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Clinical Profile and Management of Blunt Chest Trauma Patients at Tertiary Care Centre - A Cross Sectional Study

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Abstract: ***Blunt chest trauma (BCT) remains a critical public health issue, particularly in India, where increasing road traffic accidents contribute significantly to trauma-related hospital admissions. This cross-sectional study conducted at a tertiary care centre aimed to evaluate the demographic profile, injury mechanisms, clinical features, and management outcomes of BCT patients. A total of 104 patients were analyzed, with the majority being young adult males aged 20–40 years. Road traffic accidents were identified as the primary cause (59.6%), followed by falls and assaults. Chest pain and breathlessness were the most common symptoms, with radiological evaluations revealing hemothorax, pneumothorax, and hemopneumothorax as predominant injuries. Most cases were managed with chest tube insertion and conservative measures in accordance with ATLS protocols. The average hospital stay ranged from 8 to 14 days. Mortality was low (2.9%), with all fatalities occurring within the first week, indicating the importance of early intervention. The study emphasizes the need for standardized treatment protocols, improved trauma care systems, and preventive strategies to reduce BCT burden in India.***

Keywords: Blunt chest trauma, Road traffic accidents, Chest tube insertion, Tertiary care

1. Introduction

Blunt chest trauma (BCT) is a significant contributor to trauma-related morbidity and mortality worldwide, particularly in developing countries like India, where road traffic accidents (RTAs) are rising exponentially. Even minor external trauma to the chest cavity, which houses vital organs can lead to life-threatening complications. In India, BCT is predominantly caused by vehicular accidents, falls from height, and physical assault, and is commonly managed at tertiary care centres that serve as referral hubs for such emergencies [1].

Studies have consistently shown that young adult males are the most affected group. In a prospective study in Maharashtra, males between the ages of 20 and 40 years accounted for the majority of BCT admissions, with an M:F ratio of over 6:1. RTAs were the leading cause, responsible for nearly half of the cases [1]. Similarly, a large cohort study from Gujarat emphasized that blunt trauma constituted over 80% of chest trauma cases, with 405 out of 500 patients suffering from BCT due to RTAs, again affecting primarily young men [2].

The clinical presentation of BCT varies widely—from simple rib fractures to complex hemopneumothorax and pulmonary contusions. Pain over the chest wall, tenderness, dyspnea, and decreased breath sounds are common findings. In a Haryana-based cross-sectional study, most patients presented with rib fractures, hemothorax, and pneumothorax, and a significant portion of these injuries were managed with intercostal chest drainage (ICD), demonstrating the critical role of prompt and targeted intervention [3].

The standard approach to managing BCT in tertiary care centres follows Advanced Trauma Life Support (ATLS) guidelines, which prioritize airway, breathing, and circulation. A study from Yavatmal, Maharashtra, highlighted that most patients were managed conservatively (86.59%) or with ICDs (12.19%), while thoracotomy was needed in only 1.22% of cases. Pain management also played a key role, with nerve blocks and epidurals used for high Visual Analogue Scale (VAS) scores [4].

Radiological evaluation remains essential. Recent studies also stress the growing role of bedside tools such as extended Focused Assessment with Sonography in Trauma (e-FAST). In a prospective study from South India, e-FAST showed diagnostic accuracy comparable to non-contrast CT (NCCT) scans, making it a valuable modality for early triage in stable patients [5].

Despite the increasing use of diagnostic tools and better adherence to protocols, mortality, though low, still exists. A study from Srinagar reported a mortality rate of 6.25%, primarily among patients with multiple rib fractures and associated internal injuries. Their results emphasized that most patients recovered well with integrated, multidisciplinary management involving surgery, anesthesiology, orthopedics, and critical care [6].

Associated injuries often complicate BCT. Neurotrauma, blunt abdominal trauma, and orthopedic injuries are commonly observed in polytrauma cases, increasing the need for efficient coordination among specialties. A prospective observational study from the Himalayan Hospital noted that in 61% of BCT cases, polytrauma was present, underscoring the importance of early recognition and fast intervention to

reduce hospital stay and improve outcomes [7].

