Original Article

# A Study of Pattern of Fatal Thoraco-Abdominal Injuries in RTA Cases: An Autopsy Based Cross Sectional Study

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**How to cite this article:** Ankita Chunakar, Vivek Kumar, Prasanta Kr. Sarkar et. al. A Study of Pattern of Fatal Thoraco-Abdominal Injuries in RTA Cases: An Autopsy Based Cross Sectional Study. Indian Journal of Forensic Medicine and Toxicology/Volume 19 No. 2, April - June 2025.

**Abstract**

Road Traffic Accident (RTA) is any vehicular accident occurring on the roadway i.e. originating on, terminating on, or involving a vehicle partially on the roadway. Road traffic accident ranks among the top causes of death in the world; after ischemic heart disease, it is projected to become the second leading cause in 2024. In developing countries, around 85 percent of all deaths caused by road accidents occur, and nearly half of these accidents happen in the Asia-Pacific region. India is responsible for around 10 percent of all road accident deaths in the whole world. Road traffic accidents in India is emerging as a major cause of death and injury with subsequent disability and burden on economy of a nation. The cost of burden due to RTA is estimated to be around 1-2% of a country's gross national product (GNP) specifically in lower-income countries. In this study we have analyzed the 109 cases of road traffic accidents brought for autopsy examination by the police to the Department of Forensic Medicine & Toxicology, JGMCH, Jalpaiguri, West Bengal from the January 2024 to June 2024. All data were analyzed by appropriate statistical tool (SPSS software).In this study we found that the peak incidence of RTA was observed in the age group 21-40 years comprising 41.28% of the cases. Males (88.07%) outnumbered females (11.93%) and most of the accidents occurred between night times from 8pm to 6am (48.62%). In 47.78% cases there was immediate death and cases are seen mainly in two wheeler occupants (42.20%). In two wheelers accidents, drivers (84.78%) were more commonly affected and in four wheelers accidents, front seaters were affected (55.55%). It has been observed the lungs injuries are common 32.11% cases compared to heart injuries (18.34%) cases in thoracic involvement and liver with 14.67 % cases is more commonly affected abdominal organ compared to spleen (2.75%) in abdominal injuries.

**Key words:** Road Traffic Accident, RTA, Thoraco-abdominal injuries, Lung injuries, Heart injuries, Liver injuries, Spleen injuries.

## Introduction

The World Health Organization (WHO) describes an accident as "an unpremeditated event resulting in recognizable damage." Road Traffic Accident (RTA) is any vehicular accident occurring on the roadway i.e. originating on, terminating on, or involving a vehicle partially on the roadway.[1] Most automobile

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**Submission date:** September 28, 2024 **Acceptance date:** November 4, 2024 **Published date: 28 March,2025**

accidents are accidental, few are suicidal and still fewer are homicidal in manner. RTA is a public health issue that greatly affects individuals, families, communities, and nations. Pattern of injuries and circumstances of death often indicate the manner. [2] Road traffic accident ranks among the top causes of death in the world; after ischemic heart disease, it is projected to become leading cause of death in developing countries, around 85 percent of all deaths caused by road accidents occur, and nearly half of these accidents happen in the Asia-Pacific region.[the second leading cause in 2024.[3] India is responsible for around 10 percent of all road accident deaths in the whole world. Road traffic accidents in India is emerging as a major cause of death and injury with subsequent disability and burden on economy of a nation.[4] RTA is a serious public health issue that greatly affects individuals, families, communities, and nations. The cost of burden due to RTA is estimated to be around 1-2% of a country's gross national product (GNP) specifically in lower-income countries.[5] [6].As per the data released by the Ministry Of Road Transport And Highways, during the calendar year 2022, road crashes in India claimed about 1.68 lakh lives and caused injuries to more than 4.4 lakh people and number of fatal accidents and numbers of persons killed in road accident increasing since 2005. Decadal trend reveals increasing trend in number of accidents, person killed and injuries.[18] In Southeast Asian countries RTA are among the top five causes of fatality. In 2011, India witnessed 4.97 lakhs reported road traffic accidents, 142485 reported deaths, an accident every one minute and death every 3 minutes.[19] It has been reported that involvement of the abdominal organs like the liver, spleen, bladder, and kidney is in descending order of frequency in road traffic crashes.[7] Amongst accidental occurrence, road traffic accidents are the commonest cause for thoraco-abdominal injuries and 45.08 % of victims in both fatal and non-fatal categories had injuries to thoracic region(23.21%), followed by injuries to thoraco-abdominal region (23.21%) while the injuries to abdominal region comprised only 17.20% cases.[8] After the strict implementation to use the helmet in two wheelers, the number of head injuries due to road traffic accidents has subsequently decreased, but injuries fatal thoracic and abdominal regions are still on the rise. Due to the anatomical position, thoracic and abdominal viscera are commonly injured in road traffic accidents. The objectives of the present study is to describe the distribution of injuries and demographic profile and also to study the pattern of thoraco-abdominal injuries sustained as a result of road traffic accidents as most of the RTA studies are focused to prevent injuries to brain but injuries to the thoracic and abdominal viscera are also causing significant mortality during RTA so we conducted the study of autopsied cases of RTA at the mortuary of Department of FMT, JGMCH from January 2024 to June 2024, the data of study can be used for the development of a strategy for the prevention of thoraco-abdominal fatalities due to RTA and creating public awareness on road safety.

