DOI: 10.7860/JCDR/2025/81859.22152

Original Article

Forensic Section

Pattern of Abdominal Organ Injuries in Road Traffic Accidents: An Autopsy Based Cross-sectional Study from Central Kerala, India

JOSEPH AJIN[1], BABY NEERAJA[2], RAJAN BONEY[3], NEERATTY ASOKAN BALARAM[4], BABU BOBAN[5]

ABSTRACT

Introduction: The abdominal wall usually avoids severe damage by transferring stress to the abdominal organs. Analysing the pattern of abdominal injuries in Road Traffic Accidents (RTAs) may help clinicians in providing more targeted treatment to trauma victims at the earliest.

Aim: The present study aimed to analyse the pattern of abdominal organ injuries in RTAs based on medicolegal autopsies.

Materials and Methods: The present cross-sectional study included data from medicolegal autopsies of RTA victims conducted between December 2019 and September 2021 at a Government Medical College hospital in Thrissur, Central Kerala, South India. All cases in which death occurred as a result of RTA-related injuries were included. Postmortem examinations were performed, and injuries were recorded. Data were statistically analysed using the chi-square test and Cramer's V effect size value Statistical Package for Social Sciences (SPSS), version 16.0, Illinois, CA, USA).

Results: A total of 70 cases were included. Males accounted for 57 (81.42%) (p=0.022). The majority of victims 55 (78.57%) were brought dead to the hospital, most of whom were between 40-59 years of age. Among single-organ injuries, the liver was most commonly involved 38 (54.28%), followed by the mesentery 23 (32.85%). The most common type of injury was liver laceration (35/67, 52.22%), followed by mesenteric contusion (20/31, 64.51%) and splenic laceration (17/67, 25.37%). Multiple-organ injuries were also observed, most commonly involving two organs.

Conclusion: Liver and mesenteric injuries were the most frequently observed, highlighting the severity and complexity of abdominal trauma. These findings emphasise the need for early diagnosis, efficient trauma care systems, and preventive strategies to reduce mortality associated with such injuries.

Keywords: Disability, Lacerations, Medicolegal cases

INTRODUCTION

The RTA-related injuries and fatalities are a major public health issue in low and middle-income countries, where they account for over 85% of all fatalities and 90% of Disability adjusted Life Years (DALYs) [1]. In India, the road accident death rate has increased by 5% annually over the past decade, while the population has grown by only 1.4% annually. Furthermore, the distribution of traffic-related fatalities and injuries has been shown to vary by age, gender, month, and time of day [2].

Several studies have investigated whether there is a significant pattern of abdominal organ injuries in RTAs [3-7]. Previous medicolegal cases suggest that abdominal injuries often go unnoticed, which can lead to fatal outcomes [3]. Results from population-based studies, however, have been heterogeneous. Some studies reported that thoracic injuries, particularly involving the lungs, were most common [4], while others found that the liver, followed by the kidneys, were the most frequently injured organs [5].

Therefore, further data are essential to establish the types of injuries and organs most commonly involved. A detailed study and analysis of abdominal injury patterns in RTAs may provide clinicians with valuable information for targeted management [7]. The present study aimed to analyse the pattern of abdominal organ injuries, specifically contusions and lacerations, based on medicolegal autopsies. The main objectives were to determine the types and patterns of abdominal organ injuries, and to analyse their distribution by gender and age.

MATERIALS AND METHODS

The present descriptive cross-sectional study was conducted in the Department of Forensic Medicine, Government Medical College, Thrissur, Central Kerala, South India from December 2019 to September 2021. All procedures adhered to the Declaration of Helsinki (1975, revised in 2013). The study protocol was approved by the Institutional Research and Ethics Committee (Ref No. B6-8772/2016/MCTCR (7)).

Inclusion criteria: Autopsy samples of all known cases with a documented or alleged history of death due to RTAs, across all age groups, were included.

Exclusion criteria: Unknown bodies, decomposed bodies, deaths due to railway accidents, and deaths caused by abdominal injuries from blunt weapons were excluded.

Sample size calculation: The minimum sample size was calculated as 70, based on the study by Gushinge and Kadu, using the formula:

$n=Z(1-\alpha)^2pq/d^2$,

where p=prevalence (59%), and d=allowable error (β error), set at 20% of p [3].

