

An autopsy-based distribution pattern of thoraco-abdominal injuries in victims of road traffic accidents in Western Delhi: An observational study

¹Dr. Jitender Pratap Singh, M.D. Forensic Medicine, Associate Professor, Dept. of Forensic Medicine, Noida International Institute of Medical Sciences (NIIMS), Noida International University, Greater Noida, U.P.

²Dr. Manjari Kishore, M.D. Pathology, Associate Professor, Dept. of Pathology, Noida International Institute of Medical Sciences (NIIMS), Noida International University, Greater Noida, U.P.

³Dr. Abhishek Sharma, M.D. Forensic Medicine, Assistant professor, Dept of Forensic Medicine, Rama Medical College, Ghaziabad, U.P.

Corresponding Author: Dr. Manjari Kishore, M.D. Pathology, Associate Professor, Dept. of Pathology, Noida International Institute of Medical Sciences (NIIMS), Noida International University, Greater Noida, U.P.

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Abstract

Introduction: Road traffic accident (RTA) is a leading cause of mortality and morbidity in our country. A clear understanding of different patterns of fatal injury in RTA victims is important to assess a trauma center’s effectiveness in saving a precious life. RTA claims approximately 1.5 million of lives each year. Our study aims to examine the autopsy-based different patterns of thoraco-abdominal injuries in victims of RTA, highlighting the nature of offending vehicle and duration of survival in victims with varied injuries.

Aims & Objective: The primary goal of our study is to examine the patterns of fatal injuries in victims of RTA and to assess the need and approaches at trauma centers for an effective urgent & intensive management.

Materials & Methods: The present study is a cross-sectional study done in Department of Forensic Medicine, covering the region of Western Delhi over a

period of one year.2021-22. We aim to study the victims of road traffic accidents who were brought dead or spot dead or hospital death. A detailed information of the victims like age & sex along with history of accidents like type of offending vehicle, vehicle used by the victim, manner of the accident as available in records were noted. An attempt was made to note the duration of survival in these patients in different types of injuries. The results were analyzed using SPSS 20 software.

Results: A total of 220 cases were included in our study, with majority being male (180; 81.8%) with male: female ratio of 4.5:1. The age of victims ranged from new-born to elderly (more than 70 years); maximum cases observed in the age group of 21-30 years (40% of cases), with 95.5 % males in that age group. An overall increase in accidents rate were noted in males in each age group. The commonest type of victim in our study was the pedestrians (54.55%). In our study, four-wheelers (truck,

buses, van) had maximum number of victims, comprising of approximately 62% of total cases. Of 200 cases, maximum cases were of spot death, comprising of 112 cases (50.9%). Secondly, in 84 of our cases (38.2%), victims survived for a period of only 0-6 hours. Majority of our cases had combined thoraco-abdominal injuries (64 cases, 29%). Of 220 cases, 116 had chest injury and 16 had injury to heart. Of 116 victims with chest injury, 88 had rib fractures. Of 16 cases with heart injury, 12 cases had rib fractures also. Liver was the major solid organ injured in victims in our study.

Conclusion: Our study presents a pattern distribution of thoraco-abdominal injuries in victims of RTA which help in assessing the necessity for advanced trauma center facilities. This study also aims at giving an insight to triage the victims to provide them with intensive management to save a precious life with a more focused approach.

Keywords: Road traffic accidents, thoraco-abdominal injuries, medico-legal autopsy

Introduction

In current scenario, "Road Safety" is one of the biggest public health issues throughout the country. In fact, lakhs of lives are lost annually because of fatality due to road accidents, and the clock is ticking constantly. Road traffic injuries are the principal cause of death in the age group of 15 to 49 years. Every year the lives of approximately 1.3 million people are cut short globally as a result of a road traffic crash. Unfortunately, more than 90 percent of road traffic deaths occur in low- and middle-income countries. India, ranks at the top with about 11% share in the world. The above-mentioned data is actually an alarming situation for us, which in turn require immense safety approach while on road. This can be only achieved if we take adequate precautionary

measures to prevent it and also to organize our health set-ups in dealing these accidental cases on priority basis.