**Objective:** The objectives of the present study are to describe the distribution of injuries and demographic profile and also to study the pattern of thoraco-abdominal injuries sustained as a result of road traffic accidents and autopsied at the mortuary of Department of FMT, JGMCH from January 2024 to June 2024, which can be used for the development of a strategy for the prevention of mortality due to RTA and public education on road safety.

## Materials and Methods

It is a prospective cross sectional study conducted to analyze the pattern of Fatal Thoraco-abdominal injuries cases in road traffic accidents autopsied in the mortuary of Department of FMT, JGMCH, Jalpaiguri from January 2024 to June 2024. Total 109 cases of fatal thoraco- abdominal injuries cases were included in this study. Detailed information on the cases was based one valuation of post-mortem findings. Data was analyzed with age, sex, nature of the collision, time of the collision, survival period, distribution of injury, internal findings, and cause of death, which were acquired from police inquest, history obtained from medical records and relatives. We have analysed all data with the help of latest version of SPSS software.

**Inclusion criteria:** 109 cases of road traffic accidents autopsied at the mortuary of Dept. of FMT, JGMCH, Jalpaiguri.

**Exclusion criteria:** Decomposed cases and unknown brought dead RTA cases were excluded from the study.

## Observation

**Table 1: Epidemiological profile of deceased**

| AGE DISTRIBUTION: | | |
|---|---|---|
| **Age** | **Frequency** | **Percentage of age** |
| Up to 20 years | 7 | 6.42 |
| 21 to 40 years | 45 | 41.28 |
| 41 to 60 years | 38 | 34.86 |
| >60 years | 19 | 17.43 |
| Total | 109 | 100 |
| **SEX DISTRIBUTION** | | |
| **SEX** | **No. of cases** | **Percentage** |
| Male | 96 | 88.07 |
| Female | 13 | 11.93 |
| Total | 109 | 100 |
| **DRUG HISTORY** | | |
| **Alcohol & Other Drugs** | **No. of cases** | **Percentage** |
| Present | 18 | 16.51 |
| Absent | 91 | 83.49 |
| Total | 109 | 100 |

The age of the victims varied from 1 years to more than 60 years. The peak incidence was observed in the age group 21-40 years comprising 41.28% of the cases. It was also observed that 34.86% belonged to the age group 41-60 years. Individuals in the age group below 20 years were the least affected (17.42%). Males comprised a majority and constituted 96 (88.07%) compared to females who were only 13 (11.93%). The male to female ratio in the study was 7.38:1 (Male=96 Female=13). It is seen from the above table most of the victims were not under the influence of alcohol and other drugs with 91 cases (83.49%) and only in 18 cases (16.51%) evidence of alcohol and others drugs were present.