Study Procedure

A consecutive sampling technique was used. Autopsy reports of RTA victims were collected from the department. Additional information was obtained from Kerala police forms, other relevant police documents, accident histories, and photographic records. A questionnaire was used to collect data on age, gender, socioeconomic status, and abdominal injury patterns following autopsy.

Injury patterns were classified as:

Laceration: A ripped, jagged cut caused by soft tissue being stretched and torn by blunt force trauma.

Contusion: A blunt force injury resulting in vascular damage and blood leakage into surrounding tissues.

Confidentiality was maintained by converting individual names into coded identifiers, and data were stored under these codes.

STATISTICAL ANALYSIS

Data were expressed as percentages. Chi-square/Fisher's exact test was applied to identify significant differences between gender and age groups (SPSS, version 16, Illinois, CA, USA). A p-value<0.05 was considered statistically significant. Cramer's V Effect Size (ES) was used for the Chi-square test of independence to determine the strength of association between variables [8]. An ES value close to 0 indicated a very weak association, while values close to 1 indicated a strong association. Specifically, ES>0.25 suggested a strong association, ES>0.10 a moderate association, ES>0.05 a weak association, and ES=0 a very weak association.

RESULTS

The total sample size of the study was 70. Among them, the majority were males, accounting for 56 (81.42%), while females constituted 13 (18.57%). The age of the deceased ranged from 20 to 84 years, with a mean±SD of 47.5±17.9 years. Most cases were in the 40-59 year age group 22 (38.59%), followed by the 20-39 year group 21 (36.84%). Thirteen cases (22.80%) were above 60 years. Gender-wise distribution across age groups is shown in [Table/Fig-1]. Male predominance was especially evident in the 40-59 year group 22 (38.59%). The association was statistically significant (Chi-square=7.6187, p=0.022162).

Age (years)	Male (%)	Female (%)
Early adulthood 20-39	21 (36.84)	1 (7.69)
Middle adulthood 40-59	22 (38.59)	5 (38.46)
Old age 60 above	13 (22.80)	8 (61.53)
Total	56 (81.42)	14 (18.57)

[Table/Fig-1]: Age and gender distribution of the cases.
Fischer's exact test (2, N=70) =7.6187. The p-value is .022162. Craemer's effect size value=0.3299, indicates very strong association between the variables

Single abdominal organ involvement was observed in 45 (64.28%) [Table/Fig-2]. Double organ involvement occurred in 22 (31.42%). Two cases (2.85%) showed injury to three abdominal organs, while five organs were involved in a single case (1.42%). Among single-organ injuries, the liver was the most frequently affected organ, involved in 38 (54.28%), followed by the mesentery 23 (32.85%), spleen 18 (25.71%), kidney 15 (21.42%), and small intestine 1 (1.42%). Isolated injuries of the stomach, adrenal gland, pancreas, and large intestine were not observed [Table/Fig-3].

Organ involved in injury	N	%
Only one organ involved	45	64.28
Two organs involved	22	31.42
Three organs involved	2	2.85
Four organs involved	0	0
Five organs involved	1	1.42
Total	70	100

[Table/Fig-2]: Combination of organ injury.

In cases with two-organ involvement, the mesentery was most commonly injured (23/70, 64.51%), followed by the liver (36/70, 51.42%). The most common type of injury overall was liver laceration, followed by mesenteric contusion and splenic laceration [Table/Fig-4].

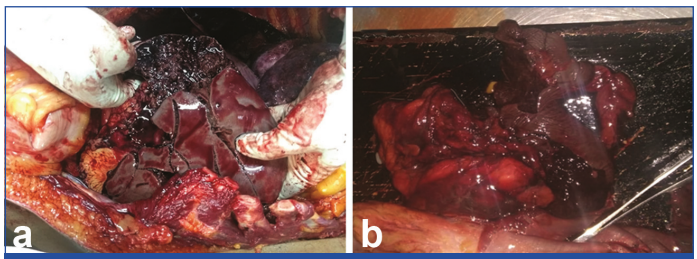
Organ involved in injury	N	%
Liver	38	54.28
Kidney	15	21.42
Mesentery	23	32.85
Spleen	18	25.71
Stomach	2	2.85
Adrenal	1	1.42
Pancreas	1	1.42
Small Intestine	1	1.42
Large Intestine	1	1.42

[Table/Fig-3]: Organ involved in injury cases.

