

A Study Examining Chest Injuries Caused by Blunt Trauma Through Prospective Autopsy Analysis

Chest Injuries
Caused by Blunt
Trauma -
Autopsy Analysis

Qurrat-ul-Ain Kamran¹, Ummara Munir¹, Talha Naeem Cheema², Khurram Saleem¹ and Tehreem Abaid¹

ABSTRACT

Objective: To evaluate chest injuries brought on by blunt trauma, with an emphasis on autopsies. The purpose of the research was to look at the epidemiological aspects of victims, such as their age, gender, and the kind of trauma they had experienced. Additionally, it aimed to pinpoint the main factors that contributed to death in these situations.

Study Design: A prospective observational study

Place and Duration of Study: This study was conducted at the Autopsy Section Forensic Medicine Department, Sheikh Zayed Medical College, Rahim Yar Khan, from July 2021 to June 2023.

Methods: This prospective observational study was carried out on 56 blunt trauma cases investigated in the Autopsy Section Forensic Medicine Department, Sheikh Zayed Medical College, Rahim Yar Khan, from July 2021 to June 2023. Detailed epidemiological characteristics of the victims, including details such as age, gender, nature of trauma and injuries sustained by the victims, and other pertinent information related to the cases were collected and recorded. A comprehensive form was designed to systematically record historical and epidemiological data. All deceased individuals underwent a meticulous examination, encompassing external and internal injuries, including a thorough assessment of bones and joints in the thoracic region.

Results: The overall mean age was 32.68 ± 6.45 years. Patient's distributions based on their age were as follows: 8 (14.3%) in 1-20 years, 31 (55.5%) in 21-40 years, 9 (16.1%) 41-60 years, and 8 (14.3%) in >60 years. The incidence of road traffic accidents, fall from height, assault, and other was 40 (71.4%), 7 (12.5%), 6 (10.7%), and 3 (5.4%) respectively. There were 46 (82.1%) male and 10 (17.9%) females. Motor bikes were the most prevalent RTA type in 36 (64.3%) cases. Majority of cases 38 (67.9%) had a survival rate of less than 6 hours. Shock and hemorrhage was the prominent cause of mortality followed by asphyxia and coma.

Conclusion: The present study found that road traffic accidents were the most common contributing factor to chest trauma due to the sheer multitude of vehicles involved in such incidents. The majority of cases exhibited a survival rate of less than 6 hours. The leading cause of mortality was shock and hemorrhage, followed by instances of asphyxia and coma.

Key Words: Blunt trauma, Chest Injuries, Autopsy

Citation of article: Kamran QA, Munir U, Cheema TN, Saleem K, Abaid T. A Study Examining Chest Injuries Caused by Blunt Trauma Through Prospective Autopsy Analysis. *Med Forum* 2023;34(10):95-98. doi:10.60110/medforum.341021.

INTRODUCTION

Trauma remains a significant cause of mortality among individuals under 40 years of age, as established by previous studies^[1,2].

¹. Department of Forensic Medicine and Toxicology, Sheikh Zayed Medical College, Rahim Yar Khan.

². Department of Forensic Medicine and Toxicology, Quaid-e-Azam Medical College, Bahawalpur.

Correspondence: Talha Naeem Cheema, Associate Professor, Forensic Medicine and Toxicology Department, Quaid-e-Azam Medical College, Bahawalpur.

Contact No: 0302 8681118

Email: drtalhacheema@gmail.com

Received: July, 2023

Accepted: September, 2023

Printed: October, 2023

The concept of trauma-related deaths occurring in three distinct peaks, known as trimodal distribution, included fatalities resulting from blunt injuries and penetration. Hemorrhage and shock have been reported to be the major contributor and main reason for mortality among these cases^[3,4]. Trauma history originated from the human evolution era where the chest was the most prone body part and had considered severely affected areas^[5]. In the modern era, the industrialization rapid growth, vehicular traffic speed, social pattern shifting, high-rise building, and escalating rate of crimes significantly added to the higher rate of trauma accidents^[6]. The chest cavity houses crucial organs such as the lungs, heart, and major blood vessels^[7].