Pattern of injury in different victims of RTA vary as per region depending on types of vehicles used, safety rules & discipline, traffic congestion, awareness of public along with conditions of road. In the present study, we aim to highlight the epidemiological factors associated with different types of RTA along with pattern of injury involving various organs. Our study tries to bring attention to details like age & gender of victims, the vehicle involved, major organs injured and duration of survival in various types of injuries. We also aim to focus on assessing the needs and approaches at trauma centers which can sometimes be life-saving for our patients.

Materials & Methods

The present study is a cross-sectional study done in Department of Forensic Medicine at Army College of Medical Sciences, New Delhi covering the region of Western Delhi over 2021-22. We aim to study the victims of road traffic accidents who were brought dead or spot dead or hospital death. All information was gathered using office copy of autopsy report and record register. A detailed information of the victims like age & sex along with history of accidents like type of offending vehicle, vehicle used by the victim, manner of the accident as available in records were noted. An attempt was made to note the duration of survival in these patients in different types of injuries. Location and type of injuries were noted along with involvement of internal organs at autopsy. A detailed note of vehicles used by victim was made along with type of offending vehicle causing the accidents. The results were analyzed using SPSS 20 software.

Results

The current study includes victims of road traffic accidents (RTA) who were brought for medico-legal

autopsy; categorizing them depending on type of vehicles used. Table 1 mentions the age & sex distribution of different types of victims of RTA in our study. A total of 220 cases were included in our study, with majority being male (180; 81.8%) with male: female ratio of 4.5:1. The age of victims ranged from new-born to elderly (more than 70 years); maximum cases observed in the age group of 21-30 years (40% of cases), with 95.5 % males in that age group. An overall increase in accidents rate were noted in males in each age group. In the age group of 0-10 years, we had 12 cases, all being females. In above 70 years and above, equal number of males & females were noted.

Table 1: Table showing age & sex distribution of victims of RTA

Age & Sex distribution			
Age		Sex	
Group	No. (%)	Male (No. & %)	Female (No. & %)
0-10	12 (5.4%)	0	12 (30%)
11-20	48 (21.1%)	40 (22.2%)	8 (20%)
21-30	88 (40%)	84 (46.7%)	4 (10%)
31-40	24 (10.9%)	20 (11.1%)	4 (10%)
41-50	12 (5.4%)	8 (4.4%)	4 (10%)
51-60	24 (10.9%)	20 (11.1%)	4 (10%)
61-70	4 (1.8%)	4 (2.2%)	0
>70	8 (3.6%)	4 (2.2%)	4 (10%)
Total	220 (100%)	180 (81.8%)	40 (18.2%)

We also evaluated the distribution of different types of victims of road traffic accidents [Table 2]. The commonest type of victim in our study was the pedestrians (54.55%); followed by cyclist (18.18%), rickshaw (10.9%), motorcyclist (7.27%), scooterist (5.45%). In 8 of our cases (3.63%), type of victims was

not identified in relation to the vehicle they used.

Predominance of males was seen in all types of victims.

Table 2: Table showing distribution of different types of victims of RTA [n=220]

Type of victims	No of Cases	Percentage (%)
Pedestrian	120	54.5%
Cyclist	40	18.18
Scooterist	12	5.45
Motorcyclist	16	7.27
Rickshaw	24	10.9
Not known	08	3.63
Total	220	100

We also analyzed the distribution of the type of offending vehicle involved in RTA. The type of offending vehicle was significantly associated with increase in number of victims [Table 3]. As in our study, four-wheelers (truck, buses, van) had maximum number of victims, comprising of approximately 62% of total cases. In approximately 31% of cases, no information was found related to the offending vehicle at the site of accident. Rest of the vehicles causing accidents were auto-rickshaw & scooter (7%).