Organ involved in injury	Contusion	Laceration	Both
Liver	1 (3.22)	35 (52.22)	2 (100%)
Kidney	4 (12.90)	11 (16.41)	0
Mesentery	20 (64.51)	3 (4.47)	0
Spleen	1 (3.22)	17 (25.37)	0
Stomach	2 (6.45)	0	0
Adrenal	0	1 (1.49)	0
Pancreas	1 (3.22)	0	0
Small Intestine	1 (3.22)	0	0
Large Intestine	1 (3.22)	0	0
Total	31	67	2

[Table/Fig-4]: Type of Injury with organ involved.
The chi-square statistic is (8, N=100)=55.2107. p<0.00001. Laceration in liver was significantly different from others. Craemer's effect size value=0.5254 indicates very strong association between the variables

Liver injury was found in 38 (54.28%). Of these, isolated contusion was observed in only 1 case, laceration in 35 cases, and a combination of laceration and contusion in 2 cases. Kidney injuries were seen in 15 (21.42%), comprising 4 contusions and 11 lacerations. Mesenteric injuries were documented in 23 (32.85%), of which 20 were contusions and 3 were lacerations. Splenic injuries occurred in 18 (25.71%), with 1 contusion and 17 lacerations. Images of liver and spleen lacerations are shown in [Table/Fig-5]. Stomach injury was observed in 2 (2.85%), both as contusions. One case (1.42%) each of adrenal laceration, pancreatic contusion, small intestinal contusion, and large intestinal contusion was noted.



[Table/Fig-5]: Photomicrographs of laceration a) Liver and b) Spleen.

Of the total 70 study subjects, 55 (78.57%) were brought dead, while 15 (21.42%) received hospital treatment.

DISCUSSION

This study found that, among single-organ injuries, the liver was the most commonly affected organ (54.28%), followed by the mesentery (32.85%). The most common type of injury overall was liver laceration, followed by mesenteric contusion and splenic laceration. Males predominated (81.42%), with the highest incidence in the 40-59 year age group. These findings are consistent with previous reports indicating that males are the predominant victims of RTAs (85.9%) [3].

A study on post-mortem examinations of 114 RTA cases with abdominal trauma, either isolated or combined with other injuries,

similarly found that the liver was the most commonly injured organ (58.77%), with laceration being the predominant type (77.61%). In that study, males accounted for 85.96% of cases, and the most affected age group was 21-30 years (24.56%) [3]. Comparable male predominance was also observed by Hanumantha et al., [4] (92%) and Shetty BSK et al., [5] (86%).

Other studies reported that thoracic injuries, particularly lung involvement, were most frequent (92.3%) [4]. In those series, two-wheeler occupants and pedestrians were the most common victims. Thoracoabdominal injuries were seen in 155 cases, of which external abdominal injuries were observed in 74. The kidney was the most commonly affected abdominal organ, followed by the liver. Contusions were more frequent in the kidney, whereas lacerations predominated in the liver [5]. In contrast, motorcycle collisions most often resulted in head and neck injuries (41.73%), with abdominal involvement being the least common [6].

It Was often observed that the abdominal wall escaped gross external injury by transmitting force to the abdominal organs, which sustain damage without visible external trauma [3]. An autopsy-based study of 160 cases of abdominal trauma reported externally visible abdominal injuries in 100 cases, with visceral trauma identified in 85. Hepatic trauma was noted in 98 cases, with 87 going undiagnosed during life. Similarly, 60 out of 65 cases of splenic trauma went uninvestigated [7].

In India, men form the major workforce and are often the sole earning members of their families. As a result, they rely on vehicles to commute to work and are more prone to sustaining injuries from RTAs. People in the age groups of 20-39 and 40-59 years are more vulnerable to RTA-related injuries, as they lead more active lives and are more exposed to the external world due to education and employment. Consequently, they face greater risks from the adverse effects of modern automobile use. Farooqui JM et al., demonstrated that men in the 20-39 age group were commonly involved in RTAs [9]. Furthermore, Hadaye RS et al., also reported that the highest proportion (33.96%) of victims were in the 21-30 age range, followed by the 31-40 age range (20.1%) [10].