Trauma associated with heart, lungs, and blood vessels poses a significant threat to an individual's integrity and survival. These remain a prominent site of injury in RTA due to its location and size. Despite advancements in vehicle safety and the availability of advanced

control procedures, there is still an increasing trend in chest-related crush injuries [8]. Additionally, a majority of trauma-related deaths involve legal implications. Therefore, determining the cause of death is essential for seeking compensation from the state or insurance companies. Chest injuries account for approximately 10% of all trauma-related fatalities and result in 15% of the loss of disability adjusted life years (DALYs) [9,10]. Notably, they stand as the second leading cause of death in pediatric trauma cases [11]. However, due to limited data availability, accurately assessing the full extent of chest injuries and their associated complications remains challenging. This scarcity of data hampers the analysis and interpretation of these injuries, making it difficult to develop effective countermeasures, evaluations, and prevention strategies. Despite the considerable social impact of trauma, there is a lack of reliable epidemiological data specifically related to trauma caused by blunt mechanisms.

METHODS

This prospective observational study was carried out on 56 blunt trauma cases investigated in the Autopsy Section Forensic Medicine Department, Sheikh Zayed Medical College, Rahim Yar Khan, from July 2021 to June 2023. Detailed epidemiological characteristics of the victims, including details such as age, gender, and nature of trauma injuries sustained by the victims, and other pertinent information related to the cases were collected and recorded. A comprehensive form was designed to systematically record historical and epidemiological data. All deceased individuals underwent a meticulous examination, encompassing external and internal injuries, including a thorough assessment of bones and joints in the thoracic region. A comprehensive form was designed to systematically record historical and epidemiological data. In this process, all deceased individuals underwent a meticulous examination, encompassing external and internal injuries, including a thorough assessment of bones and joints in the thoracic region.

All the data collected were analyzed utilizing SPSS version 27. Statistical differences were assessed through the Chi-square test when applicable. The results are presented as mean and standard deviation (SD) or median and range, depending on the nature of the data. A significance level of $p < 0.05$ was considered statistically significant for all analyses.

RESULTS

The overall mean age was 32.68 ± 6.45 years. Patient's distribution based on their age were as follows: 8 (14.3%) in 1-20 years, 31 (55.5%) in 21-40 years, 9 (16.1%) 41-60 years, and 8 (14.3%) in >60 years. The incidence of road traffic accident, fall from height, assault, and other was 40 (71.4%), 7 (12.5%), 6 (10.7%), and 3 (5.4%) respectively.

(10.7%), and 3 (5.4%) respectively. There were 46 (82.1%) male and 10 (17.9%) females. Motor bike was most prevalent RTA types in 36 (64.3%) cases. Majority of cases 38 (67.9%) had survival rate of less than 6 hours. Shock and hemorrhage was the prominent cause of mortality followed by asphyxia and coma. Table-I presents the demographic information of the patients. Figure-1 displays the incidence of chest injuries from various sources due to blunt trauma. Figure-2 illustrates different survival periods in hours, while Figure-3 depicts the incidence of various causes of mortality. It was noted that 24 cases (42.9%) of victims experienced rib fractures, with combined bony fractures occurring in 20 cases (35.7%).

Table No. 1: Demographic details of patients (N=56)

Variables	Value (Mean \pm SD) N (%)
Age (years)	32.68 \pm 6.45
Age Groups (years)	
1-20	8 (14.3%)
21-40	31 (55.5%)
41-60	9 (16.1%)
>60	8 (14.3%)
Gender	
Male	46 (82.1%)
Female	10 (17.9%)
RTA cases (N=40)	
Motor bike	36 (64.3%)
Pedestrian	12 (21.4%)
Others	8 (14.3%)

