

# One Year Autopsy Study on Pattern of Thoraco Abdominal Injuries in Fatal Road Traffic Accident Cases

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## Abstract

**Background:** In India, 1.77 lakh people died in traffic accidents in 2015. Thoracic cage houses body's most important organs for breathing and circulation. Any damage to it has a significant negative impact on one's chances of living. Objective of this study is to examine pattern of abdominal and thoracic injuries in fatal motor vehicle accident cases.

**Study design:** Autopsy cases of road traffic accidents sustaining thoraco abdominal injuries which are brought to mortuary of Belagavi Institute of Medical Sciences Civil Hospital and KLE's Dr. Prabhakar Kore Hospital. Sample size: 105.

**Results:** 82% victims were males and 52% were among age range of 21-40 years. Commonest cause for death was hemorrhagic shock in 51 cases (48.57%) and most common period of survival was within 2 hours of occurrence of accident in 30 victims (28.57%). The commonest organ to be involved was lungs in 67 (63.8%) cases and second most common organ and commonest abdominal organ to be involved was spleen in 55 (52.38%) cases, 3rd commonest organ and 2nd commonest abdominal organ to be involved was liver in 50 (47.6%) cases. The commonest injury seen was rib fracture in 60% cases and hemoperitoneum was commonest abdominal injury found in 49 (46.66%) cases followed by liver laceration in 31 cases (29.52%).

**Conclusion:** Non Government Organizations, police and also individuals who witness any accident should provide prehospital care to injured patients which will reduce fatality to a large extent. Ambulances should not be just transport vehicles but they should be well equipped with pre hospital treatment facilities.

**Keyword:** Thoracic injuries; Abdominal injuries; Bony fractures; Spinal injuries.

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## INTRODUCTION

Most of the injuries disclose themselves hence treatment becomes easier, but blunt thoraco abdominal injuries are silent ones as a result of which often there a fatal outcome. Victims lives can be saved if these injuries are diagnosed earlier and treated immediately.

This study will attempt to examine pattern of thoracic and abdominal injuries in patients involving fatal motor vehicle accidents. In road



traffic collision situations, brain injuries have historically received a lot of attention. But thoraco abdominal region also needs to be thoroughly examined. Findings of this study will aid in developing strategies and policies to lower mortality and morbidity from thoraco abdominal injuries. It will also help to broadening the understanding of physicians for treating trauma victims and medico-legal professionals to deposit evidence in court of law.

## METHODS

**Source of data:** Autopsy cases of road traffic accidents sustaining thoraco abdominal injuries which are brought to mortuary of Belagavi Institute of Medical Sciences Civil Hospital and KLE's Dr. Prabhakar Kore Hospital.

**Study period:** 1st January 2021 - 31st January 2022 (13 months).

Sample size was calculated by universal sampling method. Sample size was 105.

All fatal cases of thoraco abdominal injuries subjected for postmortem examination. were taken up for the study. A detailed dissection and examination of thoraco abdominal region was carried out as per standard medico-legal autopsy technique and injuries were noted.

## RESULTS AND DISCUSSION

Damage to thoracic and abdominal compartments is known as thoracoabdominal injury. Heart, major blood veins, and lungs are located in thorax. Thoracic muscles and ribs shield two layers of pleurae surrounding the lungs. Diaphragm shifts position when breathing, dividing peritoneal and thoracic compartments.<sup>1</sup>

The abdomen may protrude significantly into the chest, exposing it to damage to the chest wall. Along with hollow viscous organs like stomach and small and large intestines, peritoneal cavity houses solid organs like liver, spleen, and pancreas. Bladder, retroperitoneal organs and spaces, vascular systems, lower ribs, and abdominal wall muscles are also located in peritoneum.<sup>1</sup>