Table 3: Distribution of the type of offending vehicle involved in RTA

Offending Vehicle in RTA		
Vehicle	No of cases	%
Truck	64	29.1
Bus	52	23.6
Car	08	3.6
Auto-rickshaw	12	5.5
Scooter	04	1.8
Van	12	5.5
Unknown	68	30.9
Total	220	100

A detailed analysis of period of survival was done in different types of thoraco-abdominal & pelvic injuries. The complete details are tabulated in Table no. 4. Of 200 cases, maximum cases were of spot death, comprising of 112 cases (50.9%). Secondly, in 84 of our cases (38.2%), victims survived for a period of only 0-6 hours. Twelve of our cases (5.5%) had survival period of 7-12 hours. Among rest 12 cases, 4 victims survived for 13-18 hours, 4 for 19-24 hours and 4 for 1 day- 1 week, subsequently. Majority of our cases had combined thoraco-abdominal injuries (64 cases, 29%), followed by cases of only pelvic injuries and abdomino-pelvic injuries combine with 40 cases each (18.2% in each group). This was followed by cases of only abdominal injury (24 cases, 10.9%) and chest-pelvic injuries (20 cases, 9.1%). Sixteen (7.3%) of our victims had only chest injuries. Combined thoracic, abdominal and pelvic injuries were noted in rest of our 16 cases.

Maximum cases of spot deaths were noted in victims with combined thoraco-abdominal injuries (48 of 112 cases, 42.9%); followed by only abdominal injuries (16

cases), only pelvic (12 cases), combined thoracic & pelvic (12 cases). Eight cases of spot death were noted in each of the rest 3 groups, i.e., only thoracic injuries, combined abdomino - pelvic and combined thoraco-abdominal & pelvic injuries.

Among 84 cases who survived for 0-6 hours, majority of victims had combined abdomino -pelvic injuries (24 cases, 28.5%). This was followed by 16 cases in each of the two groups, i.e., thoraco-abdominal and victims with only pelvic injuries. Eight victims were noted in each of the three groups, i.e., only chest injuries, only abdominal injuries and victims with combined chest-pelvic injuries. A survival period of 7-12 hours was noted in 12 of our cases, of which 8 cases had only abdominal injuries and rest 4 cases had combined abdomino-pelvic injuries. Only 4 of our cases had survival period of 13-18 hours and all succumbed to pelvic injuries alone. Four victims who survived for 19-24 hours had combined abdomino-pelvic injuries. Rest four of our total cases who survived for 1 day- 1 week had combined thoraco-abdominal and pelvic injuries.

Table 4: Duration of survival in different types of injuries in RTA

Period	Survival (%)	Injuries						
		Chest Only (I) (%)	Only Abd (II) (%)	Combined (I) + (II) (%)	# (III) Pelvis (%)	I + III (%)	II + III (%)	I+II + III (%)
Spot death	112(50.9)	8 (7.1)	16 (14.4)	48 (42.9%)	12 (10.7%)	12 (10.7)	8(7.1)	8(7.1)
0-6 hrs	84 (38.2)	8(9.5)	8 (8.5)	16 (19%)	16 (19%)	8 (9.5)	24 (28.5)	4 (4.7)
7-12hrs	12 (5.5)	-	-	-	8 (66.7%)	-	4 (33.3)	-
13-18hrs	4(1.8)	-	-	-	4 (100.%)	-	-	-
19-24hrs	4(1.8)	-	-	-	-	-	4(100)	-
1d-1 week	4(1.8)	-	-	-	-	-	-	4(100.0)
Total	220 (100%)	16 (7.3)	24 (10.9)	64 (29%)	40 (18.2%)	20 (9.1%)	40 (18.2%)	16 (7.3)

We thoroughly evaluated our cases for presence of different types of injury in chest and heart. The detailed analysis is mentioned in Table No. 5. While analyzing this, we found that of 220 total cases, 116 had chest injury with laceration in 80 cases. Twelve cases had contusion and 24 cases had combined contusion and laceration. We also correlated the presence of rib fractures in chest injury cases and found that of 116 cases with chest injury, 88 victims had rib fracture also. Rest 28 cases did not have rib fracture. Of 220 cases, 16 cases had heart injury. All 16 cases had laceration with combined rib fractures in 12 cases. Four of 16 cases with laceration injury in heart did not have associated rib fracture.