**Table 2: Profile of road users**

| TIME OF INCIDENT | | |
|---|---|---|
| **Time of incidence** | **No. of victims** | **Percentage** |
| 6 AM to 12 Noon | 19 | 17.43 |
| 12 Noon to 8 PM | 37 | 33.95 |
| 8 PM to 6 AM | 53 | 48.62 |
| Total | 109 | 100 |

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| TIME OF DEATH | | |
|---|---|---|
| **Time of Death** | **No.of cases** | **Percentages** |
| Instant Death | 43 | 39.46 |
| Immediate Death | 52 | 47.78 |
| Delayed Death | 14 | 12.86 |
| Total | 109 | 100 |
| **ROAD USER** | | |
| **Road User** | **No. of victims** | **Percentage** |
| Pedestrian | 38 | 34.86 |
| Two Wheeler Occupant | 46 | 42.20 |
| Four Wheeler Occupant | 18 | 16.51 |
| Heavy Vehicles Occupant | 7 | 6.42 |
| Total | 109 | 100 |

Most of the incidents irrespective of the cause, occurred between 8PM to 6AM comprising 53 cases (48.62%) of total cases followed by at the time 12 Noon to 8 PM 37 cases comprising 33.95 % and the least number of incidents occurred between 6AM to 12 Noon comprising 17.43% of the total cases. It is seen from above table that most of the death occurred of my study population is immediate death with 52 cases (47.78%), followed by instant death with 43 cases (39.46%) and delayed death occurred in only 14 cases comprising with 12.86%. It is seen from the above table that most of the victims in the study were two wheeler occupants with 46 cases (42.2%) and followed by pedestrian 38 cases (34.86%) and four wheeler occupants were 18 cases comprising 16.51%, and Heavy Vehicles Occupant in only 7 cases (6.42%).

**Table 3: Profile of two wheeler users**

| TWO WHEELER USER | | |
|---|---|---|
| **Two wheeler user** | **No. of cases** | **Percentage** |
| Driver | 39 | 84.78 |
| Back Sitter | 7 | 15.21 |
| Total | 46 | 100 |
| **HELMET WEAR** | | |
| Helmet | No. of cases | Percentage |
| Present | 19 | 41.30 |
| Absent | 27 | 58.70 |
| Total | 46 | 100 |

Among the all deaths in this study due to two wheeler accidents, most of deceased were driver comprising 39 cases (84.78%) followed by back sitters 7 cases (15.21%). It is seen from the above table that most of the two wheeler user not wear the helmet during driving with 27 cases (58.70%), followed by 19 cases (41.30%) used the helmet.

**Table 4: Profile of four wheeler users**

| **FOUR WHEELER USER** | | |
|---|---|---|
| **Four wheeler users** | **No. of cases** | **Percentage** |
| Driver | 5 | 27.78 |
| Front sitter | 10 | 55.55 |
| Back sitter | 3 | 16.67 |
| Total | 18 | 100 |
| **SEAT BELT USERS** | | |
| **Seat Belt** | **No. of cases** | **Percentage** |
| Use | 6 | 33.34 |
| Not use | 12 | 66.66 |
| Total | 18 | 100 |

It is seen from the above table that most of the four wheeler user was dead who were sitting in front of the car with 10 cases(55.55%), followed by Four wheeler driver 5 cases (27.78%), then back sitter with only 3 cases comprising with 16.67%. It is seen from the above table that most of the four wheeler user not used the seat belt during driving with 12 cases (66.66%), followed by 6 cases (33.34%) who had used the seat belt.

**Table 5: Thoracic injuries**

| **Chest Injuries** | | |
|---|---|---|
| **Types of injuries** | **No. of cases** | **Percentages** |
| Contusion | 23 | 21.10 |
| Laceration | 11 | 10.09 |
| Abrasion | 17 | 15.59 |
| Fracture clavicle | 3 | 2.75 |
| Ribs fracture(Lt.) | 4 | 3.66 |
| Ribs fracture(Rt.) | 7 | 6.42 |
| Both side Ribs Fracture | 18 | 16.51 |
| Sternum fracture | 2 | 1.83 |
| Absent | 61 | 55.96 |
| **Lungs** | | |
| **Lungs injury** | **No. of cases** | **Percentages** |
| Laceration | 12 | 11.00 |
| Contusion | 23 | 21.11 |
| absent | 74 | 67.89 |
| | 109 | 100 |
| **Heart** | | |
| **Heart injury** | **No. of cases** | **Percentages** |
| Contusion | 16 | 14.67 |
| Laceration | 4 | 3.67 |
| Absent | 89 | 81.66 |
| | 109 | 100 |

It is seen from the above table of the chest wall injuries that contusion were present in 23 (21.10%) cases, both side rib fracture was present in 18 (16.51%) cases, followed by abrasion injury were present with 17 (15.59%) cases, right sided ribs fracture was present with 7 (6.42%) cases, followed by left sided ribs fracture was presented with 4 (3.36%) cases, fracture clavicle was present with 3 (2.75%) cases and 2 (1.83%) cases with fracture sternum. It is seen from the above table that lungs injuries were absent in 67.89% cases and heart injuries were absent in 81.66% cases. Contusion of the lung was present in 12 (11.0%) cases & contusion of the heart was present in 4 (3.67%) cases.

