

Original research article

## An Autopsy Based Study of Chest Injuries in Fatal Road Traffic Accidents Conducted at IGIMS, Patna, Bihar

Nikhil Goel<sup>1</sup>, Aman Kumar<sup>2</sup>, Sanjeev Kumar<sup>3</sup>, Mukesh Prasad<sup>4</sup>

<sup>1</sup> Senior Resident, Department of F.M.T., All India Institute of Medical Sciences, Patna, India

<sup>2</sup> Professor, Department of F.M.T., Indira Gandhi Institute of Medical Sciences, Patna, India

<sup>3</sup> Associate Professor, Department of F.M.T., Indira Gandhi Institute of Medical Sciences, Patna, India

<sup>4</sup> Assistant Professor, Department of F.M.T., Indira Gandhi Institute of Medical Sciences, Patna, India

Corresponding Author: Mukesh Prasad

E-mail: [awaramail@gmail.com](mailto:awaramail@gmail.com)

### Abstract

**Background:** Thorax (chest) is one of the most important cavities of the human body. Thoracic trauma constitutes 10 to 15% of mortalities in the world wide population. Road Traffic Accident (RTA) is like an endemic disease, which affects mainly young people. According to a study, death related trauma rank third after cardiovascular diseases and cancer. 90% of RTA take place in low and middle income countries.

**Objective:** To study the pattern and type of chest injuries in fatal road traffic accidents.

**Materials and Methods:** The present study was done on medicolegal autopsies conducted at the department of Forensic Medicine and Toxicology, Indira Gandhi Institute of Medical Sciences (IGIMS), Patna from 25th July 2017 to 24th July 2019 to study the pattern and type of chest injuries in fatal road traffic accidents.

Inclusion Criteria 1. All those who died after road traffic accidents and brought to mortuary of Indira Gandhi Institute of Medical Sciences, Patna with some history of the road traffic accident. Exclusion Criteria 1. The bodies found on the road side with injuries, where road traffic accident is suspected, but not confirmed. 2. Cases other than that of road traffic accident. 3. Decomposed bodies in which the organs are liquified and injuries could not be appreciated.

**Result:** Out of total 223 autopsies done in the study period, 61 (27.35%) cases had chest injuries. Majority of the cases were observed in Winter season. Males were affected more than females. Male of 31 – 45 years age group were most vulnerable age group for chest injuries in fatal road traffic accident. Injuries over chest and abdomen together were found in maximum number of victims (32 cases; 52.46%). Haemorrhage and shock was the most common cause of death in 80.33% of the victims. Fracture of ribs were found in 39 victims. Haemothorax was found in 88.52% of the cases. Lung alone was the commonest involved thoracic viscera in victims of chest trauma in 75.41% cases.

**Conclusion:** Improving the design of roads and vehicles, enforcing emergency medical services could be used to control the increasing toll of death due to RTA. There needs to be intensification of current educational programmes and law enforcement with regards to traffic

rules and road safety measures. Pre-hospital emergency medical system should be implemented. Also High-tech trauma centre should be established at every district head-quarter and on highways at definite intervals.

**Keywords:** Road traffic accident, Hemothorax, Chest injury, Rib fracture, hemorrhage and shock.

### Introduction

As per world health organization “Accident” means an event, independent of human will, caused by an outside force acting rapidly which results in bodily and mental injury. It has also been defined as an occurrence in the sequence of events which usually produces unintended injury, death or property damage [1]. Julius Caesar died of stab injuries to the chest and abdomen inflicted by several of his assailants [2]. The importance of the injuries to certain intrathoracic structures was acknowledged by Sushruta, the ancient Hindu surgeon as early as 300 B.C.[3]. Road Traffic Accident (RTA) is like an endemic disease, which affects mainly young people. According to a study, death related trauma rank third after cardiovascular diseases and cancer [4]. 90% of RTA take place in low and middle income countries [5]. This accounts for 10% of deaths due to all causes. In India, according to the National Crime Record Bureau (NCRB) report, 2015, 53 cases of road accidents took place every one hour in the year 2015 [6].