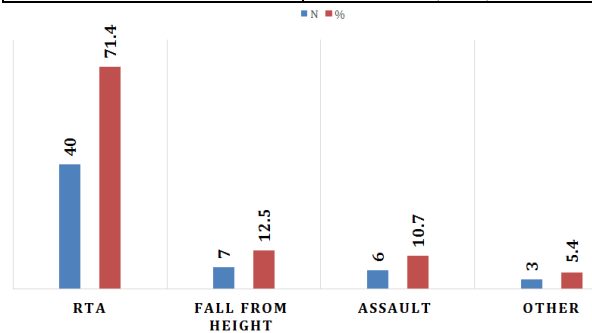


Figure No. 1: Causes of Chest Injuries (N=56)

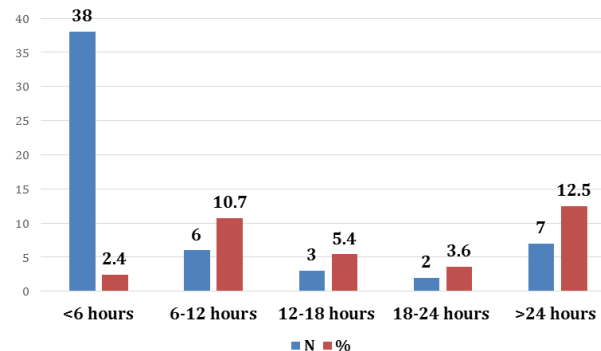


Figure No. 2: Survival rate of patients (N=56)

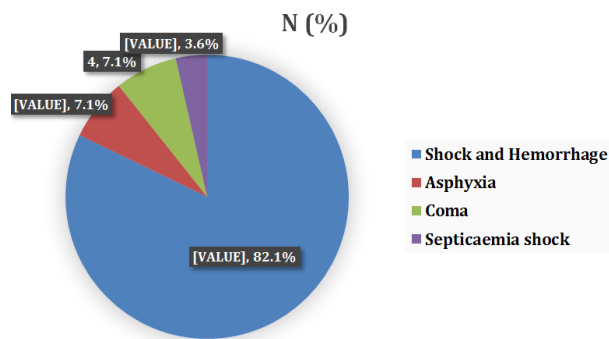


Figure No.3: Incidence of different causes of mortality (N=56)

DISCUSSION

The present study examined the chest injuries caused by blunt trauma through prospective autopsy analysis and found that road traffic accidents were the most common contributing factor to chest trauma due to the sheer multitude of vehicles involved in such incidents. The majority of cases exhibited a survival rate of less than 6 hours. The leading cause of mortality was shock and hemorrhage, followed by instances of asphyxia and coma. An earlier study reported that multiple trauma contributions to mortality rate significantly decreased with the advancement of the health care system in the last few decades [12]. This study exclusively involved patients with a single trauma type. The primary findings of our analysis were as follows: trauma patients were identified based on their singular mode of mortality. Approximately, most cases succumbed to their injuries at the scene of the incident, with a reliable reduction observed during the post-traumatic event. In our study, head and thoracic injuries emerged as the primary causes of death, being the leading types of injuries observed. In contrast, injuries associated with pelvis and abdomen were categorized as less severe trauma. Moreover, our analysis of cumulative mortality data, considering various time intervals, highlighted factors like injury patterns and location that influence the overall mortality pattern among trauma cases.

Numerous investigations focused on the mortality rate distribution among severe trauma cases in the last few decades [13, 14]. Nonetheless, numerous researchers have underscored that the mechanism of trauma and the particular type of injury sustained are the key factors that influence the timing of trauma-related deaths [15]. Remarkably, limited studies have been done on the pattern and causes of mortality by RTA, especially since most studies have also included cases of penetrating trauma [16]. Our analysis, focused specifically on patients with blunt trauma resulting from road traffic collisions, revealed a unimodal distribution of mortality. Previous research has indicated that penetrating trauma leads to quick death after the incident, whereas fatalities from blunt trauma tend to happen subsequently, during the post-traumatic

period [17]. An earlier multiple investigation observed that fatalities due to blunt trauma also exhibited a significant percentage of on-scene mortality [18, 19].

