

International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

An Observational Study on Vehicle and Victim-Related Factors Influencing Thoraco-Abdominal Injuries

Garima Singh[1], Gaurav Sharma[2], Anju Singh[3], Sarvesh Yadav[4]

[1]Associate Professor & Head, Department of Forensic Medicine, S N Medical College, Agra
[2]Associate Professor, Department of Forensic Medicine, S N Medical College, Agra
[3]Professor & Head, Department of Forensic Medicine, Rajarshi Dashrath Autonomous State Medical College, Agra
[4]Professor, Department of Biochemistry, S N Medical College, Agra

OPEN ACCESS

Corresponding Author:

Dr. Garima Singh
Professor & Head, Department of Forensic Medicine & Toxicology S N Medical College, Agra, UP
Email:
drgarimasingh1982@gmail.com

Received: 05-09-2026
Accepted: 23-09-2026
Available online:09-10-2026

Copyright © *International Journal of Medical and Pharmaceutical Research*

ABSTRACT

Background: Thoraco-abdominal injuries are a major cause of morbidity and mortality, especially in developing countries like India, where road traffic accidents (RTAs) are increasing. These injuries involve vital organs and are often associated with high-energy trauma, making early evaluation of contributing factors essential. Objective: To study the vehicle and victim-related factors associated with thoraco-abdominal injuries and to analyze their pattern and outcomes. **Materials and Methods**: A total of 173 cases (118 admitted and 55 brought dead) were included. Data were collected from emergency records, patient/relative interviews, police reports, and autopsy findings. Injuries were assessed clinically and through postmortem examination. **Results**: The majority of victims were males (82.6%) and belonged to the 21–30 years age group (29.4%). Road traffic accidents accounted for 84.97% of cases, with pedestrians being the most affected group (27.16%). Thoracic injuries alone were most common (45.08%), followed by combined thoraco-abdominal injuries (23.12%). **Conclusion**: Thoraco-abdominal injuries predominantly affect young adult males and are mainly due to RTAs. Early trauma care, improved pre-hospital services, and strict enforcement of road safety measures are essential to reduce associated morbidity and mortality.

Keywords: *Thoraco-abdominal injuries; Road traffic accidents;Trauma; Injury pattern; Risk factors.*

INTRODUCTION

Thoraco-abdominal injuries represent a significant component of trauma-related morbidity and mortality worldwide, particularly in low- and middle-income countries like India, where the burden of road traffic accidents (RTAs) continues to rise [1]. These injuries involve vital organs within the thoracic and abdominal cavities and are frequently associated with high-energy mechanisms such as vehicular collisions. The complex anatomical and physiological interplay between thoracic and abdominal structures makes such injuries potentially life-threatening, requiring prompt diagnosis and management [2].

Road traffic injuries are a leading cause of death globally, as highlighted by the World Health Organization, which estimates that approximately 1.19 million people die annually due to RTAs, with a disproportionate number occurring in developing countries [3]. In India, rapid urbanization, increasing motorization, and inadequate road safety measures have contributed to a growing incidence of trauma cases, particularly those involving two-wheelers and heavy vehicles [4]. Thoraco-abdominal injuries commonly result from blunt trauma sustained during high-speed impacts, and their severity is influenced by multiple interacting factors.

Vehicle-related factors such as type of vehicle, speed at the time of impact, safety features (e.g., seat belts, airbags), and point of collision play a crucial role in determining the pattern and severity of injuries [5]. For instance, occupants of two-wheelers are more vulnerable due to lack of structural protection, whereas high-speed collisions involving four-wheelers or heavy vehicles often result in severe multi-organ damage [6]. Similarly, victim-related factors—including age, gender,

use of protective devices, alcohol consumption, and pre-existing comorbidities—significantly influence injury outcomes [7].

Understanding the interaction between vehicle dynamics and victim characteristics is essential for identifying high-risk groups and implementing targeted preventive strategies. Previous studies have demonstrated that non-use of seat belts, helmet non-compliance, and alcohol intoxication are strongly associated with increased severity of thoraco-abdominal trauma [8]. Moreover, early identification of such factors can aid clinicians in triaging patients, predicting prognosis, and optimizing resource allocation in emergency settings [9].

The present study aims to assess the influence of vehicle and victim-related factors on thoraco-abdominal injuries, thereby contributing to improved trauma care and preventive strategies.

