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## Original Research Article

## Fatal road traffic collisions-An autopsy based study

Dinesh Rao<sup>1,\*</sup><sup>1</sup>Dept. of Forensic Medicine, The Oxford Medical College, Hospital & Research Centre, Anekal,, Karnataka, India

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## ABSTRACT

**Background:** The Deaths due to Road Traffic Collision has become a Major Public Health issue, hence Understanding the Deaths and the Factors involved is important to prevent Fatalities and at the same time Prevent Road Traffic Collision in General. The present Study is a Retrospective Study conducted during the period 2013 to November 2020.

**Results:** Road Traffic Accidents constituted 39.35% [n-1168] of the Cases. Males formed the Majority of the Victims contributing to 83.04% of the cases. Majority of the Victims were I the age group 31-40 years, consisting of 422 victims. The least Age Group affected were those below the age 10years and those individuals above the age 70years. Light Motor Vehicle were the Major Contributor to the Accidents, contributing to 46.40% [n-542] of the cases. Head and Neck was the Major region affected in 795 cases. The Maximum Fatality reported were due to Head or Craniocerebral Injuries in 87% of the cases. Abrasions were Present in all the Victims. Majority of the Deaths were due to Traumatic Shock reported in on the Spot Deaths or Brought Dead Victims in 35.45% [n-414] cases. The commonest Cause of Death reported after 07days of Treatment, were Septicemia, Lung infections, Peritonitis, Coma.

**Conclusions:** Craniocerebral Injuries were the Main Contributors to Fatality in 87% of Accidents. Majority of Deaths were due to Traumatic Shocks due to Multiple injuries involved. Importance of Emergency Care is well understood in this study.

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## 1. Background

The number of fatal and disabling road accident happening is increasing day by day and is a real public health challenge for all the concerned agencies to prevent it. A Traffic collision, occurs when a vehicle collides with another vehicle, pedestrian, animal, road debris, or other stationary obstruction, such as a tree, pole or building. Traffic collisions often result in injury, disability, death, and property damage as well as financial costs to both society and the individuals involved. Road transport is the most dangerous situation people deal with on a daily basis, but casualty figures from such incidents attract less media

attention than other, less frequent types of tragedy.<sup>1</sup> In 2013, 54 million people worldwide sustained injuries from traffic collisions.<sup>2</sup> This resulted in 1.4 million deaths in 2013, up from 1.1 million deaths in 1990.<sup>2</sup> About 68,000 of these occurred in children less than five years old.<sup>3</sup> Almost all high-income countries have decreasing death rates, while the majority of low-income countries have increasing death rates due to traffic collisions. Middle-income countries have the highest rate with 20 deaths per 100,000 inhabitants, accounting for 80% of all road fatalities with 52% of all vehicles. While the death rate in Africa is the highest (24.1 per 100,000 inhabitants), the lowest rate is to be found in Europe (10.3 per 100,000 inhabitants).<sup>4</sup> Injury and deaths due to road traffic accidents (RTA) are a major public health problem in developing countries where more than 85% of

\* Corresponding author.

E-mail address: [drraoforensic@yahoo.com](mailto:drraoforensic@yahoo.com) (D. Rao).

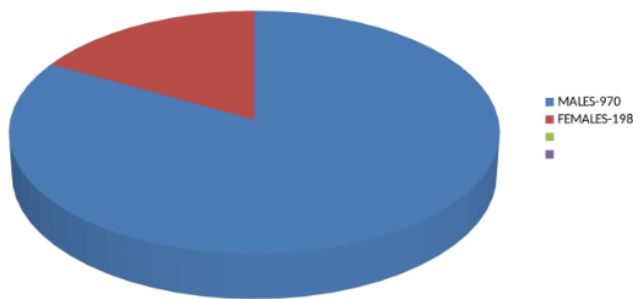
all deaths and 90% of disability-adjusted life years were lost from road traffic injuries.<sup>5</sup> In India, Road collisions accounted for 464,674 collisions which caused 148,707 traffic-related deaths. The three highest total number of fatalities were reported in Uttar Pradesh, Maharashtra and Tamil Nadu, and together they accounted for about 33% of total Indian traffic fatalities in 2015.<sup>6</sup> There are multiple Factors that Contribute to the Road Traffic Collisions, but understanding the Factors responsible for the Death of the Victims is essential to not only prevent the Fatalities but also prevent Road Traffic Collisions. Hence, the present study is one of the several such attempts made to understand the Deaths due to Road Traffic Collisions.

