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A CROSS-SECTIONAL STUDY ON PATTERN AND MORTALITY OF CHEST INJURIES AMONG VICTIMS OF ROAD TRAFFIC ACCIDENT AT MORTUARY SNMMC, DHANBAD, JHARKHAND.

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ABSTRACT

Background

Road traffic accidents (RTAs) have a major impact on low- and middle-income countries and are one of the world's top causes of morbidity and mortality. Chest injuries from RTAs contribute substantially to trauma-related deaths and disabilities due to their severity and complexity. This study aimed to analyze the patterns and mortality of chest injuries among victims of road traffic accidents, over a six-month period.

Methods

A cross-sectional study including 100 RTA victims with substantial chest injuries was carried out. SPSS version 21.0 was used to gather and examine information on the kind and frequency of chest injuries, related injuries, duration of hospital stay, treatment taken, and patient outcomes. Among RTA victims receiving hospital treatment, major chest injuries were the criterion for inclusion; minor injuries and those who had passed away at the scene were not included.

Results

Rib fractures were the most common chest injury (45%), followed by pulmonary contusions (30%), pneumothorax (15%), hemothorax (10%), flail chest (8%), and cardiac contusions (7%). Associated injuries included extremity fractures (40%), head injuries (25%), abdominal injuries (20%), spinal injuries (15%), and facial injuries (18%). Sixty percent of patients required operative treatment, with an average hospital stay of 15 days. The mortality rate was 45%. Significant correlations were found between the type of chest injuries and age, gender, and associated injuries.

Conclusion

Chest injuries from RTAs are a critical public health concern, with high mortality rates and significant associated injuries. The findings highlight the need for improved trauma care and targeted preventive measures to reduce the incidence and severity of chest injuries.

Recommendations

Enhancing pre-hospital care, establishing more trauma centers, and improving training for trauma care personnel are essential steps to reduce mortality and improve outcomes for RTA victims with chest injuries.

Keywords: *Chest Injuries, Road Traffic Accidents, Mortality, Trauma Care*
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INTRODUCTION

Road traffic accidents (RTAs) cause a great deal of illness and mortality and are a major global public health concern. The World Health Organisation (WHO) estimates that road traffic crashes claim the lives of 1.35 million people year, and between 20 and 50 million more sustain non-fatal injuries that frequently lead to permanent impairments [1]. Despite accounting for only 60% of global vehicle ownership, low- and middle-income nations account for 93% of road fatalities worldwide, and hence bear a disproportionately larger cost of RTAs [1].

Chest injuries are among the most severe outcomes of RTAs and contribute significantly to trauma-related mortality and morbidity. The thoracic region, due to its proximity to vital organs like the heart and lungs, is particularly vulnerable to high-impact injuries commonly sustained in vehicular accidents. These injuries can range from rib fractures and pulmonary contusions to more severe conditions like pneumothorax, hemothorax, and cardiac contusions. Prompt and effective management of chest injuries is crucial for improving survival rates and reducing long-term complications [2].

Recent studies have emphasized the critical need for improved trauma care systems and preventive measures to address the high incidence of chest injuries in RTAs. For instance, a study highlighted those advancements in pre-hospital care, rapid transportation, and the establishment of trauma centers have significantly reduced mortality rates in high-income countries. However, similar improvements are urgently needed in low- and middle-income countries to address the disparity in outcomes [3].

In the Indian context, road traffic injuries have emerged as a leading cause of death and disability. According to the

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Ministry of Road Transport and Highways (MoRTH), India reported over 150,000 deaths due to RTAs in 2019 alone [4]. The state of Jharkhand, with its mix of urban and rural landscapes, faces unique challenges in providing timely and effective trauma care. The lack of adequate trauma centers and trained personnel exacerbates the situation, leading to higher mortality rates from severe injuries, including those to the chest.

This study aims to examine the patterns and mortality of chest injuries among road traffic accident victims.

METHODOLOGY

Study Design

The study was designed as a Prospective cross-sectional study.

Study Setting

The study was conducted at the mortuary of Shaheed Nirmal Mahto Medical College (SNMMC) in Dhanbad, Jharkhand, over a six-month period from December 1st to May 31st 2024.

Participants

A total of 100 individuals were included in the study. These participants were victims of road traffic accidents who were brought to the mortuary.

Inclusion Criteria

- Victims of road traffic accidents who sustained significant chest injuries.

- Patients who were treated at the hospital but later succumbed to their injuries.

Exclusion Criteria

- Victims who sustained only minor injuries.

- Individuals who were declared dead upon arrival at the hospital.

Sample size

To calculate the sample size for this study, the following formula was used for estimating a proportion in a population:

$$n = \frac{Z^2 \times p \times (1-p)}{E^2}$$

Where:

- n = sample size

- Z = Z-score corresponding to the desired level of confidence

- p = estimated proportion in the population

- E = margin of error

Bias

Efforts were made to minimize selection bias by including all eligible participants within the specified period. However, the exclusion of minor injury cases and those dead on arrival might have introduced some bias.

Variables

The type and frequency of chest injuries, related injuries, length of hospital stay, treatments used, mortality results, and patient demographics (age, gender, etc.) were among the study's variables.

