

---

# Pattern, Severity of Injuries Sustained in Road Traffic Accident: An Autopsy Based Study

Sadasivam Shanmugam<sup>1</sup>, Swarana Sekar<sup>2</sup>, Kaviya Kamalanathan<sup>3</sup>

<sup>1</sup>Associate Professor, <sup>2</sup>Junior Resident, <sup>3</sup>Junior Resident, Department of Forensic Medicine & Toxicology, Government Madurai Medical College, Madurai, Tamil Nadu.

**How to cite this article:** Sadasivam Shanmugam, Swarana Sekar, Kaviya Kamalanathan. Pattern, Severity of Injuries Sustained in Road Traffic Accident: An Autopsy Based Study. Indian Journal of Forensic Medicine and Toxicology / Volume 18 No. 1, January-March 2024.

## Abstract

Road Traffic Accidents (RTA's) constitute a significant public health problem, they are rising in an alarming rate and causing increased morbidity and mortality among people. Motor vehicle accidents are complex events resulting primarily from human, technical, and environmental contributing factors. That is the reason, road traffic accidents are creating the burden for people related to mortality and morbidity.

**Objectives:** The following study analyses the following: 1) Age and sex distribution of the deceased in RTA. 2) Month and Time of occurrence of RTA. 3) Pattern of injury sustained in RTA.

**Methodology:** A retrospective study was conducted for a period of three month (October 2022-December 2022), in cases of road traffic accidents brought for autopsy at tertiary care teaching hospital, Madurai. All the data regarding the age, sex, month, time and place of occurrence, type and site of injuries and outcome are collected based on autopsy report. Data was analysed using standard statistical method.

**Results:** Of the total 330 road traffic accidents cases, 81.8% cases were males, 18.2% females. Majority of the victims were in the age group of 41-50 years (21%), Urban victims found to be on the highest side (77.2%), compared to Rural victims 22.8%. Most of the RTA happened during the month of NOVEMBER (38.2%) and during the time period between 2 PM and 1 0PM (40.6%). Head injuries contributes the most common injury pattern (60.7%) compared to other pattern of injury.

**Conclusion:** The present study concluded that head injuries were the most common injury pattern in RTAs and it is the main factor for death. Proper awareness about usage of helmets, punishment regarding drunk & driving and rash driving among the common people will help to reduce the mortality due to Road traffic accidents.

**Keywords:** Road traffic accidents, Patterns of injuries, Helmets

## Introduction

RTA constitute a major public health problem which affects people in emotional and economical aspects since most of the victims were male and who were the bread winner of the family. Road traffic

crashes cost 3% of their Gross Domestic Product. More than 90% of road traffic deaths occur in low and middle income countries. An increase in average speed is directly related to likelihood of occurrence of RTA and mortality following it. Driving under

---

**Corresponding Author:** Swarana Sekar, Junior Resident, Department of Forensic Medicine and Toxicology, Government Madurai Medical College, Madurai, Tamil Nadu.

**E-mail:** swarna2222@gmail.com

**Submission Date:** Aug 6, 2023

**Revision Date:** Sept 2, 2023

**Publication date:** Jan 19, 2024

---

the influence of alcohol or drug or any psychoactive substances increases the risk of RTA. Correct helmet use can reduce the occurrence of RTA to about 42% as per national survey. Drivers using mobile phones are approximately 4 times more likely to be involved in RTA than who don't use it<sup>1</sup>. Road Traffic Accidents are conceived to become the 3<sup>rd</sup> contributor to global disease burden by 2020. According to the WHO Road Traffic Injuries caused an estimated 1.2 million deaths worldwide in each year<sup>2</sup> Egypt, Injuries, Deaths. Road traffic accidents (RTAs).

According to Road Traffic Accident census 2021 issued by the Central Government Of India, Ministry Of Road And Highway Transport Research Wing, New Delhi, a total number of 4,12,432 RTA's have been reported by States and Union Territories during the calendar year 2021 claiming 1,53,972 lives. The number of RTAs in 2021 has been increased by 12.6% on an average compared to the previous year (2020). Similarly, the number of deaths and injuries has been increased by 16.9% compared to the previous year (2020)<sup>1</sup>. In India a total number of 4,12,432 accidents have been reported in 2021. Among vehicle categories involved in RTA, two wheelers for the second consecutive year accounted for the highest share in the total accidents and fatalities during 2021. Urban area accounts for 31% of accident death in the country<sup>1</sup>. Knowledge regarding time of incident, pattern of injuries, and severity of injuries will help us in reduction of mortality and disability due to RTA's.