Another retrospective analysis from Kashmir reported that among 160 chest trauma patients, 65% underwent tube thoracostomy, while 28% were managed conservatively. Associated head and neck injuries were the most common co-morbid findings. The study highlighted that timely and appropriate management led to a high recovery rate despite limited resources [8].

Pain control is often underemphasized but plays a crucial role in recovery. In the Patiala study, pain over the chest wall was present in over 80% of cases, and most patients with rib fractures required effective analgesia to aid respiration and prevent complications like atelectasis and pneumonia [9].

Despite the overall positive outcomes reported across studies, the lack of uniform national guidelines remains a challenge. A critical review by Mohta et al. emphasized that dedicated trauma teams and evidence-based protocols could greatly improve outcomes. Many hospitals still face limitations in manpower, ICU resources, and timely radiological support [10].

In summary, BCT continues to be a major clinical challenge in India. It most commonly affects young men involved in road accidents, presents with diverse injury patterns, and often requires conservative or semi-invasive treatment. Early recognition, adherence to trauma protocols, and interdisciplinary collaboration significantly improve patient outcomes.

2. Literature Survey

Blunt chest trauma (BCT) is one of the most frequent injuries in polytrauma patients and a major contributor to trauma-related morbidity and mortality. Several Indian studies have examined the clinical spectrum, epidemiology, and management outcomes of BCT at tertiary care centres.

Epidemiology and Demographics:
Multiple studies consistently report that young adult males are the most affected group, with road traffic accidents (RTAs) being the predominant cause of BCT. Bansod et al. (2023) and Potey et al. (2020) found that males in the 20–40 age group accounted for the majority of cases, with RTAs being responsible for over 70% of incidents [1,4]. Similarly, Tolia and Bhatt (2020) reported that 81% of chest trauma cases were due to blunt injuries, with high prevalence among males [2].

Clinical Presentation:
Common clinical findings include chest wall pain, rib fractures, hemothorax, pneumothorax, and pulmonary contusions. Verma and Bhardwaj (2023) observed rib fractures and hemothorax as the most frequent injuries in BCT patients, while Mittal and Ray (2023) found that 61% of patients had polytrauma with associated head, abdominal, or limb injuries [3,7].

Management Strategies:
Most cases of BCT are managed conservatively. Studies by Potey et al. (2020) and Khursheed et al. (2019) reported that over 85% of patients were treated non-surgically, with intercostal chest drainage (ICD) used in moderate to severe cases [4,8]. Only a small fraction required thoracotomy or surgical intervention. Pain control and supportive care remain crucial elements in improving outcomes [9].

Diagnostic Tools:
The use of extended Focused Assessment with Sonography in Trauma (e-FAST) has gained attention for its speed and accuracy. Devadoss et al. (2021) demonstrated that e-FAST had comparable diagnostic utility to CT scanning in stable patients, making it valuable in resource-limited emergency settings [5].

Outcomes and Mortality:
Outcomes are generally favorable with timely intervention. Akhter et al. (2019) and Mohta et al. (2006) emphasized that mortality rates are low when patients receive prompt and multidisciplinary care, although missed injuries and delayed diagnosis still pose risks [6,10].

3. Problem Definition

Blunt chest trauma (BCT) is a major cause of morbidity and mortality among trauma patients, especially in developing countries like India, where the incidence of road traffic accidents, falls, and assaults is high. Despite its clinical significance, there is a lack of standardized protocols and comprehensive region-specific data regarding the epidemiological patterns, injury types, associated complications, and effectiveness of various management approaches for BCT.

In many Indian tertiary care centres, patients present with a wide spectrum of chest injuries, from simple rib fractures to life-threatening hemothorax and pulmonary contusions. However, treatment strategies vary widely, with most patients being managed conservatively and only a small percentage requiring surgical intervention. While advanced trauma life support (ATLS) guidelines exist, their consistent application, along with access to diagnostic tools like e-FAST and CT, remains inconsistent across institutions.

There is a pressing need to systematically evaluate the clinical profile, diagnostic methods, treatment modalities, and outcomes of patients with blunt chest trauma in the Indian tertiary care setting. This will help in identifying gaps in current practices, improving resource allocation, optimizing patient management, and reducing mortality and complications.