The liver is particularly vulnerable to damage in acute abdominal trauma due to its size, fixed position, and solid consistency. Additionally, when the pressure inside hollow organs increases significantly, the intestines and bladder may rupture due to severe compression injuries [11]. With regard to the degree of kidney damage, there was no distinction between frontal and lateral collisions [12].

A recent study conducted in a metropolitan city in central India reported that 47.2% of cases involved injuries to the lower extremities, while 27.1% involved the head, neck, and face. Singular site fractures occurred in approximately 40.4% of cases. O'Connor JV et al., concluded that frontal crashes involving a fixed object or intrusion were more likely to result in multiple rib fractures, sternal fractures, and pulmonary contusions [13,14]. In the present study, we found only single-organ injuries in 64% of cases. A previous study on medicolegal autopsies demonstrated that 67.5% of cases showed multiple organ damage, while 31.25% of cases had no external injuries [15].

A recent study conducted in South India among medical undergraduates found that RTA occurrence was significantly associated with cell phone use, intoxicated driving, signal jumping, and overspeeding [16-18]. Overspeeding, reckless driving, and alcohol consumption were also identified as major risk factors for RTA fatalities [19]. Major arterial injuries, such as those involving the thoracic aorta, have been recognised as significant causes of death and morbidity, usually resulting from chest injuries associated with traffic accidents [20,21]. During the present study period, however, no arterial injuries associated with RTAs were observed.

Delay in transporting victims to the hospital remains a major factor contributing to the increased severity of morbidity and mortality. The present study found that the majority of RTA victims either died on the spot or were brought dead to the hospital (78.6%). This finding is consistent with a previous study that reported 42.1% of accident victims died on the spot, while 35.0% of those admitted following an accident died within one hour. This highlights the importance of prompt hospital transfer and treatment in reducing morbidity and mortality.

The increasing mortality rates observed in the study population can be attributed to the lack of timely emergency care. The government must establish provisions for on-the-spot emergency medical services for road traffic victims, as It is well-practiced in many foreign countries [22]. Passengers traveling in cars should ensure the use of seat belts to reduce the impact of collisions and protect the abdomen. Riders and drivers must adhere to traffic rules and maintain permissible speed limits. Regular public awareness programs on road safety should be conducted as an additional preventive measure. Previous studies conducted in South India also emphasised the importance of enhancing emergency medical services, enforcing traffic regulations more strictly, and providing health education [23-25].

A retrospective evaluation of 1,014 patients admitted to Gaziantep Abdulkadir Yüksel State Hospital as a result of traffic accidents reported hepatobiliary system injuries as the most common, followed by spleen injuries [26]. A study conducted on 158 RTA-related deaths at Jorhat Medical College and Hospital revealed that liver injuries (96.7%) were the predominant thoracoabdominal injury. Analysis of thoracoabdominal injuries indicated that the most common types were contusions and lacerations [27]. A prospective study of 100 cases of blunt abdominal trauma at a Medical College and Hospital in Rajkot also found the liver (60%) as the most commonly injured organ, followed by the spleen (36%). Renal, pancreatic, and bladder injuries comprised the remainder [28]. The liver's superficial position relative to other abdominal organs makes it more susceptible to impact forces transmitted through the abdominal wall. [Table/Fig-6] [9,29-40] summarises autopsy investigations carried out in different Indian states. Across all studies, the age group of 21-30 years and liver injuries were most commonly reported, often resulting in death. These findings support the observations of the present investigation.

Author	Year of publication	Place of study and period of study	Major age group and abdominal organ injured
Farooqui et al., [9]	2013	Loni, Maharashtra. June 2007 to May 2009.	20-39 years. Liver (11.88 %) and kidneys (8.41%).
Jagannatha et al., [29]	2022	Bangalore, Karnataka. January 2007 to December 2008.	21-30 years. Liver (46.70%) and spleen (25.00%).
Reddy NB et al., [30]	2014	Bangalore, Karnataka. November 2008 to May 2010.	21- 40 years. Liver (32.60%) and spleen (18.30%).
Abymon KK et al., [31]	2021	Mangalore, Karnataka. January 2009 and December 2013.	20 - 29 years. liver (38.00%), and spleen (17.00%).
Ravi BK et al., [32]	2017	Ranchi, Jharkhand. August 2012 to July 2013.	31-45 years. Liver (30.17%), and spleen (17.24%).
Bhimrao SK et al., [33]	2021	Nagpur, Maharashtra. October 2012 to September, 2014.	21-30 years Liver (73.17%), and kidneys (36.58%).