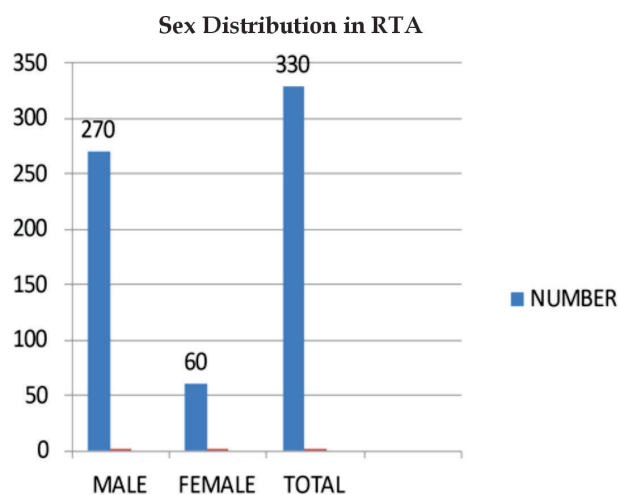
### Materials and Methods

The present Retrospective study conducted for period of 3 months between October 2022 and December 2022, in the cases of death due to road traffic accidents, subjected to autopsy at Government Rajaji Hospital (GRH), Madurai, Tamil Nadu state. Cases of other form of traumatic injuries were excluded in the study. Autopsy reports of 330 deceased victims were analysed and necessary details were sort in terms of Age, Sex, month, time and place of occurrence, type and site of injuries. The data was analysed using standard statistical methods and the results were interpreted in terms of percentage and mean.

### Findings

A total of 330 deceased victims autopsy reports were analysed and the following results were made.

The distribution of study subjects according to sex is depicted in



Of the total 330 deceased RTA victims 270 (81.8%) were found to be male, 60 (18.2%) found to be female. This shows the active part of males in outside home activities.

The distribution of study subject according to Age and Sex is depicted in Table 1:

The patient age ranged between 2.5 months and 90 years with the mean Age being 46.48.

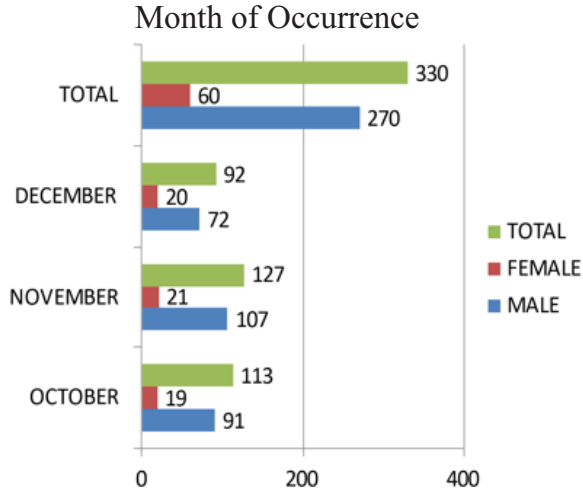
### Age and sex wise distribution of study subjects

AGE GROUP (YEARS)	SEX		TOTAL	SEX RATIO (M:F)
	MALE	FEMALE		
BELOW 10 YEARS	4(1.45)	1(1.7)	5(1.5)	4:1
11-20 YEARS	21(7.8)	1(1.7)	22(6.7)	21:1
21-30 YEARS	48(17.8)	8(13.3)	56(17)	6:1
31-40 YEARS	49(18.2)	4(6.7)	53(16)	12.3:1
41-50 YEARS	48(17.8)	17(28.3)	65(20)	2.8:1
51-60 YEARS	50(18.5)	13(21.7)	63(19)	3.8:1
61-70 YEARS	27(10)	10(16.7)	37(11.2)	2.7:1
> THAN 70 YEARS	23(8.5)	6(10)	29(8.8)	3.8:1
TOTAL	270 (81.8)	60(18.2)	330(100)	4.5:1

Out of total of 330 deceased victims, highest number of victims fall in the age group of 41-50 accounting for 69(21%).