4. Methodology / Approach

1) Study Design
This was a cross-sectional observational study conducted to evaluate the clinical presentation and management strategies of blunt chest trauma cases. The study involved real-time data collection from eligible patients admitted to the hospital during the defined period, without any intervention or alteration in standard care protocols.

2) Study Setting
The research was conducted at Rohilkhand Medical College and Hospital (RMCH), Bareilly, a tertiary care center with a

dedicated emergency and trauma unit that regularly receives chest trauma cases from both urban and rural regions of Uttar Pradesh.

3) Study Duration
The study was carried out over a one-year period from August 1, 2023, to July 31, 2024. This ensured the inclusion of cases across all seasons and provided sufficient time to gather and analyze a representative patient sample.

4) Participants – Inclusion/Exclusion Criteria
Patients aged 18–60 years with isolated or associated blunt chest trauma were included. Excluded were those below 18 or above 60 years, and patients with cardiac, mediastinal, penetrating, or medical causes of chest injury. Only admitted patients giving informed consent were enrolled.

5) Study Sampling
Convenience sampling was used to select all eligible and consenting patients with blunt chest trauma who were admitted during the study period. No randomization was done, and all cases fitting the criteria were included prospectively.

6) Study Sample Size
The estimated sample size was 100, calculated using the formula $N = 4pq/L^2$, with P = 93.3% and a 5% margin of error. The final sample size included 100 patients, accounting for potential data loss or dropouts.

7) Study Groups
As this was a non-comparative, observational study, no grouping or randomization was performed. All patients were observed as a single study group based on their inclusion in the defined criteria.

8) Study Parameters
Parameters studied included age, gender, mode of injury, clinical features, investigations, type of chest injury (rib fracture, pneumothorax, hemothorax, etc.), treatment approach (conservative or surgical), complications, and treatment outcomes including length of stay.

9) Study Procedure
Eligible patients were assessed clinically, underwent necessary imaging, and were managed according to hospital protocols. Data were recorded throughout the course of hospitalization, from admission to discharge or referral, using a pre-designed format.

10) Study Data Collection
Data were collected through direct patient interaction, clinical examination, imaging reports, and treatment records. A structured data sheet was used to ensure consistency, and the principal investigator regularly verified entries to ensure accuracy.

11) Data Analysis
Data were coded and entered into SPSS version 23.0. Descriptive statistics were used for demographics and injury patterns, while appropriate tests like chi-square or t-tests were applied to assess significance. A p-value < 0.05 was considered statistically significant.

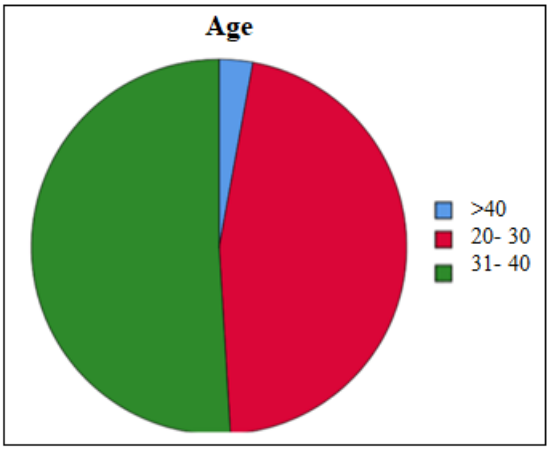
12. Ethical Considerations
Ethical clearance was obtained from the Institutional Ethics Committee of RMCH. Written informed consent was taken from all participants. Confidentiality and voluntary participation were ensured throughout the study.

5. Results & Discussion

1) Age Distribution of Patients
Young adults (20–40 years) constituted the vast majority (97.2%) of blunt chest trauma cases, indicating high-risk behavior or occupational exposure. This highlights the vulnerability of this age group to trauma-related injuries (Table 1).