**TOTAL NUMBER OF AUTOPSIES-2968 CONDUCTED DURING THE PERIOD 2013 -NOVEMBER 2020**



**Fig. 1:** Indicates the total number of autopsies conducted during the period of study

**SEX DISTRIBUTION OF VICTIMS**



**Fig. 2:** Indicated the sex distribution of the victims

**2. Materials & Methods**

This is a Retrospective Study conducted between 2013 to November 2020. All the Data were retrieved from the Autopsy Report, Hospital records & Police records. The data thus obtained were entered in a standard Format and Analyzed. Victims Mean Pedestrians, Drivers, Passengers and their death as a result of impact with Motor Cycle,

Light Motor Vehicle & Heavy Motor Cycle were Included as Road Traffic Accidents. Only those cases wherein the Vehicles responsible for Accidents and were identified was included on the study. The Victims hit by unknown Vehicles were not included in the study. Even suspected Road Traffic Accidents in Hit and Run vehicle accidents were also not included in the present study. Railways and railways traffic collision deaths were excluded in this study.

**3. Results**

Figure 1 Indicates the total Number of Autopsies Conducted During the Period of Study. A total of 2968 Autopsies were performed during the period of Study. Road Traffic accidents contributed to 39.35% [n-1168], of the Total Autopsies conducted. Figure no 02- Indicates the Sex Distribution of the victims. Males Formed the Majority of the Victims, they Contributed to 83.04% and Female contributed to 198 cases [16.96%]. o 01-Describes the Age & Sex Distribution of the Fatal Road Traffic Accident Victims. The Major Age Group affected were those between 31-40 years, a total of 422 Victims fall into this age group of which 329 were Males and 93 were Females. The least Age Group affected were those below 10 years and above 70years, contributing to 20 cases & 03 cases respectively. No cases were reported in the Age group above 80years. The other Major Age Group affected were individuals between 21-30 years [247], this was closely followed by those individuals belonging to the age group 41-50, in 212 cases. Only 96 cases were reported in the age group 51-60 and 37 cases reported in the age group 61-70, whereas a mere 3 cases reported in the age group 71-80.

**Table 1:** Describes the age & sex distribution of the fatal road traffic accident victims.

| Sl no | Age Range | Male | Female | Total |
|-------|-----------|------|--------|-------|
| 01    | 1-10      | 16   | 04     | 20    |
| 02    | 11-20     | 112  | 19     | 131   |
| 03    | 21-30     | 216  | 31     | 247   |
| 04    | 31-40     | 329  | 93     | 422   |
| 05    | 41-50     | 184  | 28     | 212   |
| 06    | 51-60     | 82   | 14     | 96    |
| 07    | 61-70     | 28   | 09     | 37    |
| 08    | 71-80     | 03   | 00     | 03    |
| 09    | 81-90     | 00   | 00     | 00    |

o 02-Describes the Type of Vehicle Responsible for Road Traffic Accidents. The Maximum Fatalities were due to Light Motor Vehicle, reported in 46.40% [n-542] cases., this was followed by Motor Cycles which contributed to 28.08%[n-328]. The Heavy Motor Vehicle Contributed to 25.52%[n-298], of the Fatal Road Traffic Accidents. o 03-Describes the Body Region Injured as a result of Impact in a Fatal Road Traffic Accident. The Major Region the Body affected due to Road Traffic Accidents was Head & Neck Region in 795 cases. Of which Male consisted of 609

