available in our centre during the study period. Atelectasis 22(19.64%), pneumonia 15(13.39%) and septicemia 9(8.03%) were common morbidities noted in patients with thoracic injury. In present study, majority of patients 108(96.4%) could be discharged in a satisfactory condition. During the study period, mortality was observed in 4(3.6%) of patients only. (Table 2) The average length of hospital stay of our study patients was 6.73 ± 4.48 days and was significantly associated with presence of extra thoracic injuries ($p=0.023$) and mechanism of trauma ($p=0.017$) (Table 3). Similarly female gender was associated with high risk of mortality ($p=0.001$) in this study. Patients who expired were of female sex and had multiple associated injuries including abdomen, fracture of vertebra and soft tissue injury. (Table 4)

Table 1: Distribution of study population according to the mechanism and type of chest injury.

Variable	n (%)
Mechanism of injury	
Blunt	100 (89.3)
Penetrating	12 (10.7)
Mode of Injury	
Road traffic accidents	67 (59.8)
Fall injuries	39 (34.8)
Physical assaults	5 (4.5)
Side	
Right	48 (42.9)
Left	29 (25.9)
Bilateral	35 (31.3)
Diagnosis	
Rib fracture (simple)	27 (24.1)
Flail chest	5 (4.5)
Hemothorax	13 (11.6)
Rib fracture+pneumothorax	35(31.3)
Hemopneumothorax	22(19.6)
Soft tissue injury	10(8.9)

Table 2: Complications and outcome of the patient with chest injury

Variable	n(%)
Complications	
Atelectasis	22 (19.64)
Pneumonia	15 (13.39)
Septicemia	9 (8.03)
MODs	7 (6.25)
Pyothorax	2 (1.78)
Outcome	
Discharged	108 (96.4)
Expired	4 (3.6)

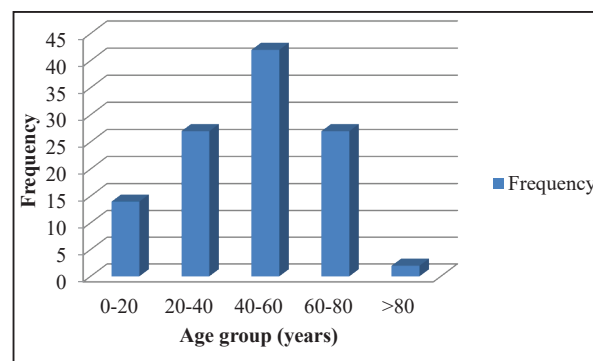


Figure 1: Frequency distribution of patients based on their age group (years).

Table 3: Multivariate logistics regression analysis for length of hospital stay (LOS) > 5 days.

Variable	Adjusted OR(95% CI)	p-value
Mechanism of injury	0.117 (0.03-0.8)	0.017
Sex	0.51(0.17-1.49)	0.22
Associated injuries	2.38(1.11-5.09)	0.023
Site (Unilateral/ bilateral)	1.89(0.84-4.27)	0.12

Table 4: Multivariate logistic regression analysis for mortality.

Variable	Adjusted OR(95% CI)	p-value
Sex	0.05 (0.005-0.51)	0.001
Mechanism of injury	0.96 (0.92-0.99)	0.48
Associated injuries	0.31 (0.031-3.07)	0.25
Site (Unilateral/ bilateral)	0.14 (0.01-1.4)	0.055

DISCUSSION

Chest trauma is an important public health problem accounting for about 10% of all trauma admissions and 25–50% of trauma deaths globally.³ In civilian practice, chest trauma is commonly caused by road traffic accidents and fall injuries and most of the injuries are found among young adult males. Road traffic accidents were the most common mode of injury (58.2%) in present study followed by fall injuries 39(34.8%). Study by Walia et al. from India also pointed that RTA is the most common mode of injury (58.69%) followed by assaults (42.39%).³