Because trauma to thoracic cage compromises the integrity of entire body as it contains key organs for respiration and circulation, thoraco abdominal injuries play a significant role in fatalities. The abdomen is the third most frequently injured area in the body due to its lack of bone protection and the presence of important organs such as the liver, spleen, kidney, pancreas, major blood vessels, stomach, intestine, bladder, and so on. Trauma to this area can potentially jeopardize an individual's survival.<sup>2</sup>

### *Pathophysiology of thoraco abdominal injuries:*<sup>2</sup>

Thoraco abdominal injuries are generally caused by two mechanisms:

Compression force

Deceleration force

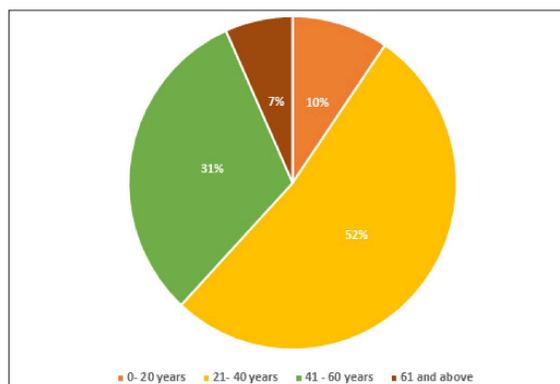
Compression force acts during direct blow or extrinsic compression against fixed object (E.g.: Seat belt injury). This mostly causes tears or sub capsular hematomas of solid organs. It also cause transient increase in intra luminal pressure in bowel leading to its rupture.

Deceleration forces cause stretching and linear shearing which tends to rupture the supported (fixed) structures at the junction between free and fixed part.

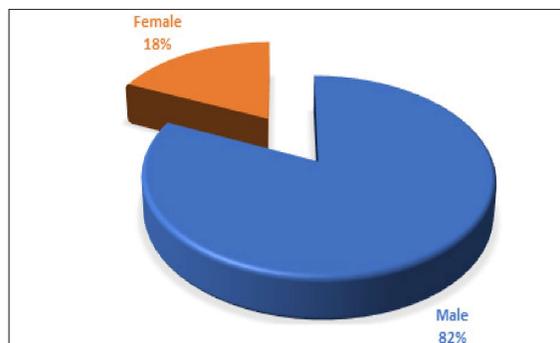
Age and sex distribution of victims (Graph 1, Graph 2, Table 1)

**TABLE 1:** Age and sex wise distribution of cases

Age group in years	Males	%	Females	%
0-20	7	6.66	3	2.85
21-40	47	44.76	8	7.61
41-60	27	25.71	6	5.71
61 and above	5	4.76	2	1.9
Total	86	82	19	18