Thorax (chest) is one of the most important cavities of the human body. Chest contains two major organs - lungs and heart. So, among the three pods of life (tripod) two pods are present in this cavity. Because of its size and anatomical position it is a major site of trauma in road traffic accidents, railway accidents, industrial mishap, penetrating trauma, blunt trauma and growing menace of terrorism globally involving bomb explosion injuries and iatrogenic or therapeutic injuries etc. Thoracic trauma constitutes 10 to 15% of mortalities in the world wide population [4]. Deaths are caused by airway obstruction, traumatic asphyxia, pneumothorax, haemothorax, flail-chest cardiac tamponade, chylothorax, interstitial emphysema and arterial air embolism. The most important danger is of anoxia, as complete anoxia of brain for only three minutes is sufficient to cause brain death. For this reason, vital nature of thoracic visceral injuries have always been of major interest both to the clinicians and forensic personnel. So, this study was taken to suggest the planners for taking safety measures and in stratifying high risk population of chest trauma due to RTA. It can also help the authorities in propagating safety measures to educate the people and to create better health care facilities on roads (e.g. trauma centres, quick response teams and well equipped ambulances).

**Aim:** To study the pattern and type of chest injuries in fatal road traffic accidents.

### Materials and Methods

The present study was done on medicolegal autopsies conducted at the Department of Forensic Medicine and Toxicology, Indira Gandhi Institute of Medical Sciences (IGIMS), Patna from 25<sup>th</sup> July 2017 to 24<sup>th</sup> July 2019 to study the pattern and type of chest injuries in fatal road traffic accidents.

- Study design: Descriptive cross-sectional study.
- Study period: The present study was conducted between 25<sup>th</sup> July 2017 to 24<sup>th</sup> July 2019
- Study population: Cases of fatal road traffic accident deaths coming for medicolegal post-mortem examination.
- Sample size: 100 cases.

### Inclusion Criteria

1. All those who died after road traffic accidents and brought to mortuary of Indira Gandhi Institute of Medical Sciences, Patna with some history of the road traffic accident.

### Exclusion Criteria

1. The bodies found on the road side with injuries, where road traffic accident is suspected, but not confirmed.
  2. Cases other than that of road traffic accident.
  3. Decomposed bodies in which the organs are liquified and injuries could not be appreciated.
- Dissection technique: After a complete external examination, dissection of the dead body was undertaken. For opening the body, a mid-line incision was given commencing from symphysis menti and was extended upto symphysis pubis, avoiding the umbilicus and any wound or injury present in the course of this line. The examination of thorax and the thoracic cavity was carried out in systematic manner. Other parts of the body were also examined thoroughly and positive findings were noted.

### Observations and Results

Out of total 223 autopsies done at mortuary of Indira Gandhi Institute of Medical Sciences, Patna, Bihar, 100 cases were of fatal RTA out of which 61 (27.35%) cases had chest injuries, as seen in Table- 1. Majority of the cases were observed in Winter season (December-February) while least number of cases were observed in Summer season (March- May), as seen in Table- 2. In the study population, 53 were male and 08 were female. Majority of victims (20 cases; 32.78%) were male of 31 – 45 years age group, as seen in Table- 3. Injuries over chest and abdomen together were found in maximum number of victims (32 cases; 52.46%) of fatal road traffic accidents while chest alone was involved in only 07 cases (11.48%), as seen in Table- 4. The cause of death in most of the victims n= 49 (80.33%) were haemorrhage and shock while septicaemia constituted least number of cases n= 03 (04.92%), as seen in Table- 5. Fracture of ribs were found in most of the cases (39 victims; 63.93%) while sternum fracture was seen in least number of cases (03 cases; 04.92%), as seen in Table- 6. Haemothorax was found in majority of the cases (54 victims; 88.52%), as seen in Table- 7. Lung alone was the commonest (46 victims; 75.41%) involved thoracic viscera in victims of chest trauma whereas injuries to both lung and heart was observed in 09 victims (14.75%), as seen in Table- 8.

### Discussion

The present study comprised of 61 cases of RTA cases having chest trauma, out of a total number of 223 autopsies performed between 25<sup>th</sup> July, 2017 to 24<sup>th</sup> July, 2019, in the department of Forensic Medicine and Toxicology, Indira Gandhi Institute of Medical Sciences, Patna. The findings of present study are comparable with the findings of studies done in the past [7]. On the contrast, in a study by Oberoy SS *et al.*, 2011 [8] observed the prevalence of fatal chest injury in their study to be only 12% of total deaths due to RTA. This may be due to the fact they had included only two wheelers road traffic accidents in their study. Maximum number of deaths were reported in the winter season which is comparable to the studies conducted in the past [9-11]. It may be due to the low visibility on roads due to fog and increased number of vehicles on roads. In the present study, male/female ratio was 6.6:1 which is comparable to various studies done in the past [7,12]. This dominance of males is readily explainable by the fact that males are more exposed to hazards of roads as they constitute working and earning member in majority of the families, while females usually stay at home and are mainly involved in indoor activities and household work. In the present study, Chest and abdomen (32 cases, 52.46%) were the most commonly involved body parts in chest trauma due to fatal RTA which is comparable to the findings in the studies done previously [7,8]. This