Several studies have debated the preventability of initial trauma deaths, particularly those occurring within the first few hours after the incident. Road traffic accidents (RTA) emerged as the most common cause of blunt chest trauma, a finding consistent with research conducted by numerous studies [20, 21]. Additionally, the study revealed that the highest number of blunt chest injuries occurred in individuals aged between 21 to 30 years, followed by those in the 31 to 40 years age group. Similar findings were reported in previous studies [22, 23]. This pattern can be attributed to the fact that young adults, being the primary earners, spent the majority of their time outdoors as compared to the extreme age.

The present study observed that brain injury, thoracic, and combination of both were the prime reasons for injuries. These injuries, often accompanied by other concurrent lesions, likely played a significant role in the patients' fatalities. Notably, traumatic brain injuries remain highly relevant; a review of existing literature indicates that the most prominent cause of mortality was trauma followed by traumatic brain injury [24]. Exsanguination was the second most prevalent cause of mortality that comes from abdominal or thoracic injuries [25]. In penetrating trauma cases, the most common cause reported was hemorrhage whereas blunt trauma mortality were caused by severe hemorrhage with brain injuries.

CONCLUSION

Road traffic accidents were the most common contributing factor to chest trauma due to the sheer multitude of vehicles involved in such incidents. The majority of cases exhibited a survival rate of less than 6 hours. The leading cause of mortality was shock and hemorrhage, followed by instances of asphyxia and coma.

Author's Contribution:

Concept & Design of Study: Qurrat-ul-Ain Kamran
Drafting: Ummara Munir, Talha Naeem Cheema

Data Analysis: Khurram Saleem, Tehreem Abaid

Revisiting Critically: Qurrat-ul-Ain Kamran, Ummara Munir

Final Approval of version: Qurrat-ul-Ain Kamran

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.2540-194/SJMC/RYS dated 05.02.2021