Rajkumar MG et al., [34]	2023	Kolar, Karnataka. January 2014 to December, 2014.	20-40 years. Liver (37.75%).
Amrendra Kumar et al., [35]	2018	Varanasi, Uttar Pradesh. January 2016 to June, 2017.	Liver (100.00%), and spleen (17.33%)
Rudresh YC et al., [36]	2024	Bengaluru, Karnataka. August 2017 and September, 2018.	21-30 years Liver (27.00%), and peritoneum. (14.00%).
Sharma RV et al., [37]	2020	Guwahati, Assam. July 2017 to June, 2018.	21-30 years. Liver (74.32%), and spleen (39.00%).
Ranjan SK et al., [38]	2023	Patna, Bihar. October 2018 to September, 2020.	21-30 years. Liver (89.61%), and spleen (50.00%).
Yadav K et al., [39]	2024	Nuh, Haryana. One year study in 2024.	21-30 years. Mesentery (5.30%), and liver (4.0%).
Chunakar A et al., [40]	2025	Jalpaiguri, West Bengal. January 2024 to June, 2024.	21-40 years. Liver (14.67 %) and spleen (2.75%).

[Table/Fig-6]: Summary of various autopsy-based studies on road traffic accidents leading to major organ injury and mortality in India [9,29-40].

Limitation(s)

Only abdominal organ injuries were considered. Head and chest injuries, which are also very common causes of death in RTAs, were not included. Therefore, large multicentric, population-based studies incorporating head and chest injuries are warranted.

CONCLUSION(S)

Liver and mesenteric injuries were commonly observed, highlighting the severity and complexity of abdominal trauma. These findings underscore the need for early diagnosis, efficient trauma care systems, and preventive measures to reduce RTA-related mortality.

Availability of data and materials: The data used in the study are available from the corresponding author on request.