Table 1: Age distribution of patients with blunt chest trauma

Age Group (Years)	Frequency	Percent
20–30	48	46.2%
31–40	53	51.0%
>40	3	2.9%
Total	**104**	**100%**

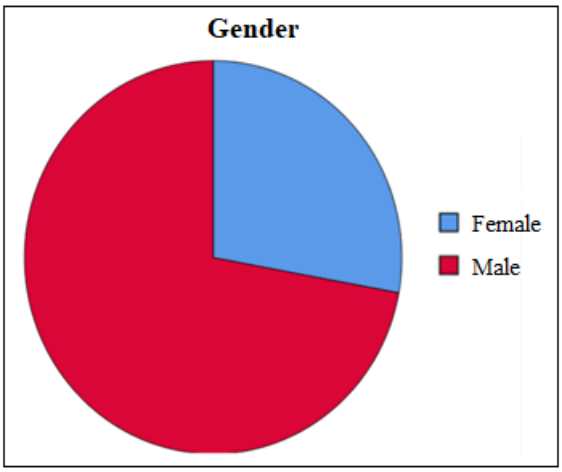


Graph 1: Age distribution of patients with blunt chest trauma

2) Sex Distribution
A clear male predominance (72.1%) was seen among blunt chest trauma cases, likely due to occupational exposure and lifestyle risks. Female patients represented a significantly smaller proportion (Table 2).

Table 2: Gender distribution of patients with blunt chest trauma

Sex	Frequency	Percent
Female	29	27.9%
Male	75	72.1%
Total	**104**	**100%**



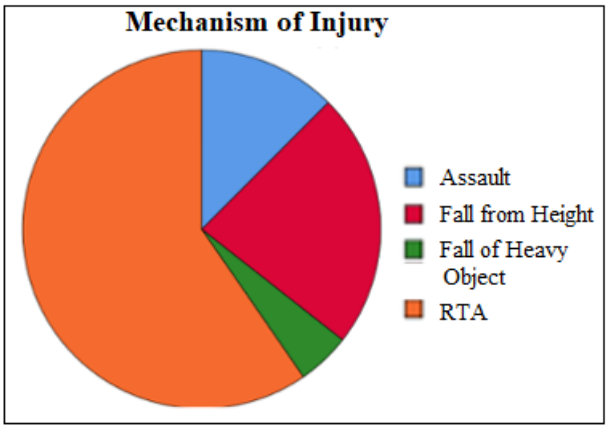
Graph 2: Gender distribution of patients with blunt chest trauma

3) Mechanism of Injury

Road traffic accidents (RTAs) accounted for nearly 60% of all injuries, making them the most common cause of blunt chest trauma. Falls and assaults were less frequent but notable (Table 3).

Table 3: Mechanism of injury in blunt chest trauma patients

Mechanism of Injury	Percent
Fall of Heavy Object	5 (4.8%)
Assault	13 (12.5%)
Fall from Height	24 (23.1%)
RTA	62 (59.6%)
Total	**104 (100%)**



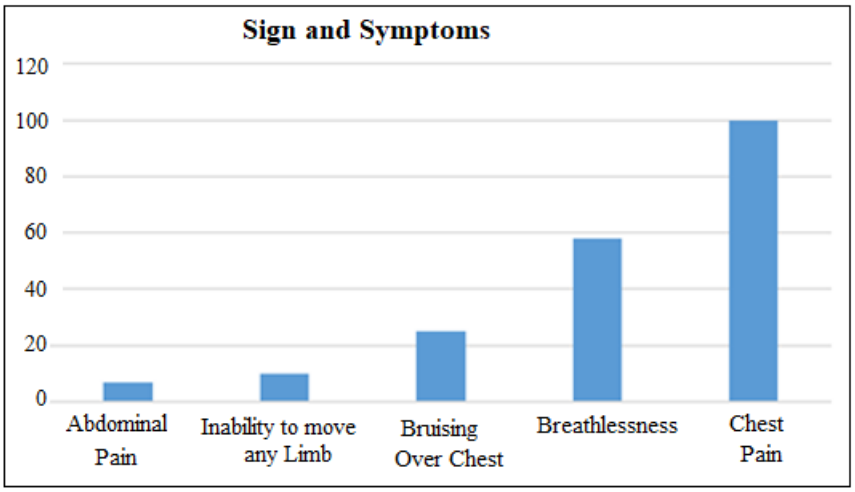
Graph 3: Mechanism of injury in blunt chest trauma patients

4) Presenting Symptoms

Chest pain was universally present (100%), with over half (55.7%) reporting breathlessness. Other symptoms like bruising and limb immobility were also observed in notable numbers (Table 4).