REFERENCES

1. O'Donovan S, van den Heuvel C, Baldock M, Humphries MA, Byard RW. Fatal blunt chest trauma: an evaluation of rib fracture patterns and age. *Int J Legal Med* 2022;136(5):1351-7.
2. Van Wyk C, Hlaise KK, Blumenthal R. Traumatic Diaphragmatic Injuries at Medicolegal Autopsy: A 1-Year Prospective Study. *Am J Forensic Med Pathol* 2022;43(4):347-53.
3. Ahmed S, Mahmood M, Rizvi SAH, Siddiqui AA, Shahid N, Akram WA, et al. Frequency and nature of road traffic injuries: Data of more than 10,000 patients from Ha'il, Saudi Arabia. *Cureus* 2019;11(1): e3830.
4. Rod JE, Oviedo-Trespalacios O, Senserrick T, King M. Older adult pedestrian trauma: A systematic review, meta-analysis, and GRADE assessment of injury health outcomes from an aggregate study sample of 1 million pedestrians. *Accid Anal Prev* 2021;152:105970.
5. Cicchino JB, Kulie PE, McCarthy ML. Severity of e-scooter rider injuries associated with trip characteristics. *J Safety Res* 2021;76: 256–61.
6. Naeem BK, Perveen S, Naeem N, Ahmed T, Khan I, Khan I, et al. Visceral injuries in patients with blunt and penetrating abdominal trauma presenting to a tertiary care facility in Karachi, Pakistan. *Cureus* 2018; 10(11): e3604.
7. Ntundu SH, Herman AM, Kishe A, Babu H, Jahanpour OF, Msuya D, et al. Patterns and outcomes of patients with abdominal trauma on operative management from northern Tanzania: a prospective single centre observational study. *BMC Surg* 2019;19(1): 69.
8. Pešić D, Trifunović A, Ivković I, Čičević S, Žunjić A. Evaluation of the effects of daytime running lights for passenger cars. *Transp Res F Traffic Psychol Behav* 2019;66: 252–61.
9. Zubaidi HA, Obaid IA, Alnedawi A, Das S. Motor vehicle driver injury severity analysis utilizing a random parameter binary probit model considering different types of driving licenses in 4-legs roundabouts in South Australia. *Saf Sci* 2021;134:105083.
10. Khan F, Shobhana SS, Sharma SR. A Prospective Autopsy Study of Chest Injuries by Blunt Trauma. *J Evidence Based Med Healthcare* 2015;2(3):212-218.
11. Daskal Y, Alfici R, Givon A, Peleg K, Olsha O, Kessel B. Israel Trauma Group. Evaluation of differences in injury patterns according to seat position in trauma victims survived traffic accidents. *Chin J Traumatol* 2018; 21(5): 273–6.
12. Monchal T, Ndiaye A, Gadegbeku B, Javouhey E, Monneuse O. Abdominopelvic injuries due to road traffic accidents: Characteristics in a registry of 162,695 victims. *Traffic Inj Prev* 2018;19(5): 529–34.
13. El-Menyar A, Abdelrahman H, Al-Hassani A, Ellabib M, Asim M, Zarour A, et al. Clinical presentation and time-based mortality in patients with chest injuries associated with road traffic accidents. *Arch Trauma Res* 2016; 5(1): e31888.
14. Slović ŽS, Vitošević K, Todorović D, Todorović M. Forensic characteristics of chest injuries among subjects who died in road traffic accidents. *Vojnosanit Pregl* 2021;78(2):215–22.
15. Alharbi RJ, Lewis V, Miller C. A state-of-the-art review of factors that predict mortality among traumatic injury patients following a road traffic crash. *Australas Emerg Care* 2022;25(1):13–22.
16. Liebsch C, Seiffert T, Vlcek M, Beer M, Huber-Lang M, Wilke HJ. Patterns of serial rib fractures after blunt chest trauma: an analysis of 380 cases. *PLoS One* 2019;14(12):e0224105.
17. O'Donovan S, van den Huevel C, Baldock M, Byard RW. Factors involved in the assessment of paediatric traffic injuries and deaths. *Med Sci Law* 2018;58(4):210–215.
18. Doecke SD, Kloeden CN, Dutschke JK, Baldock MRJ. Safe speed limits for a safe system: the relationship between speed limit and fatal crash rate for different crash types. *Traffic Inj Prev* 2018;19(4):404–408.
19. Tsellou M, Dona A, Antoniou A, Goutas N, Skliros E, Papadopoulos IN, et al. A comparative autopsy study of the injury distribution and severity between suicidal and accidental high falls. *Forensic Science. Med Pathol* 2022;18(4):407-14.
20. Hsieh TM, Tsai CH, Liu HT, et al. Effect of height of fall on mortality in patients with fall accidents: a retrospective cross-sectional study. *Int J Environ Res Public Health* 2020;17(11):4163.
21. Nau, et al. Falls from great heights: risk to sustain severe thoracic and pelvic injuries increases with height of the fall. *J Clin Med* 2021;10(11):2307.
22. Çakı İE, Karadayı B, Çetin G. Relationship of injuries detected in fatal falls with sex, body mass index, and fall height: An autopsy study. *J Forensic Leg Med* 2021;78:102113.
23. Obeid NR, Bryk DJ, Lee T, Hemmert KC, Frangos SG, Simon RJ, et al. Fatal Falls in New York City: An Autopsy Analysis of Injury Patterns. *Am J Forensic Med Pathol* 2016;37(2):80–5.
24. Teresiński G, Milaszkiwicz A, Cywka T. An analysis of the relationship between bodily injury severity and fall height in victims of fatal falls from height. *Arch Med SÁ d Kryminol* 2016;66:133–40.
25. Kumar N. Analysis Of Death In Major Trauma: An Autopsy Based Retrospective Study. *Eur J Molecular Clin Med* 2022;9(8).