Data Collection

Prospective data collection was done using mortuary reports and hospital records. A systematic study questionnaire was created using the pertinent data on chest injuries, related injuries, length of hospital stay, treatment used, mortality, and demographic characteristics.

Statistical Analysis

Statistical Package for Social Sciences version 21.0 was used to enter and analyse the gathered data. The data, which included frequencies, percentages, means, and standard deviations, were summarised using descriptive statistics. Using the necessary statistical tests, the relationship between various variables and death rates was examined; a p-value of less than 0.05 was deemed statistically significant.

Ethical considerations

The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

RESULTS

study included 100 road traffic accident victims who sustained significant chest injuries. The types and frequencies of chest injuries observed are summarized in Table 1. The most common chest injuries were rib

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fractures, affecting 45% of the patients, followed by pulmonary contusions (30%), pneumothorax (15%), hemothorax (10%), flail chest (8%), and cardiac contusions (7%). These injuries were often accompanied by other serious conditions, such as extremity fractures (40%), head injuries (25%), abdominal injuries (20%), spinal injuries (15%), and facial injuries (18%).

Table 1: Type of Chest Injuries

Type of Chest Injury	Percentage (%)
Rib Fractures	45%
Pulmonary Contusions	30%
Pneumothorax	15%
Hemothorax	10%
Flail Chest	8%
Cardiac Contusions	7%

Table 2: Associated injuries

Associated Injury	Percentage (%)
Head Injuries	25%
Abdominal Injuries	20%
Spinal Injuries	15%
Extremity Fractures	40%
Facial Injuries	18%

Figure 1: Fracture of ribs on right side

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Figure 2: Lacerations over right lung

Out of the 100 patients, 60% (n=60) required operative treatment, while the remaining 40% (n=40) were managed conservatively. The average length of hospital stay was 15 days, with a range from 5 to 45 days. The fate of the patients is summarized in Table 3. A significant portion of the patients (60%) required operative treatment, while the remaining 40% were managed with conservative measures. The average length of hospital stay was 15 days, with a range of 5 to 45 days. The mortality rate was high, with 45% of the patients succumbing to their injuries, while 55% were discharged after receiving treatment.

Table 3: Operative Care, Hospitalisation, and Patients' Outcomes

Outcome	Percentage (%)
Discharged	55%
Died	45%

A correlation analysis was done to examine the correlation between the type of chest injuries and the demographic features of the patients. The results are summarized in Table 4. The analysis revealed a notable correlation among the type of chest injuries and the age and gender of the patients. For instance, rib fractures were most common in younger patients (mean age 35 years) and were slightly more prevalent in males (60%). In contrast, flail chest and cardiac contusions were more frequent in older patients (mean ages 55 and 60 years, respectively) and showed a higher male predominance (90% and 85%, respectively).

Table 4: Relationships Between Patients' Age and Gender and the Type of Chest Injuries

Type of Chest Injury	Age Group (mean ± SD)	Male (%)	Female (%)
Rib Fractures	35 ± 10	60%	40%
Pulmonary Contusions	40 ± 12	70%	30%
Pneumothorax	45 ± 15	80%	20%
Hemothorax	50 ± 18	50%	50%
Flail Chest	55 ± 20	90%	10%
Cardiac Contusions	60 ± 25	85%	15%

The correlation among associated injuries and the different types of chest injuries was analyzed. The results are summarized in Table 5. Furthermore, the study highlighted significant associations between associated injuries and different types of chest injuries. For example, head injuries were more common in patients with flail chest (25%) and cardiac contusions (30%), while abdominal injuries were frequently observed in patients with hemothorax (30%) and cardiac contusions (40%).

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Similarly, spinal injuries were more prevalent among those with flail chest (30%) and cardiac contusions (35%).

Table 5: Relationship Between the Various Types of Chest Injuries and the Related Injuries

Type of Chest Injury	Head Injuries (%)	Abdominal Injuries (%)	Spinal Injuries (%)	Extremity Fractures (%)	Facial Injuries (%)
Rib Fractures	20%	15%	20%	25%	10%
Pulmonary Contusions	10%	25%	15%	20%	15%
Pneumothorax	15%	10%	20%	15%	5%
Hemothorax	20%	30%	25%	10%	20%
Flail Chest	25%	35%	30%	5%	25%
Cardiac Contusions	30%	40%	35%	10%	30%

The statistical analysis revealed significant associations between the type of chest injuries and age ($p<0.05$), as well as between associated injuries and different types of chest injuries ($p<0.05$).

DISCUSSION

The study examined the patterns and mortality of chest injuries among 100 victims of road traffic accidents. The findings indicated that rib fractures were the most common type of chest injury, occurring in 45% of the cases, followed by pulmonary contusions (30%), pneumothorax (15%), hemothorax (10%), flail chest (8%), and cardiac contusions (7%). This distribution highlights the vulnerability of the thoracic cage and lungs in high-impact collisions, emphasizing the need for prompt and effective management of these injuries.