**Table 2:** Describes the type of vehicle responsible for road traffic accidents.

| Sl no | Vehicle type      | Total number | Percentage |
|-------|-------------------|--------------|------------|
| 01    | Motor cycle       | 328          | 28.08%     |
| 02    | Light motor Cycle | 542          | 46.40%     |
| 03    | Heavy motor cycle | 298          | 25.52%     |
| Total |                   | 1168         |            |

**Table 3:** Describes the body region injured as a result of impact in a fatal road traffic accident.

| Sl no | Body region    | Total | Male | Female |
|-------|----------------|-------|------|--------|
| 01    | Head & Neck    | 795   | 609  | 186    |
| 02    | Chest          | 584   | 545  | 39     |
| 03    | Abdomen        | 438   | 414  | 24     |
| 04    | Pelvis & Spine | 314   | 297  | 17     |
| 05    | Upper Limb     | 298   | 230  | 68     |
| 06    | Lower Limb     | 396   | 321  | 75     |

**Table 4:** Showing list of fatal injuries reported in fatal road traffic accidents.

| Sl no | Fatal injuries                     | n-328 | Percentage |
|-------|------------------------------------|-------|------------|
| 01    | Head Injury/Cranio Cerebral injury | 795   | 87%        |
| 02    | Lung/Diaphragm Laceration          | 386   | 26%        |
| 03    | Heart Laceration/Contusion         | 102   | 08%        |
| 04    | Large Vessels Laceration           | 134   | 12%        |
| 05    | Fracture Ribs                      | 419   | 23%        |
| 06    | Liver Laceration                   | 584   | 42%        |
| 07    | Spleen Laceration                  | 229   | 07%        |
| 08    | Kidney Laceration                  | 96    | 04%        |
| 09    | Spinal Injuries                    | 314   | 28%        |
| 10    | Crush Injury to Head               | 168   | 05%        |
| 11    | Crush Injury to Chest              | 132   | 04%        |
| 12    | Crush Injury to Abdomen            | 96    | 02%        |

**Table 5:** Describes the different nature of blunt injuries reported in fatal road traffic accident victims.

| Sl no | Nature of Injuries            | Total Number | Percentage |
|-------|-------------------------------|--------------|------------|
| 01    | Abrasions                     | 1168         | 100%       |
| 02    | Contusions[Surface & Organs]  | 953          | 81.59%     |
| 03    | Lacerations[Surface & Organs] | 684          | 58.56%     |
| 04    | Fractures                     | 569          | 48.71%     |

**Table 6:** Describes the duration of admission & cause of death in fatal road traffic accident victims.

| Sl no | Total number | Duration of a dmission                 | Cause of death  |
|-------|--------------|--|---|
| 01    | 414[35.45%]  | Death on Spot/Brought Dead to hospital | Traumatic Shock   |
| 02    | 295 [25.26%] | Death within 12hours                   | Head Injury Effects /Exsanguinations                                  |
| 03    | 157 [13.44%] | Death within 24 hours                  | Head Injury Complications /Pneumothorax/ Secondary Hemorrhage         |
| 04    | 89 [7.62%]   | Death within 2-3days                   | Head Injury/- Septicemia/- Embolism                                   |
| 05    | 74[6.34%]    | Death within 5-7days                   | Deep Vein Thrombosis, Septicemia, Pulmonary Embolism                  |
| 06    | 139 [11.90%] | Death beyond 7days of Admission.       | Renal Failure/Damage, Septicemia Shock, Lung Infection, Peritonitis.. |