Table 5: Types of injuries in different chest organs

(1) Chest Organs							
3A (2) Rib # (+/-) in Chest - Abd) injury							
Organ	Type of Injury			Rib # (+ve)	Rib # (-ve)	Total No of Cases	% (out of 220)
	Contusion (i)	Laceration -(II)	(I) + (II)				
Chest Injury	12	80	24	88	28	116	52.7
Heart	-	16	-	12	4	16	7.2

In abdominal injuries cases, major organs involved were liver, spleen & kidney along with hollow organs, i.e., stomach, intestine and bladder. The results are presented in Table No. 6. Liver injury was noted in 124 cases with laceration injury in all. Forty-four victims had splenic injury with all cases having laceration. Of 36 cases with kidney injury, 20 had contusions and 16 had laceration, respectively. Perforation was observed in all 24 cases of intestinal injuries, 12 cases with bladder injury and also in 8 victims with injury to stomach.

Table 6: Types of injuries in Abdominal organs

(3B) Abdominal Organ Injury					
Organ	Type of Injury			Total No of Cases	% (Out of 220)
	Contusion	Laceration	Both		
Liver	-	124	-	124	56.3
Spleen	-	44	-	44	20
Kidney	20	16	-	36	16.3
Perforation					
Stomach	8			8	3.6
Intestine	24			24	10.9
Bladder	12			12	5.4

An attempt was also made to evaluate the type of injuries in RTA with unknown vehicle [Table No. 7]. Among total of 68 cases with no known offending vehicle, 56 victims had grazed abrasion over chest and abdomen. In rest 12 cases, imprint abrasion was found over chest & abdomen.

Table 7: Type of injuries in RTA with unknown Vehicle

Injuries Consistent with RTA with Unknown Vehicle		
Type of Injury	No of Cases	% (out of 68)
Grazed abrasion on chest & Abdomen	56	82.38
Imprint abrasion On Chest & Abdomen	12	17.65
Total	68	100.0

Discussion

Road traffic accidents account for a leading cause of mortality & morbidity in our country. Every year, approximately 1.5 lakh people dies on India roads, which translate, on an average, into 1130 accidents and 422 deaths every day. Basically, RTA accounts for 2.5% of total deaths in India with highest incidence noted in states like Uttar Pradesh (11.4%), followed by Tamil Nadu (11.3%), Andhra Pradesh (10.7%). The cost of road

accidents is borne not only by the victims and their family, but by the economy as a whole in terms of untimely deaths, injuries, disabilities and loss of potential income.

We reviewed the details of thoraco-abdominal injuries in victims of RTA in Western Delhi region with help of extensive autopsy-based examination. In our study, over a period of one year, we noted a total of 220 cases of RTA with majority of victims being male, i.e., 180 of 220 cases, amounting to 81.8%. Saini et al noted a total of 369 cases in their study of RTA cases in Jaipur, Rajasthan in one year.¹ They also noted male preponderance in their study with 317 of 369 cases being male (85.90%). Similar findings were found in studies by Kanchan et al², Sharma et al³ & Kumar et al⁴, with percentage of male victims as 89.8%, 77.30% & 88.22%, respectively. In general, male preponderance was seen in victims of RTA. This may be attributed to the fact that males are more likely to be engaged in outdoor activities and travelling to workplace. In our study we also noted an equal frequency in cases of RTA among males & females in age group of 70 years and above. Similar findings were found in few other studies as well.⁵⁻⁷

On evaluation of different types of victims in RTA, we found maximum numbers of pedestrians, comprising of 54.5% of total victims followed by two-wheelers. Similar findings were noted in studies by Chaudhary et al⁵, Biswas et al⁶, Sharma et al⁷ & Gupta et al⁸. However, Ambade et al⁹ noted a different scenario with maximum number of two-wheelers as victim (62.4%) followed by pedestrians (21.98%). Jha et al¹⁰ noted two-wheeler, pedestrian and four-wheeler accidents in South India. Two-wheeler victims were reported as commonest victims in study by Tandle et al¹¹, Dandona & Mishra et al¹², Akhilesh P et al¹³ and Singh et al¹⁴. This difference of data could be attributed to good traffic sense among

pedestrians in those regions of study. Our study highlights the need to inculcate good traffic rules among people walking on the road along with establishment of strict traffic control.