**Graph 1:** Age wise distribution of cases

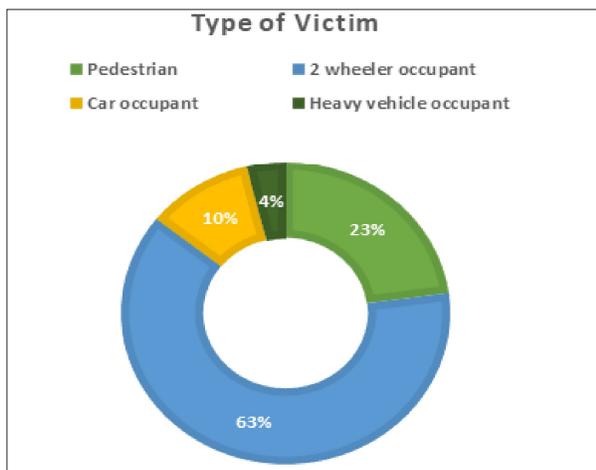


**Graph 2:** Sex wise distribution of cases

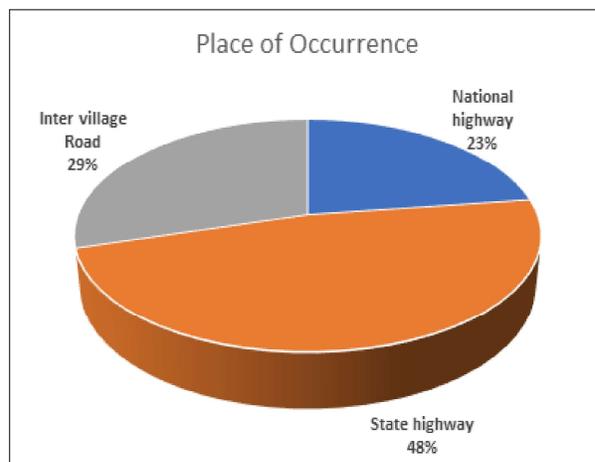
In present study most of victims (82%) were males and most common affected age group was 21- 40 years (52%). This can be attributed to fact that males are mostly working member of family and 21-40 years people are commonly engaged in outdoor activities. Similar findings were seen in Singh J, Raoof et al, Meera et al, kumar et al.<sup>3-6</sup>

Contrast results were seen in Gushinge et al study where commonest age group involved was 51-60 years.<sup>7</sup>

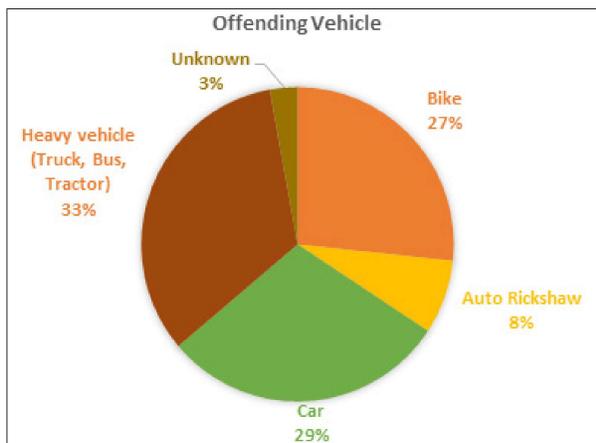
**Type of victim and offending vehicle (Graph 3 and Graph 4)**



**Graph 3:** Thoracoabdominal trauma victims



**Graph 5:** Distribution of cases as per place of occurrence of accident



**Graph 4:** Victims in relation to offending vehicle

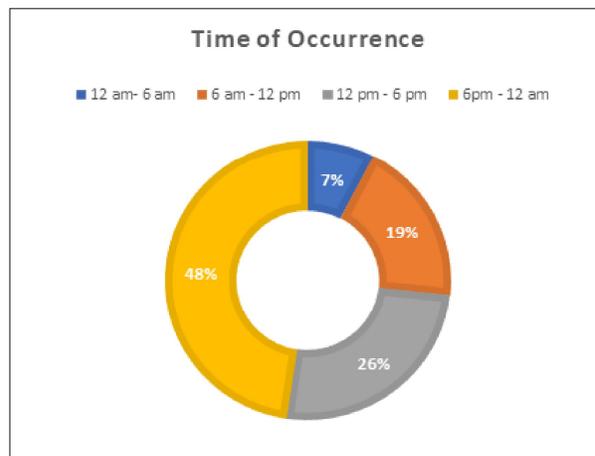
A total of 63% victims were two wheeler occupants and the most common offending vehicle was a heavy vehicle (truck, bus, tractor) in 33% of cases. Next common offending vehicle was bike (27% cases)

The number of two wheelers riding on road with high speed is more in Belagavi region as compared to cars or other vehicles. Road safety rules are not

followed properly. Bikers coming from wrong side is very common.