cases and Females 186 cases. This was closely followed by Chest Region in 584 cases, Females victims reported chest injuries in only 39cases. Abdomen was another Region Affected in 414 cases. Pelvis and Spinal injuries were reported in 314 cases, females contributed to only 17 of the Spinal and Pelvis Injuries. Lower Limb were most affected [396 cases] than the Upper Limbs[298 cases]. o 04-showing List of Fatal injuries Reported in Fatal Road Traffic Accidents. The Maximum number of Fatality reported were due to Head/Cranio-cerebral injuries in 87% of cases. Liver Laceration was another Major Fatal Injury reported on 42% [n-584] of the cases. The least type of Fatal Injury reported were Crush Injuries to Abdomen, Chest & Head, in 02%[n-96],04%[n-132] & 05%[n-168] respectively. Spinal injuries contributed to 28% [n-314] of Fatality. Lung or Diaphragm Injuries contributed in 26% [n-386], of the Fatality. Fracture Ribs were reported in 23% [n-419] of the Fatal Victims. o 05-Describes the Different Nature of Blunt Injuries Reported in Fatal Road Traffic Accident Victims. Abrasions were reported in all cases of Road Traffic Accident Victims. But contusions were Seen in 81.59% [n-953] cases. Lacerations both Surface and Visceral, contributed to 58.56% [n-684] cases. but Fractures contributed to 48.71% [n-569] cases. o 06-Describes the

Duration of Admission & Cause of Death in Fatal Road Traffic Accident Victims. The Major causes of death were reported due to Traumatic Shock in individuals who died on Spot or were Brought Dead to Hospital in 35.45% [n-414] cases. This was followed by Those Death due to Head injury/Exsanguinations reported within 12 hours, in 25.26% [n-295] cases. Death within 24 hours were due to Head Injury complications, Pneumothorax & Secondary Hemorrhage in 157 cases [13.44%]. Complications due to Head injury, Septicemia & Embolism were major causes of Death reported in 2-3 days in 7.62% [n-89] of the Victims. Deep Vein Thrombosis, Pulmonary Embolism and Septicemia were the major causes of Death reported within 5-7 days after the Accident in 6.34% [n-74] of the cases. Renal Failure/Damage, Septicemia Shock, Lung Infection, Peritonitis, Coma, were the Major causes of death reported in individuals treated beyond 07 days in 11.90% [n-139] of the Victims.

#### 4. Discussion

The present Retrospective Study was Conducted during the period 2013 to November 2020, a total of 1168 Road Traffic Accidents cases were Autopsied, this cases constituted 39.35% of the Total Autopsies conducted during the Study period. In a Study conducted by Sachin et al.<sup>7</sup>, RTA Constituted only 263 of the Total 1467 Autopsies. The Higher Rate in the Present Study is possible because of the Study conducted in Bangalore, wherein the Population density is 4378 person per square kilometer<sup>8,9</sup>

There were around 6.8 million registered vehicles across the southern city of Bengaluru in India at the end of fiscal year 2017. This statistics clearly reflects the Cause for increased Fatality, hence Demographic Factors play an important Role in the Fatality due to RTA. In the Present Study Males constituted 83.04% [n-970] the Maximum number of the Victims, an observation similar to those made by Researchers elsewhere<sup>7,8,10,11</sup> This clearly demonstrates the Active Gender in a given population and their Increased Mobility and affinity to Usage of Vehicles. It also reflects the possibility that traditional preference of Male Sex for all outdoor Activities. The present Study highlighted the fact that Majority of the Victims were in the age group 31-40, in 36.13% of the cases [n-422], a View similar to that of Aubakirova A et al.<sup>12</sup>, but contrary to those made by others<sup>10-13</sup>, who had opined that majority of their Victims belonged to 21-30 years. This is possibly due to the fact that during the Fourth Decade the Individual is well settled with his Job or Business, and had made enough savings to buy vehicle, whereas the 3<sup>rd</sup> decade is usually limited to Education and Training or Apprenticeship. It also indicates the most active Age group thriving and competing in their careers. The least age group affected were those below 10 years and those above 70 years, this reaffirms the above statement. In the present Study Light

Motor Vehicle were the Major Contributor to the Accidents, contributing to 46.40% [n-542] of the cases. This is contrary to the Claims made by Sachin et al.,<sup>7</sup> wherein Motorcycles had contributed to 78.3% of the Accidents. This is due to the Fact that the Increased Cost of the Motor Cycles. The price of New Motor Cycle can buy a Second Hand Light Motor Vehicle, besides there are many Cheap Small Cars Manufactured to suit Middle Class Population, who comprises 60% of the Population.