shows the importance of chest organs and abdominal organs protection for human survival. Main cause of death in victims of chest trauma was shock and haemorrhage in the present study, which is in consistency with the findings of other studies [7,12]. Such findings may be observed because of the fact that majority of great vessels passes through the thorax which may get injured during accidents as well as high vascularity of the lung tissue. Rib fractures were most commonly injured bony structure in chest trauma due to fatal RTA as evident from the present study. This finding is comparable to various studies done in the past [7, 12, 13]. In the present study, it is observed that majority of victims of chest injuries in fatal RTA had Haemothorax. Similar finding was seen in the study done by Kumar PM et al., 2009 [12]. Haemothorax or pneumothorax resulting from fatal RTA compresses internal thoracic viscera i.e. lungs and heart, resulting in development of respiratory failure and death. In the present study, lungs alone was the most commonly involved viscera in cases of chest trauma due to fatal RTA which is in consistency with the findings of various studies done in the past [7, 12, 14]. Above mentioned findings of the study clearly delineate the vital importance of lungs and heart for life and any injury to these organs may end up in fatality.

### Conclusions

The first reported human fatality associated with a motor vehicle was a pedestrian killed in 1899. Since then number of RTA cases has increased and has now become the chief cause of death affecting the most active and productive age group. Present study also revealed that young adult males of age group 30-45 were more commonly affected. Chest injuries in RTA involves mostly the thoracic viscera or/ and abdominal viscera which warrants need immediate, prompt, effective and adequate medical help. There is need for an urgent national policy for road safety, constructing road networks conforming to the volume of traffic, ensuring proper scrutiny of individuals before issuing driving licences, educating the public on road safety etc. Various preventive measures like avoiding high speed, restricting driving under influence of alcohol, promoting the use of helmets, seat belts and other restraints, constructions of motor vehicles with safety airbags, prohibition of use of mobile phone while driving, ensuring that people walking and cycling on roads are more easily visible. Improving the design of roads and vehicles, enforcing emergency medical services could be used to control the increasing toll of death due to RTA. There needs to be intensification of current educational programmes and law enforcement with regards to traffic rules and road safety measures especially during winter and summer holidays. We also strongly recommend the implementation of pre-hospital emergency medical system. This can be done by introducing the well established pre-hospital life support programme, like emergency medical technician-Ambulance (EMT-A), emergency medical technician -Intermediate (EMT-I), emergency medical technician - Paramedics (EMT-P). Lastly establishment of "High-tech trauma centre" having services of emergency medicine at every district head-quarter and on highways at definite intervals is the present need because the management of chest injuries at such centres significantly reduces the mortality rate.

**Tables: Showing total number of autopsies performed between 25th July, 2017 - 24th July, 2019 and the number of RTA cases having chest injuries**

Total no. of autopsies during study period	Total no. of RTA cases	Total no. of RTA cases having chest injuries
223	100	61

**Table 2: Seasonal pattern of RTA cases with chest injuries**

Different months	No. of Cases	Percentage (%)
December – February (Winter season)	19	31.14
March – May (Summer season)	12	19.67
June – August (Rainy season)	16	26.23
September – November (Autumn season)	14	22.96
Total	61	100.00

**Table 3: Comparison of sex distribution in different age groups in cases of chest injuries due to RTA**

Age group	Male	Percentage (%)	Female	Percentage (%)	Total	Percentage (%)
0–15 year	03	04.91	00	00.00	03	04.91
16-30year	17	27.86	01	01.64	18	29.50
31-45year	20	32.78	02	03.28	22	36.06
46-60year	11	18.03	05	08.23	16	26.26
>60 year	02	03.27	00	00.00	02	03.27
Total	53	86.85	08	13.15	61	100.00

**Table 4: Parts of body involved in victims of fatal RTA**

Parts of body involved	No. of victims	Percentage (%)
Chest alone	07	11.48
Chest and adjacent Head & Neck	10	16.39
Chest & Abdomen	32	52.46
Combined (head/neck/abdomen/limbs etc.)	12	19.67
Total	61	100.00