REFERENCES

[1] Gopalakrishnan S. A public health perspective of road traffic accidents. J Fam Med Prim Care. 2012;1(2):144-50.
[2] Singh SK. Road traffic accidents in India: Issues and challenges. Transp Res Proc. 2017;25:4708-19.
[3] Gushinge M, Kadu S. Autopsy study of abdominal injuries in road traffic accidents. Int J Educ Res Health Sci. 2017;3(2):90-92.
[4] Reddy NB, Hanumantha, Madithati P, Reddy NN, Reddy CS. An epidemiological study on pattern of thoraco-abdominal injuries sustained in fatal road traffic accidents of Bangalore: Autopsy-based study. J Emerg Trauma Shock. 2014;7(2):116-20. Doi: 10.4103/0974-2700.130882.
[5] Shetty BSK, Kanchan T, Menezes RG, Bakkannavar SM, Nayak VC, Yoganarasimha K. Victim profile and pattern of thoraco-abdominal injuries sustained in fatal road traffic accidents. J Indian Acad Forensic Med. 2012;34(1).
[6] Rao D, Mukerjee S. A study of pattern of injuries in road traffic collisions. J Punjab Acad Forensic Med Toxicol. 2010;10:14-16.
[7] Punia RK, Meena DS. Missed injuries in fatal blunt thoraco-abdominal region. J Indian Acad Forensic Med. 2013;35(3):230-32.
[8] Akoglu H. User's guide to correlation coefficient. Turk J Emerg Med. 2018;18:91-93.
[9] Farooqui JM, Chavan KD, Bangal RS, Syed MM, Thacker PJ, Alam S, et al. Pattern of injury in fatal road traffic accidents in a rural area of western Maharashtra, India. Australas Med J. 2013;6(9):476-82.
[10] Hadaye RS, Rathod S, Shastri S. A cross-sectional study of epidemiological factors related to road traffic accidents in a metropolitan city. J Fam Med Prim Care. 2020;9(1):168-72.
[11] Eid HO, Abu-Zidan FM. Biomechanics of road traffic collision injuries: A clinician's perspective. Singapore Med J. 2007;48(7):693-700; quiz 700.
[12] Kuan JK, Kaufman R, Wright JL, Mock C, Nathens AB, Wessells H, et al. Renal injury mechanisms of motor vehicle collisions: Analysis of the crash injury research and engineering network data set. J Urol. 2007;178:935-40.
[13] O'Connor JV, Kufera JA, Kerns TJ, Stein DM, Ho S, Dischinger PC, et al. Crash and occupant predictors of pulmonary contusion. J Trauma. 2009;66(4):1091-95.
[14] Benhamed A, Ndiaye A, Emond M, Lieutaud T, Boucher V, Gossiome A, et al. Road traffic accident-related thoracic trauma: Epidemiology, injury pattern, outcome, and impact on mortality—a multicenter observational study. PLoS One. 2022;17(5):e0268202.
[15] Subedi N, Yadav BN, Jha S, Paudel IS, Regmi R. A profile of abdominal and pelvic injuries in medico-legal autopsy. J Forensic Leg Med. 2013;20(6):792-96.
[16] Kulkarni V, Kanchan T, Palanivel C, Papanna MK, Kumar N, Unnikrishnan B. Awareness and practice of road safety measures among undergraduate medical students in a South Indian state. J Forensic Leg Med. 2013;20(4):226-29.
[17] Vijayakrishnan G, Priyadharshini P, Ramraj B, Anantharaman VV. Factors associated and knowledge on road traffic accidents and rules among private university students in Chengalpattu district, Tamil Nadu, India: A cross-sectional study. J Educ Health Promot. 2022;11:148.
[18] Bogstrand ST, Gjerde H, Normann PT, Rossow I, Ekeberg Ø. Alcohol, psychoactive substances and non-fatal road traffic accidents—a case-control study. BMC Public Health. 2012;12:734.
[19] Kumar S, Mahima, Srivastava DK, Kharya P, Sachan N, Kiran K. Analysis of risk factors contributing to road traffic accidents in a tertiary care hospital: A hospital-based cross-sectional study. Chin J Traumatol. 2020;23(3):159-62.
[20] Johannesdottir BK, Johannesdottir U, Jonsson T, Lund SH, Mogensen B, Gudbjartsson T. High mortality from major vascular trauma in traffic accidents: A population-based study. Scand J Surg. 2020;109(4):328-35.
[21] Zhang S, Xiao X, Wang J, Hu C, Du Q, Fu Z, et al. Epidemiological and clinical characteristics of road traffic crash-related thoracic traumas: Analysis of 5095 hospitalized chest injury patients. J Cardiothorac Surg. 2021;16(1):220.
[22] Wang Z, Jiang J. An overview of research advances in road traffic trauma in China. Traffic Inj Prev. 2003;4(1):09-16.
[23] Kanchan T, Kulkarni V, Bakkannavar SM, Kumar N, Unnikrishnan B. Analysis of fatal road traffic accidents in a coastal township of South India. J Forensic Leg Med. 2012;19(8):448-51.
[24] Shrivastava SR, Pandian P, Shrivastava PS. Pre-hospital care among victims of road traffic accident in a rural area of Tamil Nadu: A cross-sectional descriptive study. J Neurosci Rural Pract. 2014;5(Suppl 1):S33-38.
[25] Sasser SM, Varghese M, Joshipura M, Kellermann A. Preventing death and disability through the timely provision of prehospital trauma care. Bull World Health Organ. 2006;84:507-14.
[26] Yılmaz AM, Kalıntaş E, Yılmaz HE. Evaluation of intra-abdominal injuries in patients referred to the emergency department as a result of traffic accidents. Ann Saudi Med. 2025;45(1):01-08.
[27] Roy S, Thakuria D, Gupta VP. Study of thoraco-abdominal injuries in conjunction with road traffic accident cases brought for medico-legal autopsy. Int J Pharm Sci Rev Res. 2024;84(8):55-59. Available from: https://globalresearchonline.net/ijpsrr/v84-8/09.pdf.
[28] Kumar BB, Marsonia H, Bhatt JG, Dave JP, Vagadia JG. A prospective study on non-operative management of solid organ injuries in blunt abdominal trauma patients. Asian J Res Surg. 2024;7(2):196-205.
[29] Jagannatha SR, Viswanath D, Ananda K. Pattern of abdominal injuries in cases of road traffic accidents. Indian J Forensic Med Toxicol. 2022;6:30-32.
[30] Reddy NB, Hanumantha, Madithati P, Reddy NN, Reddy CS. An epidemiological study on pattern of thoraco-abdominal injuries sustained in fatal road traffic accidents of Bangalore: Autopsy-based study. J Emerg Trauma Shock. 2014;7(2):116-20.
[31] Abymon KK, Bhat MA, Bhat AM. Study of mortality due to thoraco-abdominal injuries in road traffic accidents in Mangalore city. Indian J Forensic Med Toxicol. 2021;15:32-37.
[32] Ravi BK, Chaudhary AK, Kumar B, Deepmala. Study on pattern of thoraco-abdominal injuries in fatal road traffic accidents at Ranchi, Jharkhand. J Med Sci Clin Res. 2017;5:22301-05.
[33] Bhimrao SK, Vipul NA, Pratik G, Manu S. Autopsy study of thoraco-abdominal injuries in road traffic accidents. Indian J Forensic Med Toxicol. 2021;15:4238-46.
[34] Rajkumar MG, Reddy SP, Ajaykumar PS, Abhinandana R. An autopsy-based retrospective study on pattern of thoraco-abdominal injuries in fatal road traffic accidents of Kolar, South India. Medico Legal Update. 2023;23(2):15-19.
[35] Kumar A, Tiwari PK, Rai SK, Pandey SK. Liver, spleen and associated organ injury in road traffic accidents: An autopsy study. Pharma Innov. 2018;7(3):424-27.
[36] Rudresh YC. A cross-sectional study of thoracoabdominal injuries pattern in road traffic accidents among autopsies. Biomedicine. 2024;44(3):348-56.
[37] Sharma RV, Das R, Choudhury A. Retrospective analysis of pattern of injuries in road traffic accidents: An autopsy-based study. Medico-Legal Update. 2020;20:459-65.
[38] Ranjan SK, Singh RK, Kumar S, Kumari P. Assessment of frequency, patterns, and causes of blunt abdominal trauma in a North Indian cohort: An autopsy-based study. Cureus. 2023;15(9):e44856.

