

## ORIGINAL ARTICLE

# A Study of Injury Pattern and Mode of Accident of Fatal Injuries in RTA Cases Admitted in a Tertiary Care Centre -3 Year Retrospective Study

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## Abstract:

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 2020. A report states that 1.24 million people die every year worldwide on the roads. RTA is a public health issue that greatly affects individuals, families, communities, and nations. The cost of burden is estimated to be around 1–2% of a country's GNP in low-income countries. To know the pattern of fatal injuries in RTA cases. To correlate the survival period and cause of death in fatal road traffic accidents. Data from medico-legal autopsies of all RTA victims from 2018 to 2020 (n= 210) were collected in this retrospective study. Data were analyzed using SPSS software, V.22. The majority of the study population, 24.2% (51 out of 210), belonged to the 1-30 age group. Male predominance was noted in the study with 84.2% (177 out of 210). The type of accident was self-fall in high proportion 26.6% (56 out of 210) followed by a collision between 2-wheelers and 4-wheelers 24.2% (51 out of 210). Intracranial haemorrhage was reported in 140 (66.6%) study participants as the leading cause of death followed by hemorrhagic shock other than head and neck injury reported in 42 (19.9%) cases. A short revival period of fewer than 24 hours was noticed in intra-cranial haemorrhage (81 out of 140) followed by hemorrhagic shock other than head and neck injury (39 cases). Skull fractures are higher in 2-wheelers compared to other types of vehicles and pedestrians. (103 out of 140). The majority of fatal accidents occurred in two-wheelers. Hence, health education and awareness should be created among two-wheeler riders, especially drivers & pillion to wear helmets and follow safety measures while riding.

**Keywords:** Road traffic accident; Intra cranial hemorrhage; Skull fracture; Survival period.

## Introduction:

The World Health Organisation (WHO) describes an accident as “an unpremeditated event resulting in recognizable damage.” The American safety council defines it as an “occurrence in a sequence of events which usually produces unintended injury, death or property damage.”<sup>1</sup> 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.<sup>2,3</sup> RTA ranks among the top causes of death in the world; after ischemic heart disease, it is projected to become the second leading cause in 2020.<sup>4</sup> In India over 1.3 lakh fatal outcome was reported in 2020 and 3.4 lakh people have sustained injuries.<sup>5</sup> India is responsible for around 10 percent of all road accident deaths in the whole world. 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.<sup>6</sup> The increased rate of fatality has been attributed to population explosion and increased motorization.<sup>7</sup> 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.<sup>8,9</sup> Injuries due to several factors like human error, vehicle problem, and environmental factors play crucial roles before, during, and after a serious RTA. The list of important factors are extensive like human errors, driver fatigue, speeding and overtaking, violation of traffic rules, poor traffic sense, mechanical fault of the vehicle or road conditions, road encroachment, traffic congestion and poor management.<sup>10</sup> The endangered groups are pedestrians, the elderly, children, and cyclists.<sup>11-13</sup> The objectives of the present study are to describe the distribution of injuries and demographic profile from autopsy cases due to fatal RTA, 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:

Ethical approval was obtained from Institutional Ethics Committee, J.N. Medical College, Belagavi to conduct the study. A retrospective study was conducted to analyze the deaths caused due to Road Traffic Accidents (RTA) which were subjected to post-mortem examination in the mortuary of KLE Hospital a tertiary care centre, in Belagavi from January 2018 to December 2020. Detailed information on the cases was based on medicolegal records and evaluation of post-mortem reports. Data were analyzed with age, sex, nature of the collision, mode of the vehicle, time of the collision, survival period, distribution of

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injury, internal findings, and cause of death, which was acquired from police inquest, history obtained from medical records and relatives.

**Ethics statement:** The study was approved by the institutional human ethics committee and institutional review board [Reference: MDC/DOME/258]. Data confidentiality was maintained.

**Statistical Methods:** Survival period, cause of death, Internal and external injury, etc., were considered as primary outcomes of interest. Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency, and proportion for categorical variables. The association between

**Table 1. Summary of baseline parameters (N=210).**

Parameter	Number (%)
<b>Age Group</b>	
0- 20	18 (8.5%)
21-40	86 (40.8%)
41-60	74 (35.2%)
>60	32 (15.2%)
<b>Gender</b>	
Male	177 (84.2%)
Female	33 (15.7%)
<b>Nature of Collision</b>	
Pedestrian	36 (17.1%)
2-wheeler self-fall	56 (26.6%)
2-wheeler collision	40 (19%)
2 & 4-wheeler collision	51 (24.2%)
4-wheeler topple	15 (7.1%)
Heavy vehicle collision	12 (5.7%)
<b>Mode of Vehicle</b>	
Pedestrian	32 (15.2%)
2-wheeler	141 (67.1%)
4-Wheeler	26 (12.3%)
Heavy vehicle	11 (5.2%)