**Table 6: Abdominal Injuries**

| **Abdominal wall injuries** | | |
|---|---|---|
| **Types of injuries** | **No. of cases** | **Percentages** |
| Contusion | 9 | 8.25 |
| Laceration | 6 | 5.50 |
| Abrasion | 22 | 20.18 |
| Absent | 72 | 66.05 |
| | 109 | 100 |
| **Liver** | | |
| **Liver injury** | **No. of cases** | **Percentages** |
| Contusion | 5 | 4.58 |
| Laceration | 11 | 10.09 |
| Absent | 93 | 85.33 |
| | 109 | 100 |
| **Spleen** | | |
| **Splenic Laceration** | **No. of cases** | **Percentages** |
| Present | 3 | 2.75 |
| Absent | 106 | 97.25 |
| Total | 109 | 100 |

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| Pelvic region | | |
|---|---|---|
| **Pelvic Injury** | **No. of cases** | **Percentages** |
| Fracture pubic bone | 6 | 5.51 |
| Dislocation of symphysis pubis | 8 | 7.34 |
| Absent | 95 | 87.15 |
| Total | 109 | 100 |

It is seen from the above table that abrasion on abdominal wall was present in 22 (20.18%) cases, followed by contusion of abdominal wall (8.25%) cases and then followed by fatal laceration of the abdominal wall in only 6 (5.57%) cases and in most of the 72 cases (66.05%) there was no abdominal wall injury. It has been observed that liver with 14.67% cases is more commonly affected abdominal organ compared to spleen (2.75%) in abdominal injuries. In 87.15% cases there were no injuries to the pelvic bones and in 8 cases (7.34%) there was dislocation of pubis and in 6 cases (5.51%) there was fracture of pubic bones. In 10.09% cases there were liver laceration that proved to be fatal and only in 2.75% cases fatal laceration of spleen were found.

## Discussion

In the present study the age of the victims varied from 1 to above 60 years. The peak incidence was observed in the age group 21-40 years comprising 41.28% of the cases followed by age group of 41 to 60 years of age (34.86%). This finding is in accordance with studies done by Tyagi, Sinha and Sengupta, Banerjee, Salgado.[9] [10][11][12] In the present study males comprised a majority and constituted 96 (88.07%) compared to females who were only 13 (11.93%). The male to female ratio in the study was 7.38:1. Sinha and Sengupta reported 80% male and 20% female incidence [10]. A male preponderance is in consistence with the study reported by Cardoso, and Seow[13] [14]. Gole, Soni and Gonade has also observed that out of 105 cases of fatal head injury during RTA, 89% male and 11%female were observed male and female ratio is 7.75:1[20] It is seen from the above table that most of the victims in the study were two wheeler occupants with 46 cases (42.2%) and followed by pedestrian 38 cases (34.86%) and this finding is not in accordance with the findings observed by Dikshit who found that most common victims were pedestrians constituting 50% of total cases followed by motorcyclists constituting 18.28% of total cases as their study was conducted in between 1966 – 1976 and at that time two and four wheelers were not prevalent so pedestrians were more exposed to RTA.[15] It has been observed the lungs injuries was common (32.11% cases) compared to heart injuries (18.34% cases) in thoracic involvement and liver with 14.67 % cases is more commonly affected abdominal organ compared to spleen (2.75%) in abdominal injuries. Dr. Anindya kumar Goswami (2009-2012) a study of pattern and distribution of injuries in fatal road traffic accident cases for last three years in the jurisdiction of Kolkata police morgue, Kolkata. This study shows that, among the 42 cases the liver injury, contusion was present in 36 cases and laceration was present in 6 cases. The findings in our study are not similar to the findings of the above mention author [16].

In the present study shows that, most of the two wheeler user not wear the Helmet during driving with 27 cases (58.70%), followed by 19 cases (41.30%) used the Helmet and this finding is similar to the findings of Michael Johnson at Ohio in which only 77 (23%) of those studied wore helmet, whereas 254(77%) were not helmeted[17].