**Table 5: Cause of death in victims of fatal RTA**

Cause of death	No. of victims	Percentage (%)
Asphyxia	04	06.55
Haemorrhage and shock with Asphyxia	05	08.20
Haemorrhage and Shock	49	80.33
Septicaemia	03	04.92
Total	61	100

**Table 6: Fracture of different bones in victims of fatal RTA**

Bone involved	No. of victims	Percentage
Ribs	39	63.93
Clavicle	04	06.56
Sternum	03	04.92
Combined (ribs/clavicle/scapula/sternum/femur etc.)	15	24.59

Total	61	100.00
-------	----	--------

**Table 7: Conditions of pleural cavity in the victims of chest trauma in cases of fatal RTA**

Pleural cavity	No. of victims	Percentage (%)
Normal	02	03.28
Haemothorax	54	88.52
Pyothorax	00	00.00
Pneumothorax	02	03.28
Combined (Haemothorax and Pneumothorax)	03	04.92
Total	61	100.00

**Table 8: Involvement of thoracic viscera in victims of chest injuries due to fatal RTA**

Viscera involved	No. of victims	Percentage (%)
Lung	46	75.41
Lung and Heart	09	14.75
Combined (lung/heart with great vessels etc.)	03	04.92
Normal	03	04.92
Total	61	100

## References

1. Kumar S, Singh RK. Pattern of Craniocerebral Injuries in Fatal Vehicular Accidents in Patna (Bihar). *Journal of Indian Academy of Forensic Medicine*. 2014;36(2):125-9.
2. Dodia H, Sansiya K. A Study of Penetrating Thoracic and Abdominal Injuries. *IOSR Journal of Dental and Medical Sciences*. 2015; 14(8): 64- 95.
3. Kansupada KB, Sassani JW. Sushruta: the father of Indian surgery and ophthalmology. *Documenta ophthalmologica*. 1997 Mar 1;93(1-2):159-67.
4. Prasad VH, Mamatha K, Venkateswarlu B, Babu M. A study of thoraco abdominal injuries in medico legal autopsies conducted in the department of forensic medicine, S.V. Medical College, Tirupati during January 2014 to June 2015. *International Journal of Pharmaceutical Research And Bio-science*. 2016;5(6):29-41.
5. Farooqui JM, Chavan KD, Bangal RS, Syed MA, Thacker PJ, Alam S, et al. Pattern of injury in fatal road traffic accidents in a rural area of western Maharashtra, India. *The Australasian medical journal*. 2013;6(9):476.
6. NCRB AD. Road Accidents in India—2015, National Crime Records Bureau. Ministry of Home Affairs, New Delhi. 2015;2015.
7. Shetty SK, Kanchan T, Menezes RG, et al. Victim profile and pattern of thoraco-abdominal injuries sustained in fatal road traffic accidents. *J Indian Acad Forensic Med* 2012;34(1):16-9.
8. Oberoi SS, Sandhu HS, Aggrawal KK, Bhullar DS. Pattern and distribution of injuries in fatal two wheeler accidental cases. *J Panjab Acad Forensic Med Toxicol* 2011; 11 (1): 31-33.
9. Chourasia S, Baghel J, Rautji R, Radhakrishna KV, Shivakumar DK. An autopsy study of fatal road traffic accidents (RTA) at medicolegal centre of a tertiary health care hospital in South western Maharashtra: Six year Retrospective study. *Int journal of Biomedical and Advance research*. 2019; 10 (5): e5152.
10. Das DK. Study of Road Traffic Accidental (RTA) Deaths in and around Barpeta District: An Autopsy Based Study. *Journal of Evidence based Medicine and Healthcare*. 2015;2(22):3329-7.

11. Singh KP, Slong D, Devi TM. Pattern of road traffic accidents in Imphal. *Journal of Indian Academy of Forensic Medicine*. 2012;34(4):301-3.
12. Kumar PM, Ziya A, Prashant A, Yadav S, Chaturvedi R and Tripathi S.K. Fatality due to chest injury in road traffic accident victims of Varanasi and adjoining districts, U.P. *Medico –Legal Update*. 2009; 6(3):7-9.
13. Hanumantha BN, Madithati P. Pattern of Craniofacial Injuries and socio demographic distribution of Road Traffic Accidents in Bangalore: autopsy study. *International Journal of Medical Science and Public Health*. 2012;1(2).
14. Arther et al. A retrospective study of pattern of injury in chest trauma patients. *J. Thoracic Surg*. 1968; 56:520.