Head and Neck was the Major region affected in 68.06% [n-795] of the cases. Chest Injury was noted in 584 cases and Abdomen injury in 414 cases. Similar were the observation made by others<sup>10-16</sup> who had observed that Head injury was reported in 67.39% of his Victims. This is possibly due to the weight of the Head [5-7kgs], Eccentric position to the Spine and Easy Free Mobility than the other parts of the body. In a study conducted by Abhishek et al.<sup>17</sup> he had observed Abdomen as the Major region involved, this is contrary to the claims made in the present study and the study conducted elsewhere<sup>14-18</sup> This results need to be carefully verified and Analyzed to understand the Gross discrepancies, however Multiple region involvement is another Factor which was not part of the present study. The Maximum Fatal Injuries reported were Head or Craniocerebral Injuries in 87% of the cases. This are similar to the claims made by others.<sup>7-19</sup> In similar study conducted by Deepak Kumar et al.<sup>20</sup>, Hemorrhagic Shock was considered as the Major Cause of Death. Hence this has opened a major topic for Debate, because of the Fact that ICD10 classification diseases never recognizes Hemorrhagic Shock as Causes of Death, because the Term Hemorrhagic Shock is the Mechanism of Death and Never a Cause of Death. The other possible causes is Multiple Region Involvement or Multiple injuries due to involvement of Other body parts like Chest, Abdomen, and Extremities. Another Important Observation made in the present study is that, All the Victims [100%] showed Presence of Abrasions on their Body. This Clearly confirms the Fact that Abrasions remain the Character of Road Traffic Collision Victims, this is due to Impact by Blunt Force and Mobility factor involved and also due to contact with the rough surface that is Road. But the observation made by Sachin et al.<sup>7</sup> is contrary to the present study wherein Abrasions was reported in only 29.8% cases. However the other injuries like Contusions, Lacerations and Fractures proportions reported in the present study were similar to those made elsewhere with close variations.<sup>20,21</sup> In the present Study Analysis of the Period of Survival or Treatment of the Victim of Road Traffic Collision and the Autopsy Cause of Death, the Majority of the Deaths were due to Traumatic Shock reported in on the Spot Deaths or Brought Dead Victims in 35.45% [n-414] cases. The commonest Cause of Death reported after 07 days of Treatment, were Septicemia, Lung infections, Peritonitis, Coma. And The commonest

Causes of Death within 24 hours were due to Complications of head Injury, Pneumothorax & Secondary Hemorrhage. The observations are close to those made by Sachin et al.,<sup>7</sup>, however his study did not specify the Post Mortem Cause of Death.

This result will potentially help Medical System Establishments and the Clinicians<sup>22</sup> to understand the Fatal Process involved in relation to the Time of Accident. There are similar studies, designed based on autopsy findings, used for clinical audit of trauma systems, as well as accurate, standard, and valuable tools for data gathering and determination of the actual cause of death.<sup>23,24</sup> Hence this result has highlighted the Importance of an on Time Efficient Surgical Team and Adequate Neurosurgical Trauma Care Center with the sophisticated Radiological Facility so as to enable them to serve the Emergency need, as an important measure to reduce the Mortality and Morbidity surrounding the Road Traffic Fatalities. Hence, this study has impressed upon the essentiality of a Proper Understanding of Fatality due to Road Traffic Collision so as to address the concerns of the Major Public Health Issue that is responsible for the Maximum number of Fatalities in the present Times.

## 5. Conclusions

Cranio-cerebral Injuries were the Main Contributors to Fatality in 87% of Accidents. Majority of Deaths were due to Traumatic Shocks due to Multiple injuries involved. Majority of the Victims had died within 1 hour after the accidents in 35.45% [n=414] cases. The Importance of Emergency Care to reduce the fatality is well understood. Infections played an important Role in Fatality for Accident Victims treated for more than 07 days.

## 6. Source of Funding

None.

## 7. Conflict of Interest

None.

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## Author biography

Dinesh Rao, Professor & HOD

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