Table 4: Symptoms at presentation in blunt chest trauma patients

Sign and Symptoms	Frequency	Percentage
Abdominal pain	7	6.7%
Inability to move any limb	10	9.7%
Bruising over chest	25	24.03%
Breathlessness	58	55.7%
Chest pain	104	100%



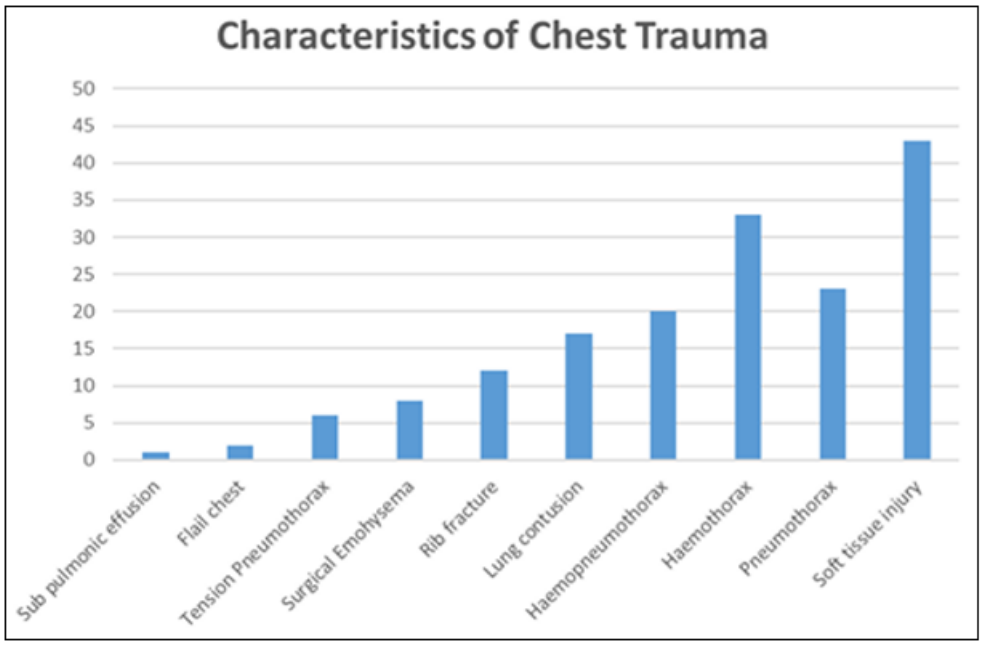
Graph 4: Symptoms at presentation in blunt chest trauma patients

5) Chest Trauma Types

Hemothorax (31.8%) and hemopneumothorax (19.2%) were the most common chest injuries, with pneumothorax and lung contusions also frequently observed. These conditions required immediate diagnosis and management (Table 5).

Table 5: Types of blunt chest trauma observed

Characteristic of Blunt Chest Trauma	Frequency
Subpulmonic effusion	1
Flail Chest	2
Tension Pneumothorax	6
Surgical Emphysema	8
Rib Fracture	12
Lung Contusion	17
Hemopneumothorax	20
Hemothorax	33
Pneumothorax	23
Soft Tissue Injury	43



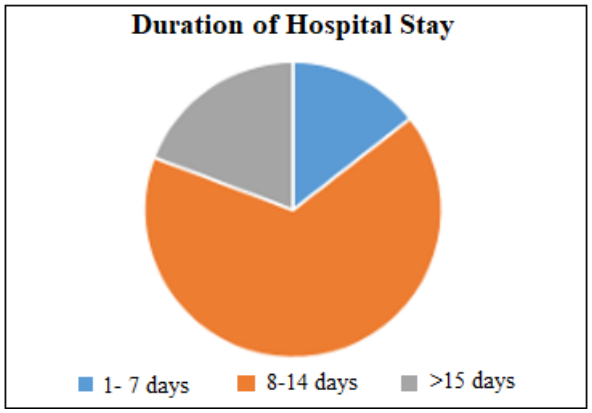
Graph 5: Types of blunt chest trauma observed

6) Duration of Hospital Stay

Most patients (66.3%) required 8–14 days of hospitalization, reflecting moderate injury severity. Only a small number (14.4%) were discharged within one week (Table 6).