## Conclusion

This study attempts to contribute to the body of knowledge on road safety. It is hoped that it will inspire and facilitate increased cooperation, innovation and commitment to prevent road traffic accident ultimately preventing the fatal thoraco-abdominal injuries. Incorporation of safety measures in the two and four wheelers to protect the thoracic and abdominal region and most important is creating awareness among general public which will help in reducing morbidity &mortality due to fatal road traffic accidents.

**Conflict of Interest:** No conflict of interest.

**Source of Funding:** Self.

**Ethical Clearance:** Ethical clearance was obtained from the Ethical committee, Jalpaiguri Govt. Medical College & Hospital, Jalpaiguri. (Memo No. - JGMC&H EC/21 Dt. – 10.01.2024)

## References

1. Eisfeld J. International Statistical Classification of Diseases and Related Health Problems. WHO. 2014;1(1-2):107-110. doi:10.1215/23289252-2399740.

2. Singh SK. Road traffic accidents in India: Issues & Challenges. Transp Res Proc 2017;25(3):4712-23.
3. World Health Organisation. 10 Facts on Global Road Safety. WHO. Published online 2015. http://www.who.int/features/factfiles/roadsafety/en/[Accessed on 24 Nov 2021.]
4. Lee JW. World Health Day Theme 2004 Road safety is no accident. Nurs J India. 2004;95(4):74.
5. Kumar A, Lalwani S, Agrawal D, Rautji R, Dogra T. Fatal road traffic accidents and their relationship with head injuries: An epidemiological survey of five years. Indian JNeurotrauma. 2008;05(02):63-67. doi:10.1016/s0973- 0508(08)80002-0.
6. Kaul A, Sinha U, Kapoor A, et al. An epidemiological study of fatal road traffic accidents in Allahabad region. Indian Internet J Forensic Med Toxicol. 2005;3(1).
7. Chandulal R. Fatal road accidents. J Police Res Development 1971;12:17-9.
8. Numan H, Chavan KD, Bangal RS, Singh B. Pattern of thoraco-abdominal injuries in rural region. Ind J Forensic Med Path 2009;2(3):97-102.
9. Tyagi AK, Sharma GK, Kumar B. Craniocerebral damage buy blunt force impact. J Indian AcadForen Med 1986; 1:24-39.
10. Sinha SN, Segupta SK. Road traffic accidents fatalities in Port Moresby: a ten years survey. AccidAnnalPrev 1989; 21 (3): 297-301.
11. Banerjee KK, Agarwal BB, Kohli A, Agarwal NK. Study of head injury victims in fatal road traffic accidents in Delhi. Indian J Med Sci 1998; 52(9): 395-398.
12. Salgado MSL and Colombage SM. Analysis of fatalities in Road Accidents. Forensic Science International 1988; 36: 91-96.
13. Cardoso ER, Piper A. Pediatric head injury caused by off road vehicle accidents Can J Neurol Sci 1989; 16(3): 336-9.
14. Seow E, Lau G. Who dies at A&E? The role of forensic pathology in the audit of mortality in an emergency medicine department. Foren Sci Int 1996; 82: 201-10.
15. Chandra J, Dogra TD, Dikshit PC. Pattern of Cranio-Intracranial injuries in Fatal Vehicular Accidents in Delhi, 1966-76, Med. Sci. Law 1979; 19(3): 186-194.
16. Goswami A. k. (2009-2012) a study of pattern and distribution of injuries in fatal road traffic accident cases for last three years in the jurisdiction of Kolkata police morgue, Kolkata. A thesis for degree of Forensic Medicine.
17. Michael Johnson R, McCarthy MC, Miller SF, People JB. Craniofacial trauma ininjured motocyclists: the impact of helmet usage. J Trauma 1995; 38(6): 876-8.
18. Road Accidents in India 2020. Ministry of road transport & highway transport research wing. Morth.nic.in. 2022.[online] Available at:<https://morth.nic.in/sites/default/files/RA_2022_30_Oct.pdf > [Accessed 27th October 2024].
19. Sharma SM. Road traffic accidents in India. Int J Adv Integrated Med Sci 2016;1(2):57-64.
20. GoleShreenarayan, Soni Priyanka, GonadeUlhas. Study of Fatal Head Injury Due To Road Traffic Accident In Tertiary Care Hospital CimsBilaspur. IOSR-JDMS 2021; 20(11): 18-22.