There are large number of heavy vehicles operating in Belagavi region. Even because national highway is near, interstate trucks operate in large numbers. Similar results were seen in Sharma et al and Raoof et al where most common offending vehicle was a heavy vehicle like bus or truck.<sup>8,4</sup>

Contrast results were seen in Raoof et al, Meera et al, Sharma et al where majority victims were pedestrians. This can be due to encroachments of pavements which forces pedestrians to walk on roads.<sup>4,5,8</sup>



**Graph 6:** Distribution of cases as per time of occurrence of accident

**Place and Time of occurrence (Graph 5 and 6)**

In this study road traffic accidents involving thoracoabdominal injuries most commonly occurred on state highway (48%) followed by intervillage road (29%). This can be attributed to fact of poor maintenance of state highways and congested roads in Belagavi region.

Similar findings were seen in Kumar et al where maximum accidents (52%) occurred on highways followed by city road (28.2%).<sup>6</sup>

Contrast findings were seen in Rao et al where most common place of occurrence was national highway (54.5%) followed by state highway in 30.9% cases.<sup>4</sup>

Road traffic accidents involving thoracoabdominal injuries mostly occurred in evening time between 6 pm and 12 am (48%). This can be attributed to fact that there is heavy flow of traffic during this time.

**Cause of death (Table 2)**

**TABLE 2:** Distribution of cases in relation to cause of death

Cause of death	No. of cases	Percentage
Hemorrhagic shock	51	48.57
Septicemia	8	7.61
Polytrauma	17	16.19
Hemopneumothorax	3	2.85
Hypovolemic shock	7	6.66
Others (Respiratory failure, Neurogenic shock, Severe chest injury with lung consolidation, Thrombosis, Crush injury, Traumatic cervical spine injury)	19	18.09
Total	105	100

In this study, the most common cause of death was hemorrhagic shock in 51 cases (48.57%). In Gyan et al, Raoof et al, Rao et al, Meera et al studies too, hemorrhagic shock was commonest cause of death.<sup>4,9,5</sup>

This is due to fact that most of the vital organs of the body are located in thorax and abdomen. Any injury to these regions causes deterioration of hemodynamic functions causing internal hemorrhage.

**Period of survival (Table 3)**

**TABLE 3:** Distribution of cases in relation to period of survival

Period of survival	No. of cases	Percentage
< 2 hours	30	28.57
2-6 hours	22	20.95
6-12 hours	13	12.38
12-24 hours	12	11.42
1 - 7 days	11	10.47
1 - 4 weeks	15	14.28
>4 weeks	2	1.9
Total	105	100

In our study about 30 victims (28.57%) died within 2 hours of accident, followed by 22 victims (20.95%) whose survival period was between 2-6 hrs.

Contrast findings were seen in Dipayan et al study where 57% victims died on the spot, in Bhowate et al study 82% victims died within 2 hrs of accident, Gushinge et al study where 53% victims had survival period of less than 1 hour.<sup>10,11,7</sup>

Abdominal cavity doesn't have any bony covering like head. This leads to injury to vital organs and vascular system of abdomen thereby causing hemorrhage and death. There is need for early transport of patients to hospital, on the spot emergency medical care.

**Region of body involved and involvement of different organs (Table 4 and table 5)**

**TABLE 4:** Distribution of cases according to region of body involved

Region of the body involved	No. of cases	Percentage
Chest alone	10	9.5
Abdomen alone	5	4.76
Spine alone	1	0.95
Chest and abdomen	65	61.9
Chest and Spine	7	6.66
Abdomen and Spine	1	0.95
Abdomen, Chest and Spine	16	15.23
Total	105	100

**TABLE 5:** Number of victims in relation to different organs involved

Organs	No. of cases	Percentage
Lungs	67	63.8
Heart	14	13.33
Oesophagus	8	7.61
Chest wall	39	37.14
Liver	50	47.6
Spleen	55	52.38
Kidney	36	34.28
Bowel	10	9.5
Stomach	4	3.8
Urinary Bladder	4	3.8
Genitals	10	9.5
Peritoneum	40	38
Perineum	4	3.8

table cont....

Abdominal wall	14	13.33
Spinal cord	25	23.8

In present study, involvement of both chest as well as abdomen was seen in 65 cases (61.9%) whereas only chest was involved in 10 (9.5%) cases and only abdomen was involved in 5(4.76%) cases.