In our study, on analyzing the type of offending vehicle, we found that four-wheeler (HMV/LMV) was the commonest type of offending vehicle. To add to that, heavy motor vehicle (trucks & buses) comprised of maximum numbers (52.7% of total cases). This can be explained because of accidents with greater impact in relation to their heavy weight & high-speed culminating in fatal outcomes of the victim of accidents. Many other authors had similar findings, comprising HMV (trucks & buses) as offending vehicle in majority of their cases (35-60%).¹⁵⁻¹⁷ A little different finding was noted in study by Raof Abdul et al¹⁸, with LMV (car) as commonest offending vehicle (36.3%) followed by HMV (truck) in 29% and two-wheelers in 14.5% of cases. Mandal & Yadav et al¹⁹ and Jha et al¹⁰ noted four-wheeler (HMV/LMV) as commonest offending vehicle in 75% followed by two-wheelers in 25% cases in pedestrian victims.

We had distributed the different thoraco-abdominal injuries under categories like injuries involving only chest, abdominal region, pelvic areas and also combined injuries involving any 2 or 3 of these types. Maximum of our victims had combined thoraco-abdominal injuries (64 cases of 220, 29%) followed by 40 cases each with only pelvic injuries and combined abdomino-pelvic injuries respectively. Mandal & Yadav et al¹⁹ found lower limbs as commonest region involved followed by head and thorax in pedestrian victims. Jakhar et al²⁰ noted head as commonest region involved followed by thorax in pedestrian victims of RTA. Lilhare et al²¹ noted extremity as commonest region involved followed by head injuries. Ravimuni et al²² found head injuries as

common one followed by limb, abdomen and thoracic injuries.

In addition to analyzing the thoraco-abdominal injuries in detail, we made an attempt to note the survival in our victims. This was done with an idea to help in dealing different cases with different injuries and in prioritizing any possible treatment to avoid any unseen mortality with emergency & intensive intervention. Though, 112 victims in our study were spot deaths and majority of spot death cases had thoraco-abdominal injuries. Eight-four of our cases survived only for 0-6 hours. Cases with pelvic injuries survived longer. This tabulation helps in making us vigilant so that immediate triaging of victims can be done by qualified professionals to decrease any possible mortality in them, if we have a clear picture of severity of organs involved in that victim.

Liver, spleen and kidney were the major organs involved. Liver was injured in 124 of cases with laceration in all. Splenic laceration was noted in all 44 cases of splenic injury. Kidney injury was noted in 36 cases with laceration in 16 and contusion in 20 cases. Perforation injury was noted on all cases of intestinal, stomach and bladder injuries. Ravimuni et al²² found liver as common organ injured than any other organ in two-wheeler victims. A similar finding was noted in studies by Husaini et al²³, Reddy et al¹⁷, Raoof et al¹⁸ & Chaudhary et al⁵ with liver being the commonest organ injured in victims of RTA. These findings were in concordance with ours.

An analysis was also done for injury to chest organs. Of 220 cases, 116 had chest injury and 16 had injury to heart. Of 116 victims with chest injury, 88 had rib fractures. Of 16 cases with heart injury, 12 cases had rib fractures also. Similar to us, few other studies have also reported rib fractures as commonest internal injury.²⁰⁻²³

But, in a study by Singh & Dhatarwal¹⁶, rib fracture was noted in only 36.9% and lung injury in 29.8%.

In sixty-eight of our cases, the offending vehicle could not be traced. Fifty-six victims had grazed abrasion on chest & abdomen and only 12 victims had imprint abrasion over chest & abdomen region. These findings could help us analyzing different aspects regarding type of vehicle, impact & injury to underlying organs, etc.

Conclusion

The purpose of this publication is to present an in-depth analysis and overview of the road traffic accidents along with distribution of fatal injuries in Western Delhi. The data analysis on road accidents is focussed on a detailed autopsy-based evaluation of victims, type of thoraco-abdominal injury, major organs involved along with an estimate of survival period of victims. This detailed information basically gives an indication of the formulation of suitable preventive measures along with informed decision and policy making in the area of road safety. The prevailing data of RTA help us in gaining a better understanding of the fatality rate of various bodily traumas. Above all, it helps us in giving an indication of the necessity of advanced trauma centre facility in preventing, triaging such cases which require urgent intervention and thereby saving a precious life.

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