MATERIALS AND METHODS

Study Design

The present observational study was conducted in the Department of Forensic Medicine & Toxicology at Sarojini Naidu Medical College, Agra. The study included victims with thoraco-abdominal injuries who were either brought for treatment to the Emergency Department or subjected to medico-legal autopsy at the institutional mortuary.

Study Setting

The study was carried out in the following departments of the institution over a period of one year from January to December 2025.

1. Emergency Department
2. Mortuary (Department of Forensic Medicine & Toxicology)

Study Population & Sample Size

All victims with thoraco-abdominal injuries who were brought to the Emergency Department and/or mortuary of the institution during the study period were included. A total of 173 eligible cases presenting during the study period were included in the study.

Sampling Frame

- **Working Unit:** Individuals who sustained or died due to thoraco-abdominal injuries and were brought to the study center.
- **Respondent Unit:** Victims themselves (where possible), relatives or attendants, police records, and autopsy findings.

The study was conducted in two parts:

1. Emergency Department (Antemortem Study)

a) Antemortem History

Relevant history was obtained from the victim (where possible), relatives or accompanying persons, and police records. Information collected included:

- **Biosocial profile:** Age, sex, education, occupation, residence (urban/rural), and marital status
- **Accident-related factors:**
    - Place, date, and time of accident
    - Type of vehicle(s) involved
    - Type and condition of road
    - Category of road user (pedestrian, driver, passenger, etc.)
    - Time interval between accident and arrival at the hospital

b) Antemortem Examination

Clinical examination of victims was performed to assess:

- Distribution of injuries (thorax and abdomen)
- Type of injuries (classified as minor, major, and fatal)
- Severity and extent of trauma

2. Mortuary (Postmortem Study)

a) Postmortem History

Information regarding biosocial characteristics and accident-related factors was verified using hospital records and police inquest reports prior to autopsy. Additional details included:

- Date and time of death
- Survival period after injury
- Associated conditions or complications affecting survival

b) Postmortem Examination

A detailed medico-legal autopsy was conducted to evaluate:

- **Injury characteristics:**
  - Location: Thorax and abdomen
  - Nature and severity, with emphasis on fatal injuries
- **Thoracic injuries:**
  Injuries to chest wall, ribs, lungs, pericardium, and heart
- **Abdominal injuries:**
  Injuries to abdominal wall and internal organs including liver, spleen, pancreas, stomach, intestines, kidneys, urinary bladder, and genital organs
- **Internal findings:**
  Contents of peritoneal cavity, stomach, intestines, gallbladder, uterus (where applicable), and urinary bladder were examined
- Photographic documentation was performed where necessary
- Injuries were correlated with radiological findings when available
- In suspected cases, viscera were preserved and sent for toxicological analysis

Inclusion Criteria

- All victims with thoraco-abdominal injuries presenting to the Emergency Department or undergoing autopsy during the study period

Exclusion Criteria

- Cases where death or injury was due to causes other than thoraco-abdominal trauma
- Cases where the cause of death could not be determined

Data Processing and Analysis

The collected data were compiled, coded, and entered into Microsoft Excel. Descriptive statistical analysis was performed, and results were presented in the form of tables, charts, and percentages.

RESULTS

Table-1: Age wise distribution of cases

Age groups	Number of cases		Total
	Fatal	*Non fatal*	
0-10	*2(2.15%)*	*3(3.75%)*	*5 (2.89%)*
11–20	*9 (4.67%)*	*13(16.15%)*	*22(12.71%)*
21-30	*31(33.33%)*	*20(25%)*	*51(29.4%)*
31-40	*21 (22.58%)*	*21 (26.25%)*	*42 (24.27%)*
41-50	*11 (11.28%)*	*14(17.5%)*	*25 (14.45%)*
51-60	*12(12.90%)*	*4 (5%)*	*16(9.24%)*
61-70	*7 (7.52%)*	*3 (3.75%)*	*10(5.78%)*
71 and above	-	*2 (2.5%)*	*2(1.15%)*
Total	*93*	*80*	*173 (100%)*

Maximum number of victims in both fatal and non fatal cases were from age group 21-30 years.