In our study, the most common organ to be involved was lungs in 67 (63.8%) cases and second most common organ and commonest abdominal organ to be involved was spleen in 55 (52.38%) cases, 3rd commonest organ and 2nd commonest abdominal organ to be involved was liver in 50 (47.6%) cases.

Similar findings were seen in Bhowate et al study where lungs were most common organ involved in 82 cases (45.81%) followed by liver in 77 cases (43.01%)<sup>11</sup>

Contrast findings were seen in Gushinge et al study which considered only abdominal injuries, the liver was most common organ involved in 67 (58.77%) cases.<sup>7</sup>

#### **Injuries sustained by victims (Thoracic injuries, abdominal injuries, spinal injuries, bony fractures) (Table 6-9)**

**TABLE 6:** Distribution of cases according to involvement bony fractures

<b>Bony fractures</b>	<b>No. of cases</b>	<b>Percentage</b>
Ribs	63	60%
Clavicle	8	7.6%
Sternum	14	13.33%
Vertebrae	24	23%
Pelvis	18	17.14%

**TABLE 7:** Thoracic injuries

<b>Thoracic injuries</b>	<b>No. of cases</b>	<b>Percentage</b>
Rib fracture	63	60
Clavicle fracture	8	7.6
Sternal fracture	14	13.33
Pneumothorax	18	17.14
Hemothorax	38	36.19
Lung contusion	34	32.38
Lung collapse	8	7.6
Lung laceration	26	24.76
Heart contusion	7	6.66
Chest wall emphysema	7	6.66
Chest wall crush injury	8	7.6

Chest abrasion	45	42.85
Chest contusion	5	4.76

**TABLE 8:** Abdominal injuries

<b>Abdominal injuries</b>	<b>No. of cases</b>	<b>Percentage</b>
Hemoperitoneum	49	46.66
Liver laceration	31	29.52
Liver rupture	12	11.42
Crush injury of liver	7	6.66
Kidney laceration	10	9.52
Kidney rupture	11	10.47
Crush injury of kidney	12	11.42
Spleen laceration	16	15.23
Spleen rupture	13	12.38
Crush injury of spleen	7	6.66
Crush injury bladder	5	4.76
Crush injury genitals	10	9.52
Crush injury bowel	8	7.61
Crush injury abdominal wall	12	11.42
Crush injury pelvis	9	8.57
Fracture pelvis	18	17.14
Abrasion over abdomen	10	9.52

**TABLE 9:** Spinal injuries

<b>Spinal Injuries</b>	<b>No. of cases</b>	<b>Percentage</b>
Vertebral fracture	24	23
Anterolisthesis	4	3.8
Vertebral muscle edema	4	3.8
Disc bulge	5	4.9
Paraspinal spasm	3	2.8

In our study, rib fracture was commonest injury seen in 63 (60%) cases. Next common fracture was that of vertebrae in 24 (23%) cases. In thoracic injuries following rib fracture second common injury was chest abrasion in 45 (42.5%) cases and hemothorax in 38 (36.19%) cases.

In present study, hemoperitoneum was commonest abdominal injury found in 49 (46.66%) cases followed by liver laceration in 31 (29.52%) and spleen laceration in 16 (15.23%) cases.

In our study, vertebral fracture was the most common spinal injury seen in 24 (23%) cases followed by disc buldge in 5% cases.

Our findings corresponded with findings of Ravi et al study where the most common injury observed were rib fractures in 60% cases, also in Bhowate et al study rib fracture was the commonest injury and it was seen in 68.15% cases followed by lung laceration in 38.54% cases and the commonest abdominal injury was liver laceration in 32.4% cases.<sup>11,12</sup>

Contrast findings were seen in Maksoud et al study where lung contusion (19%) and pneumothorax (13.1%) constituted the most common thoracic injuries.<sup>13</sup>

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### CONCLUSION AND RECOMMENDATIONS

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1. There is need of more trauma centers in Belagavi region.
2. Along with main road separate tracks should be made for pedestrians to walk.