Table 6: Hospital stay duration in blunt chest trauma patients

Duration of Hospital Stay	Number of Patients
1-7 days	15
8-14 days	69
>15 days	20
Total	104



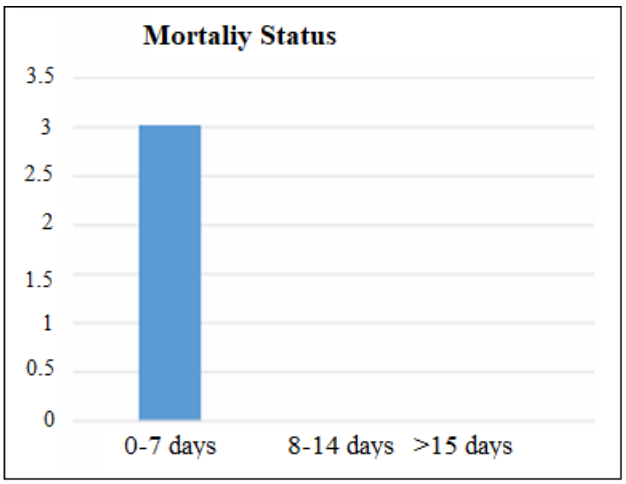
Graph 6: Hospital stay duration in blunt chest trauma patients

7) Mortality Status Post-Admission

The in-hospital mortality rate was low at 2.9%, reflecting effective emergency care. All deaths occurred within the first 7 days, highlighting the critical early phase of management (Table 7).

Table 7: Mortality status post-admission in blunt chest trauma patients

Days	Frequency
0-7 days	3
8-14 days	0
>15 days	0



Graph 7: Mortality status post-admission in blunt chest trauma patients

6. Discussion

Among the 104 patients, BCT predominantly affected males (72.1%) aged 20–40 years (97.2%), with road traffic accidents (RTAs) being the most common cause (59.6%). These findings align with national and global trends. For instance, Bansod et al. (2023) reported a similar male predominance and noted that vehicular accidents caused nearly half of the BCT cases in their Maharashtra-based study [1]. Akhter et al. (2019) also found RTAs to be the leading mechanism in their Srinagar cohort, with young adult males comprising the majority of cases [6].

Symptomatically, chest pain was universal (100%), and breathlessness was reported in over half the cases (55.7%). This parallels results from Wilkins (1978) and Stewart (2014), who identified pain and respiratory distress as key early symptoms in blunt thoracic injuries [11, 12].

Regarding injury patterns, our study found hemothorax (31.8%) and hemopneumothorax (19.2%) as the most frequent findings, corroborating results by Sinha (2019), who also

reported a high prevalence of thoracic effusions and contusions [13]. These conditions often required intercostal chest drainage, which was the primary intervention in our series—consistent with treatment modalities emphasized in the studies by Akhter et al. and Mohta et al [6, 10].

Only 2.9% of our patients succumbed to their injuries, all within the first 7 days. This is slightly lower than mortality figures reported by Akhter et al. (6.25%), likely due to prompt and conservative interventions in our setting [6].

Overall, our findings reinforce that early diagnosis, adherence to ATLS protocols, and conservative management—especially ICD placement and pain control—remain the mainstay of care for BCT in tertiary centres.

7. Conclusion

Blunt chest trauma primarily affects young adult males, with road traffic accidents being the leading cause. Hemothorax and hemopneumothorax were the most common injuries, often requiring chest tube insertion. Most patients were managed successfully with conservative treatment, and the overall mortality rate was low. Early intervention within the first week was crucial for survival. The study emphasizes the importance of timely diagnosis, adherence to trauma protocols, and multidisciplinary care to improve outcomes in patients with blunt chest trauma.

8. Future Scope

Future research on blunt chest trauma should focus on developing region-specific clinical guidelines for early diagnosis and standardized management protocols across tertiary care centers. Incorporating artificial intelligence and advanced imaging techniques like portable CT or real-time E-FAST monitoring could enhance diagnostic accuracy. Larger multicentric studies are needed to evaluate long-term outcomes, complications, and quality of life post-discharge. Additionally, community-level interventions, including road safety education and trauma prevention programs, can play a critical role in reducing the incidence of such injuries.

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