**Table 2. Summary of injury-related parameters and cause of death (N=210).**

Parameter	Number (%)
<b>Time</b>	
12 pm -6 pm	38 (18%)
6.1 pm-12 am	40 (19%)
12.1 am – 6pm	53 (25.2%)
6.1pm-12 pm	79 (37.6%)
<b>Survival Period</b>	
0-1 day	126 (60%)
2 - 7 days	52 (24.7%)
1.1 week - 1 month	29 (13.8%)
>1 month	3 (1.4%)
<b>External injury</b>	
Head	157 (74.7%)
Thorax	59 (28%)
Abdomen	59 (28%)
Limbs	178 (84.7%)
<b>Internal injury</b>	
Head	140 (78%)
Spine	11 (5.2%)
Thorax	56 (26.6%)
Abdomen	42 (20%)
Limbs	15 (7.1%)

explanatory variables and categorical outcomes was assessed by cross-tabulation and comparison of percentages. The odds ratio along with 95% CI is presented. The Chi-square test was used to test statistical significance. P value <0.05 was considered statistically significant. Data were analyzed by using SPSS software, V.22.<sup>14</sup>

**Results:**

The majority of the study population like 51 out of 210 (24.2%) individuals belonged to the 21-30 years age group followed by 51-60 years (20%), 31- 40 years (16.6%), and 41- 50 years (15.2%). Male predominance was noted in the study with 177 out of 210 (84.2%). Nature of accidents for two-wheelers self- fall amounting to 56 out of 210 (26.6%), the proportion of two & four-wheeler collisions was 24.2% and 19% respectively, whereas pedestrians reported 36 out of 210 (17.1%). The majority of study

**Table 3. Comparison of survival period across the cause of death (N=210).**

Cause of Death	Survival Period				P value
	0-1 Day	1- 7 Days	1.1 Week - 1 Month	>1Month	
Intracranial Haemorrhage (N=140)	81 (57.86%)	42 (30%)	16 (11.43%)	1 (0.71%)	<0.001
Hemorrhagic Shock (N=42) (Other than head and neck injury)	39 (92.86%)	3 (7.14%)	0 (0%)	0 (0%)	
Septicaemia (N=16) (Delayed complication)	0 (0%)	5 (31.25%)	9 (56.25%)	2 (12.5%)	
Others (N=12)	6 (50%)	2(16.67%)	4 (33.33%)	0 (0%)	

**Table 4. Association of demographic and RTA parameters with a skull fracture in ICH cases (N=140).**

	Skull Fracture		Odds ratio (95 % CI)	P value
	Yes	No		
<b>Age groups</b>				
0-10 (N=3)	0 (0%)	3 (100%)	4.86(0, -)	0.99
11- 20 (N=7)	6 (85.71%)	1 (14.29%)	4.71(0.49, 45.1)	0.17
21-30 (N=31)	22 (70.97%)	9 (29.03%)	1.92(0.63, 5.80)	0.24
31-40 (N=22)	14 (63.64%)	8 (36.36%)	1.37(0.42, 4.44)	0.59
41-50 (N=23)	17 (73.91%)	6 (26.09%)	2.22(0.65, 7.54)	0.19
51-60 (N=29)	20 (68.97%)	9 (31.03%)	1.74(0.57, 5.32)	0.32
>60 (N=25)	14 (56%)	11 (44%)		
<b>Gender</b>				
Male (N=115)	81 (70.43%)	34 (29.57%)	2.581 (1.07, 6.23)	0.03
Female (N=25)	12 (48%)	13 (52%)		
<b>Mode of Vehicle</b>				
Pedestrian (N=21)	13 (61.9%)	8 (38.1%)		
2-Wheeler (N=103)	69 (66.99%)	34 (33.01%)	1.25 (0.47, 3.3)	0.65
4-Wheeler (N=12)	8 (66.67%)	4 (33.33%)	1.23 (0.28,5.45)	0.78
Heavy Vehicle (N=4)	3 (75%)	1 (25%)	1.85 (0.16, 20.94)	0.62
<b>Survival Period</b>				
0-1 Day (N=81)	60 (74.07%)	21 (25.93%)		
1- 7 Days (N=42)	26 (61.9%)	16 (38.1%)	0.56(0.25, 1.26)	0.16
1 Week-1 Month (N=16)	7 (43.75%)	9 (56.25%)	0.27(0.09, 0.82)	0.02
>1 Month (N=1)	0 (0%)	1 (100%)	-	1
<b>Head (External)</b>				
Yes (N=108)	72 (66.67%)	36 (33.33%)	1.05 (0.45, 2.41)	0.91
No (N=32)	21 (65.63%)	11 (34.38%)		
<b>Head (internal)</b>				
Yes (N=138)	93 (67.39%)	45 (32.61%)	-	0.99
No (N=2)	0 (0%)	2 (100%)		

participant's mode of the vehicle was 2-wheeler with 141 out of 210 (67.1%) followed by pedestrians 32 (15.2%) (Table 1).