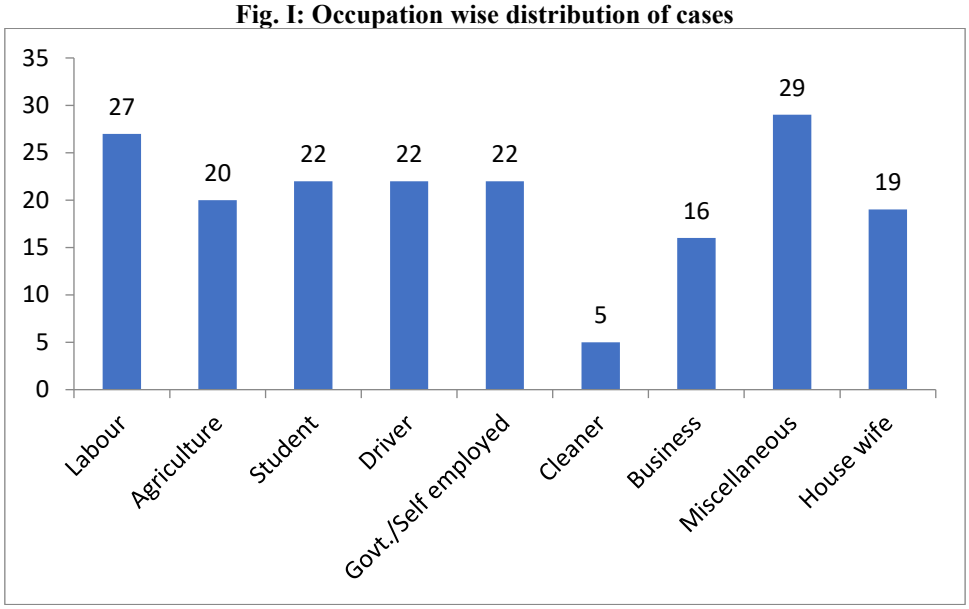
Table-II: Gender wise distribution of cases

Sex	Number of cases		Total
	Fatal	*Non Fatal*	
Male	*81 (87.09%)*	*62 (77.5%)*	*143 (82.6%)*
Female	*12(12.90%)*	*18(22.5%)*	*30 (17.34%)*

Total	*93*	*80*	*173(100%)*

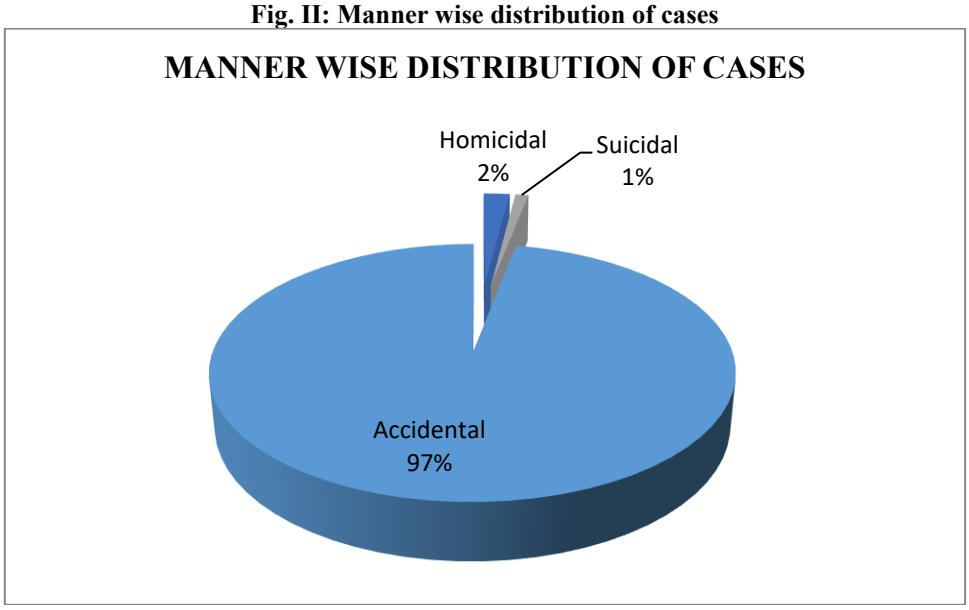
The above table shows males out numbering the females both in fatal and non-fatal victims. 82.6% victims were males as compared to 17.34% were females.

Fig. I: Occupation wise distribution of cases



Maximum number of victims were labourers i.e. 27 (15.6%) followed by drivers 22(12.7%) and students 22 (12.7%).

Fig. II: Manner wise distribution of cases



(Value of X^2 = 5.57, P< 0.05, Significant)

Accidental occurrence of thoraco- abdominal injuries are commonest in both fatal and non-fatal groups i.e. (97.10%) followed by homicidal (2.31%) and in only 1 (0.5%) case the circumstance of injuries was suicidal.