Our study showed males suffered more chest injuries than females, Similar observation of male dominance with ratio of 7:1 was made by Okugbo Su et al.⁹ and the age with higher incidence of chest trauma was in 4th to 6th decades, consistent with the study of Chrysou et al.¹⁰ who reported that the maximum number of patients belonged to the age group 41 to 60 years (66%). These observations could be because males are more involved in outdoor activities with active participation in high risk taking and sports compared to females and older age group.¹¹ In the present study most of the patients sustained blunt injury with the ratio of blunt to penetrating injury as 8.6:1. Other studies had documented proportions ranging from 3:1 to 70:1.¹¹⁻¹³ RTA remains a leading cause of trauma and admissions to the accidents and emergency units of most hospitals and thereby contributing significantly to high morbidity and mortality.^{14,15}

Another mark of severity of chest trauma in our study was bilateral chest involvement. Physiological effects like chest pain, recruitment of accessory muscles of

respiration, pulmonary contusion, hypoxia and arterial desaturation are expected to be worsened in patients with bilateral chest involvement compared with unilateral chest injuries.^{12,16,17} Detail and comprehensive primary and secondary survey of trauma with proper clinical examination together with information on the mechanism of injury will provide information on potential severity of thoracic injury.¹⁸ Inspection, palpation, percussion and auscultation have a very high index of sensitivity (90%) and specificity (98%) in diagnosis of tension pneumothorax.¹⁹ Chest X-ray is the first investigation for evaluation but computed tomography (CT) thorax remains a better choice for providing information about internal injuries including lung contusion. Pulmonary contusion may not be immediately apparent radiographically in one-third of patients and hence often it requires follow-up chest radiograph for confirmation of the diagnosis.¹⁹⁻²⁰ In the present study, most of the patients had undergone a CT thorax for detail evaluation of thoracic injuries. However, chest CT exposes patients to radiation doses which may increase their risk of cancer in future. Moreover, chest CT is expensive and does not always provide much additional information if completed after a normal chest X-ray.²¹ Most of the patients in our study presented hours to even days after injury. Delay in presentation has been found to be caused by non-availability of means of transportation especially when the accident occurs beyond 35 miles from the trauma center.²² Air-ambulance would be the most ideal means of transportation in such circumstances to meet the golden hours before onset of deterioration and complications which unfortunately is expensive and not readily available in resource limited county like Nepal.

Nearly 10-15% of patients who sustain thoracic trauma undergo emergent thoracotomy or VATS for resuscitation, may be for massive hemothorax, major thoracic vascular injuries, cardiac tamponade, tracheobronchial injuries, or evidence of esophageal injury. The remaining 85-90% of patients can be managed with tube thoracostomy, pain control, pulmonary toilet, and observation.²³ Only two patient in our study required VATS for their management but unfortunately an elderly woman who underwent VATS for control of massive hemothorax ultimately succumbed to death. Experienced CTVS surgeon could have made a difference in such circumstances. Common complications seen in our study were atelectasis (20.89%) followed by pneumonia (17.9%), septicemia (13.4). In the study by Kumar et al, the most common causes of morbidity were pneumonia (10%) atelectasis (10.06%) and septicemia (6%).²⁴ The overall mortality rate in this study was 4.5% and this is also comparable to study by kumar et al.²⁴ who had mortality rate of 6% and to other similar studies which have documented mortality rates ranging from 2.2% to 33%.^{20,25} The pattern of associated extra-thoracic injuries in this study is in agreement with findings from study by Lema MK et al.⁴ Patients with extra thoracic injuries and bilateral chest involvement had longer hospital stay and was statistically significant in our

study similar to the findings by Lema MK et al. In study by Yimim AE et al.²⁶ from Ethiopia, chest injury patients who had associated head and neck injury were four times more likely to die than their counterparts (AOR 3.56, 95% CI 1.31e9.72). Also, patients who had associated spinal cord injury were five times more likely to die than their counterparts (AOR 4.8, 95% CI 1.13e20.47).

This is a single centered study and cardiothoracic surgeon was not available in the institution during the time of study which could have affected the management of some patients.

CONCLUSION

Young adult males in their most productive age group are usually affected by trauma. Road traffic accidents continue to be the major etiological factor for chest injuries. However, most patients can be managed by conservative treatment and mortality is also low if timely intervened. Associated extra thoracic organ injury and severe chest injury as characterized by bilateral chest involvement correlated positively with morbidity.

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Source(s) of Support: None

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