In the majority of cases, the time of the accident was between 6 pm- 12 pm (37.6%), 79 out of 210 and it was 53 (25.2%) subjects between 12 am- 6 pm. Survival periods were 0-1 day recorded in the majority of cases amounting to 126 out of 210 (60%) followed by 2-7 days with 24.7% and 1 week to 1 month time in 13.8%. External head injuries were noticed in 157 (74.7%) cases, and thorax and abdomen injuries in 59 (28%) each. Limb injuries were noted in 178 (84.7%) cases. Skull fractures were noticed in 102 (48.57%) cases. Internal head injuries were more predominant with 140 out of 210, (78%) followed by thorax (26.6%), abdomen (20%), limbs with (7.1%), and spine with (5.2%). Intracranial haemorrhage was recorded in 140 (66.6%) cases as a cause of death, hemorrhagic shock in 42 (19.9%) cases, septicemia in 16 (7.6%) cases, and 12 (5.7%) had other causes for death (Table 2).

There was a statistically significant difference observed in the survival period across different causes of death (P value <0.001). A short survival period of 0-1 day, 2-7 days was reported in the majority of cases of intracranial haemorrhage, and hemorrhagic patients' septicemia was reported in the relatively high proportion in 1.1 weeks to 1 month survival time as per Table 3.

Compare to the female the odds of occurrence of skull fracture in ICH cases was 81 out of 115 (70.43%) in males and the association was statistically significant. (P value <0.05). Compared to pedestrians, the odds of occurrence of skull fracture in ICH cases was 13 out of 21 (61.9%) in 2-wheelers, it was 69 out of 103 (66.99%) in 4-wheelers, and it was 8 out of 12 (66.67%) in heavy vehicle types. There was no statistically significant association between the mode of the vehicle and skull fracture in ICH cases. Compared to a short survival period of 0-1-day, 1 week to 1 month had 7 out of 16 (43.75%) cases, the odds of occurrence of skull fracture in ICH cases which was statistically significant. The association of other confounding factors like age, and internal and external head injuries. The strongest association was observed with external head injuries with 72 out of 108 (66.67%) the occurrence of skull fracture in ICH cases as per Table 4.

#### Discussion:

Road traffic accident fatalities are an important focal point in the discipline of forensic medicine.<sup>15-17</sup> RTA is a more serious issue in that, the age groups commonly involved are the most productive age group, i.e., 15-40 years. Countries like India, that are still in the developing stage, face the double burden of already existent communicable diseases and increasing burden of non-communicable diseases, including RTA.<sup>18</sup> So, the present study was conducted to describe the distribution of injuries and demographic profile from autopsy cases due to fatal RTA, which can be used for the development of a strategy for prevention of mortality due to RTA, and public education on road safety. Kumar N et al. in their study involving 100 fatal RTA cases report that (88 %) involved were male, and (12 %) were female.<sup>19</sup> This is in line with the present study where males (84.2%) were more commonly involved than females (15.7%). They also report that

pedestrians and two-wheeler rider victims were (37 %) each. Similarly, in the present study, two-wheelers (67.1%) and pedestrians (15.2%) were the most commonly involved groups. The age group commonly involved in RTA, according to the present study, was 21-30 (24.2%). Other studies from different parts of India have also shown that the majority of the victims belonged to the 20-29 or 20-30 age group.<sup>20-24</sup> In our study, the majority of RTA happened between 6 AM to 12 AM (37.6%) followed by 12 am to 6 pm (25.2%). Earlier studies also report that most accidents took place between late afternoon/evening and late night/ midnight.<sup>25-27</sup> Farooqui et al. and Mishra et al. reported that maximum accidents took place in the daytime between the afternoon to evening.<sup>28,29</sup> In the present study, external injuries were commonly observed in the limbs (84.7%), followed by the head and skull fracture. Other studies report a similar trend.<sup>3,30</sup> Intracranial haemorrhage and hemorrhagic shock were the leading causes of death, in the present study (66.6% and 19.9%). This is similar to the findings of Dipak Kumar Das,<sup>3</sup> other studies<sup>31-34</sup> report hemorrhagic shock due to multiple injuries as the predominant cause. In the present study it was observed that following road traffic accidents, the majority of the victims died in 12-24 hours. This is in line with other studies.<sup>3,32</sup> This being a descriptive study, there were a few limitations. There were limited samples hence generalizability is poor. A prospective study including a large sample in multiple centers is recommended in the future to understand the epidemiology of RTAs.

#### Conclusion:

Based on the study's findings, male preponderance was observed in Road Traffic Accident deaths, intracranial haemorrhage was the most common cause of death and 60% of them died within the first day. The majority of the accidents happened in two-wheelers. Hence, health education, and awareness should be created among two-wheeler riders, especially drivers & pillion two wheelers to wear helmets and follow safety measures while riding. Increasing emergency preparedness and decreasing fatalities can be done. From law enforcement it remains evident that strict enforcement of the rules is still necessary, and this Implementation of rules to monitor the speed of vehicles, lighting & signalling system.

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