Table -III: Type of accident wise distribution of thoraco-abdominal injuries cases

Manner of Thoraco abdominal injuries.	**Fatal**	**Non-Fatal**	**Total**
Accidents	*92 (53.17%)*	*75 (43.35%)*	*167 (96.53%)*
Road traffic accidents	*83 (47.94%)*	*64 (36.99%)*	

Fall from height	*1 (00.57%)*	*5 (2.89%)*	
Agricultural accidents	*2 (1 .15%)*	*2 (1.15%)*	
domestic accidents	*3 (1 .73%)*	*4 (2.31%)*	
Railway accidents	*1 (00.57%)*	--	
Industrial accidents	*1 (00.57%)*	--	
Other	*1 (00.57%)*	--	
Homicide	*04 (2.31%)*	*00*	*04(2.31%)*
Suicide	*02(1.15%)*	*00*	*02(1.15%)*
Total	*98 (56.64%)*	*75 (43.35%)*	*173 (100%)*

Out of 173 cases of thoraco-abdominal injuries, 167 were due to accidents and of which road traffic accidents were commonest i.e. 147 (84.97%).

Table -IV: Type of Victim wise distribution of Road Traffic accident cases

Type of Victim	**Number of cases**		**Total**
	Fatal	*Non fatal*	
Pedestrians	*29*	*18*	*47 (27.16%)*
Drivers	*17*	*10*	*27(15.16%)*
Passengers	*26*	*17*	*43 (24.85%)*
Two wheeler riders	*10*	*13*	*23(13.29%)*
Unknown	*4*	*3*	*7 (2.4%)*
Total	*86*	*61*	*147*

Pedestrians were the most frequently injured (27.16%) followed by passengers who were traveling in 3 or 4 wheeler vehicles comprises 24.85%, drivers 15.16%, 13.29% were the two wheeler riders and 2.4% of victims were in unknown category.

Table No.-V: Distribution of Injuries in relation to region involved

Region	**Number of cases**		**Total**
	Fatal	*Non fatal*	
Thorax only	*36 (38.70%)*	*42 (52.5%)*	*78(45.08%)*
Abdomen only	*13(13.97%)*	*24(30%)*	*37(21.38%)*
Both Thoracic arid abdominal	*32 (34.40%)*	*8(10%)*	*40 (23.12%)*
Thoracic and fracture of pelvis	*5 (5.37%)*	*3 (3.75%)*	*8 (4.62%)*
Abdomen and 'fracture of pelvis	*3 (3.22%)*	*2 (2.5%)*	*5 (2.89%)*
Combined thoraco abdominal and fracture of pelvis	*4 (4.30%)*	*1 (1 .25%)*	*5 (2.89%)*

The above table shows that in great number of victims (45.08%) injuries to thoracic region only in both fatal and non-fatal groups, followed by injuries involving both thoracic and abdominal region (23.12%), and (21.38%) of victims had injuries to abdominal region only.

DISCUSSION

The age distribution revealed a predominance of young adults, with the highest incidence in the 21–30 years age group (29.4%), followed by 31–40 years. This aligns with earlier studies by Kumar A et al. [10] and Singh H et al. [11], who also reported similar age patterns. The higher incidence in this group may be attributed to increased mobility, occupational exposure, and risk-taking behavior.

A marked male predominance (82.6%) was observed, consistent with findings by Banerjee KK et al. [12] and Ghangle AL et al. [13]. This is likely due to greater outdoor activity and occupational exposure among males. Most victims were married (73.98%) and belonged to lower socioeconomic strata, supporting earlier observations that individuals from economically weaker sections are more vulnerable to trauma due to hazardous occupations and unsafe travel conditions .

Road traffic accidents (RTAs) were the leading cause (84.97%) of thoraco-abdominal injuries, with accidental manner accounting for 97.1% of cases. These findings are comparable to studies by Meera TH et al. [14] and Pathak MK et al. [15]. Pedestrians constituted the most affected group, followed by passengers, reflecting poor traffic awareness and infrastructure deficiencies. Four-wheelers were the most common vehicles involved, corroborating reports by Singh YN et al. [16].

Injury pattern analysis showed thoracic injuries to be more common than abdominal injuries, with rib fractures being the most frequent thoracic injury. Similar findings were reported by Tirpude BH et al. [17]. The lungs were the most commonly affected thoracic organ, often associated with rib fractures, due to their anatomical position within the rib cage. Cardiac injuries were less frequent but usually associated with severe trauma.