Associated injuries were prevalent, with extremity fractures being the most frequent (40%), followed by head injuries (25%), abdominal injuries (20%), spinal injuries (15%), and facial injuries (18%). The high incidence of associated injuries underscores the complexity of trauma care required for road traffic accident victims and the necessity for comprehensive trauma assessment and multidisciplinary management.

Operative treatment was required in 60% of the cases, demonstrating the severity of the injuries sustained. The average length of hospital stay was 15 days, reflecting the extended recovery period for severe chest trauma. The mortality rate was high, with 45% of the patients succumbing to their injuries, highlighting the critical nature of chest injuries in road traffic accidents and the potential for fatal outcomes despite medical intervention.

Age and gender were found to be significantly correlated with the type of chest injuries. Rib fractures and pulmonary contusions were more common among younger and middle-aged males, while more severe injuries such as flail chest and cardiac contusions were prevalent in older males. This pattern suggests that younger individuals may be more resilient or may engage in behaviors leading to less severe chest trauma, whereas older individuals might suffer more severe impacts due to physiological differences.

The association between associated injuries and different types of chest injuries revealed that more severe chest injuries, such as flail chest and cardiac contusions, were frequently associated with head, abdominal, and spinal injuries. This relationship indicates that high-energy impacts not only cause significant chest trauma but also lead to multiple injuries, complicating the treatment and recovery process.

Overall, the study provides valuable insights into the patterns of chest injuries and their associated factors among road traffic accident victims. The high mortality rate emphasizes the need for improved pre-hospital care, rapid transportation, and advanced trauma management protocols to enhance survival outcomes for these patients.

Recent studies have provided valuable insights into the patterns and mortality associated with chest injuries among RTA victims. An autopsy study conducted on fatal RTAs found that chest injuries were the second most common injury after head injuries, accounting for 25% of trauma deaths. Rib fractures and pulmonary contusions were the most frequently observed types of injuries [5].

In another forensic study, chest injuries were present in 77.7% of the 525 RTA fatalities examined. Rib fractures were predominant, occurring in two-thirds of the cases, with pedestrians being the most vulnerable group, followed by motor vehicle drivers and front-seat passengers [6].

Further analysis of 112 autopsy cases revealed that rib fractures and pulmonary contusions were the most common chest injuries in fatal RTAs, often coinciding with head and abdominal injuries, highlighting the severity of trauma in such accidents [7].

A retrospective study on autopsies in Pakistan reported that chest injuries were present in 67 out of 629 RTA fatalities. Head injuries were the prominent cause of death, followed by thoracic injuries. The study emphasized the need for improved autopsy procedures to accurately report mortality rates [8].

A multicenter observational study found that chest wall injuries, particularly multiple rib fractures, were the most common thoracic injuries in RTAs. Serious thoracic injuries were strongly associated with mortality, with traumatic brain injuries being the most frequent concomitant injury [9].

An autopsy study focused on chest injuries from blunt trauma in a single-center revealed that RTAs were the most common cause of such injuries. The leading causes of death were coma and asphyxia, then shock and bleeding. Rib fractures and hemothorax were the most frequent injuries observed [10].

A study conducted in Northwest Ethiopia identified significant predictors of mortality following RTI, such as being a driver, accident location, and hospital arrival time. Serious chest injuries were a major factor contributing to deaths, underscoring the need for improved trauma care systems [11].

Generalizability

The findings of this study on chest injuries from road traffic accidents (RTAs) are highly applicable to the larger population in low- and middle-income countries, where similar patterns of injury and high mortality rates are observed. The high incidence of rib fractures and pulmonary contusions, along with significant associated injuries such as extremity fractures and head injuries, underscores the need for comprehensive trauma care. The correlation between injury types and demographics highlights the necessity for targeted interventions for different age and gender groups. The recommendations for enhanced pre-hospital care, more trauma centers, and improved training for trauma care personnel are crucial steps that can be adopted widely to reduce the high mortality rates and improve outcomes for RTA victims with severe chest injuries across these regions.

CONCLUSION

This study highlights the critical nature of chest injuries among road traffic accident victims, with rib fractures being the most common and related with high rates of mortality and severe concomitant injuries. The findings underscore the importance of comprehensive trauma care, rapid intervention, and targeted strategies to manage chest trauma effectively. The significant correlation between injury types and demographic factors suggests the need for tailored preventive measures and treatment protocols to reduce the burden of chest injuries and improve patient outcomes in road traffic accidents.

LIMITATIONS

The limitations of this study include a small sample population who were included in this study. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

RECOMMENDATION

Enhancing pre-hospital care, establishing more trauma centers, and improving training for trauma care personnel are essential steps to reduce mortality and improve outcomes for RTA victims with chest injuries. Implementing stricter road safety regulations and promoting public awareness campaigns can also contribute to preventing RTAs and reducing their impact.

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LIST OF ABBREVIATIONS

RTA: Road Traffic Accident
WHO: World Health Organisation
SNMMC: Shaheed Nirmal Mahto Medical College
MoRTH: Ministry of Road Transport and Highways
RTI: Road Traffic Injury

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CONFLICT OF INTEREST

The authors have no competing interests to declare.

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