[39] Yadav K, Atal DK, Chawla H, Yadav R, Khan M, Yadav RP. A cross-sectional study on pattern of thoraco-abdominal injuries in victims of fatal road traffic accidents. Medico Legal Update. 2024;24(1):202439-44.

[40] Chunakar A, Kumar V, Sarkar PK, Chakraborty P, Deb PK, Dey CK. A study of pattern of fatal thoraco-abdominal injuries in RTA cases: An autopsy-based cross-sectional study. Indian J Forensic Med Toxicol. 2025;19(2):33-38.

PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Forensic Medicine, Amala Institute of Medical Sciences, Thrissur, Kerala, India.
2. Assistant Professor, Department of Forensic Medicine, Amala Institute of Medical Sciences, Thrissur, Kerala, India.
3. Associate Professor, Department of Pharmacology, Amala Institute of Medical Sciences, Thrissur, Kerala, India.
4. Professor, Department of Forensic Medicine, Government Medical College, Thrissur, Kerala, India.
5. Professor, Department of Forensic Medicine, Amala Institute of Medical Sciences, Thrissur, Kerala, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Joseph Ajin,
Assistant Professor, Department of Forensic Medicine, Department of Forensic Medicine, Amala Institute of Medical Sciences, Thrissur-680555, Kerala, India.
E-mail: ajnabi572@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Aug 07, 2025
- Manual Googling: Sep 13, 2025
- iThenticate Software: Sep 16, 2025 (11%)

ETYMOLOGY: Author Origin

EMENDATIONS: 8

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? NA
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Aug 05, 2025**
Date of Peer Review: **Aug 09, 2025**
Date of Acceptance: **Sep 18, 2025**
Date of Publishing: **Dec 01, 2025**