Among abdominal organs, the liver was most commonly injured, followed by the spleen and kidneys. This is consistent with previous studies by Banerjee KK et al. [12] and Alsalem AH et al. [18]. The liver's large size and anterior position make it particularly vulnerable to blunt trauma. Intestinal perforation was the most common hollow viscus injury.

Recommendations

1. **Strengthening Road Safety Measures:** Strict enforcement of traffic rules, including speed limits, helmet use, and seatbelt compliance, should be ensured.
2. **Public Awareness Programs:** Health education campaigns should be conducted to improve road safety awareness, especially among young adults and high-risk groups.
3. **Improvement in Pre-hospital Care:** Development of efficient emergency medical services, including trained paramedics and well-equipped ambulances, is essential to reduce mortality during transportation.

Limitations

1. **Hospital-Based Study:** The study was conducted at a single tertiary care center, which may not represent the true burden in the general population.
2. **Limited Sample Size:** The number of cases studied may not be sufficient to generalize findings at a regional or national level.
3. **Selection Bias:** Only cases brought to the hospital or mortuary were included; cases not reported or treated elsewhere were excluded.

CONCLUSION

Young adult males from lower socioeconomic groups are most commonly affected. Pedestrians and passengers remain highly vulnerable. Thoracic injuries, especially rib fractures with lung involvement, are more frequent, while the liver is the most commonly injured abdominal organ. Strengthening road safety measures and improving trauma management systems are essential to reduce the burden of these injuries.

Funding- None

Conflict of Interest- None

REFERENCES

1. GBD 2019 Injuries Collaborators. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2020;396(10258):1204–1222.
2. Feliciano DV, Mattox KL, Moore EE. *Trauma*. 9th ed. New York: McGraw-Hill Education; 2020.
3. World Health Organization. *Global status report on road safety 2023*. Geneva: World Health Organization; 2023.
4. Ministry of Road Transport and Highways, Government of India. *Road accidents in India 2022*. New Delhi: MoRTH; 2023.
5. Dischinger PC, Ryb GE, Ho SM. Injury patterns and severity among drivers and passengers involved in motor vehicle crashes. *J Trauma Acute Care Surg*. 2015;78(3):486–492.

6. Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA, Jarawan E, et al. *World report on road traffic injury prevention*. Geneva: World Health Organization; 2018.
7. Nantulya VM, Reich MR. The neglected epidemic: road traffic injuries in developing countries. *BMJ*. 2002;324(7346):1139–1141.
8. Wesson HKH, Boikhutso N, Hyder AA, Bertram M, Hofman KJ. Informing road traffic intervention choices in South Africa: the role of economic evaluations. *Injury*. 2017;48(2):421–428.
9. American College of Surgeons Committee on Trauma. *Advanced trauma life support (ATLS): student course manual*. 10th ed. Chicago: American College of Surgeons; 2018.
10. Kumar A, Lalwani S, Agrawal D, Rautji R, Dogra TD. Fatal road traffic accidents and their relationship with head injuries. *J Forensic Leg Med*. 2008;15(6):347–352.
11. Singh H, Dhattarwal SK. Pattern and distribution of injuries in fatal road traffic accidents in Rohtak. *J Indian Acad Forensic Med*. 2004;26(1):20–23.
12. Banerjee KK, Agarwal BB, Kohli A, Aggarwal NK. Study of chest injuries in fatal road traffic accidents. *J Forensic Med Toxicol*. 1997;14(2):10–14.
13. Ghangle AL, Pathak MK. Study of pattern of injuries in road traffic accidents. *J Indian Acad Forensic Med*. 2002;24(3):80–83.
14. Meera TH, Nabachandra H. Pattern of thoraco-abdominal injuries in road traffic accidents. *J Indian Acad Forensic Med*. 2005;27(3):145–149.
15. Pathak MK, Jha N. An epidemiological study on road traffic accident cases in a tertiary care hospital. *J Nepal Med Assoc*. 2006;45(162):238–243.
16. Singh YN, Bairagi KK, Das KC. An epidemiological study of road traffic accident victims in medicolegal autopsies. *J Indian Acad Forensic Med*. 2006;28(2):74–76.
17. Tirpude BH, Batra AK. Pattern of chest injuries in fatal road traffic accidents. *J Forensic Med Toxicol*. 1999;16(1):15–18.
18. Alsalem AH, Qaisaruddin S, Adesunkanmi AR. Pattern of abdominal trauma in children. *Ann Saudi Med*. 1998;18(3):234–237.