3. Compulsory use of seat belts not just by drivers but also by fellow passengers in vehicle will result in lesser injuries.
4. There is need for maintaining speed limit to reduce fatal injuries.
5. Road design and environment alongside the road should be safer so as to avoid lager and fatal injuries.
6. Areas or regions which are more prone to accidents should be noted and area wise traffic management should be done.
7. Children should be taught road safety education.
8. Pedestrians need to be encouraged for using zebra crossings rather than direct crossing of the roads in any manner.

**List of abbreviations:** Not applicable

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### REFERENCES

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1. Autopsy Cases in North India. Asian J. Med. Res. 2022;11(1):25-30.
2. **Hamish Kerr, Brady Bowen, and Deborah Light.** Thoracoabdominal injuries- A Practical Approach. In the book- The Adolescent Athlete, 2<sup>nd</sup> edition, pg 113-135
3. **Singh J.** A Cross-Sectional Study on Pattern and Injury Severity Score in Thoracoabdominal Trauma Among Medicolegal Autopsy Cases in North India. *Asian Journal of Medical Research*, 11(1), 25-30
4. **Raof Abdul MP, Devi Th. M, Neha S, Chhetri D.** Pattern and injury severity score in thoraco-abdominal trauma: A cross-sectional study in medicolegal autopsy cases. *Indian J Forensic Community Med* 2019;6(1):18-23
5. **Th, Meera & Nabachandra, H.** (2005). A Study of Pattern and Injury Severity Score in Blunt Thoraco-abdominal Trauma cases in Manipal. *Medico-Legal Update*. 5.47-52.
6. **M, Kumar & Kohli, Anil & AK, Tyagi.** (2015). Injury pattern and injury severity scores in railway accidents in Delhi. *International Journal of Medical Toxicology and Legal Medicine*. 18. 42.
7. **Gushinge M, Kadu S.** Autopsy Study of Abdominal Injuries in Road Traffic Accidents. *Int J Educ Res Health Sci* 2017;3(2):90-92.
8. **Sharma, B & Manisha, Gupta & Sumedha, Bangar.** (2005). NISS a Valuable Tool for Trauma Scoring on Autopsy. *Pakistan Journal of Biological Sciences*. 10.3923/pjbs.2005.995.1000.
9. **Ananda Rao BVS, Rajesh B, Uppu R,** et al. Study of deaths due to blunt injury abdomen in and around Visakhapatnam. *J. Evid. Based Med. Healthc.* 2018; 5(51), 3466-3469. DOI: 10.18410/jebmh/2018/706
10. **Dipayan Deb Barman, R Karnaboopathy,** study on pattern and severity score of fatal blunt abdominal injuries sustained in RTA, *J Indian Academy for Med* 2019 jul-sept 41(3) pg 158-162
11. **Sandip Bhowate, BH Tirpude, SS Asawa** study on pattern of thoraco abdominal injuries in fatal trauma cases at MGIMS Sewagram, Wardha and PCMS and RC Bhopal, *IJFMT* Jan-June 2016 vol. 10,issue 1pg 95-100.
12. **Ravi, Binod.** (2017). Study on Pattern of Thoraco-Abdominal Injuries in Fatal Road Traffic Accidents at Ranchi, Jharkhand. *Journal of Medical Science And clinical Research*. 05. 22301-22305. 10.18535/jmscr/v5i5.166
13. **Abd El Maksoud WM, Algahany MA.** Pattern and In-Hospital Mortality of Thoracoabdominal Injuries Associated with Motor Vehicle Accident-Related Head Injury: a Single-Center Retrospective Study. *Applied Bionics and Biomechanics*. 2022;2022:3602838. DOI: 10.1155/2022/3602838.