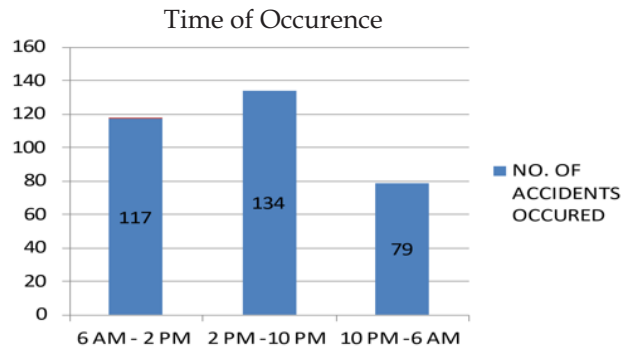
On applying Z test it is shown that age group between 51-60 years and 21-30 years are statistically significant.

With this data, Male: Female ratio was made. In this, maximum sex differentiate was observed in the age group of 31-40 years with male and female gender ratio of 12.3:1. While the overall male and female ratio was 4.5:1.



Various circumstances were attributed to the causation of RTA and is shown in Figure 2.

Of the total of 3 month which includes October, November, and December. Maximum RTA happened during November which rainfall was maximum during the year. Hence season of the contributes the major role in RTA.



Next comes to the times of occurrence which is presented in Figure 3.

Of the 330 autopsy report analysed, the maximum RTA happened during the time period between 2 pm and 10 pm which amounts to 134 in number (40.6%) followed by the time period (6 am- 2pm) which accounts to 117 (35.5%) in number.

In this 2pm -10pm time period maximum RTA occurred during the time interval of 6-10 pm in

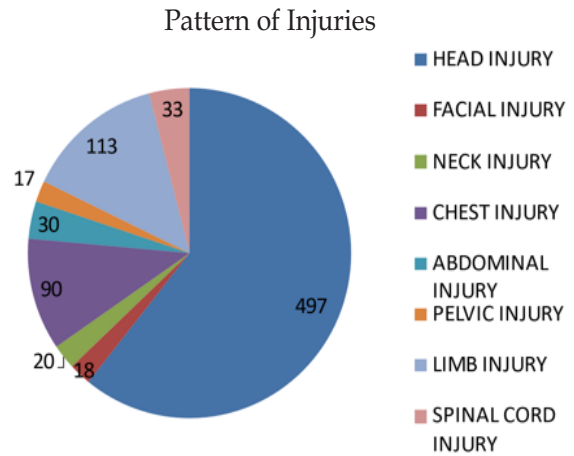
which people return to their home from office /any domestic activity happens during that time period.

Hence avoiding rash driving, using proper helmets, avoiding usage of mobile phones while driving and following traffic rules greatly helps in avoidance of such RTA's.

Distribution of body region injured in RTA is depicted in the Table 2.

SITE OF INJURY	TOTAL INJURIES ( NO)	PERCENTAGE
HEAD INJURY	497	60.7%
LIMB INJURY	113	13.8%
CHEST INJURY	90	11%
SPINAL CORD INJURY	33	4%
ABDOMINAL INJURY	30	3.7%
NECK INJURY	20	2.5%
FACIAL INJURY	18	2.2%
PELVIC INJURY	17	2.1%
TOTAL	818	100%

On analysis, the maximum region of the body injured in RTA is the head. Hence it indirectly reflects the improper use of helmet and quality of helmet used by the victims.



Head injury contributes to 497 in number of the total injuries of 818, which contributes (60.7%). Head injury is the most common cause of death in RTA's

which is followed by limb injuries. Limb injuries includes long bone fractures. Limb injuries found to be 113(13.8%).

#### Patterns of head injury depicted in the Table 3.

PATTERNS	NUMBERS	PERCENTAGE
SKULL FRACTURE	200	40.24%
MENINGEAL HEMORRHAGE	270	54.32%
INTRA CEREBRAL HEMORRHAGE	27	5.43%
TOTAL	497	100%

**Chest injury** accounts to 90 in number which is 11% of total injuries. Chest injury includes fracture ribs and visceral organ injuries (heart and lung). Visceral organ injury may or may not be associated with rib fractures.

#### Patterns of chest injury has been depicted in Table 4.

PATTERNS	NUMBERS	PERCENTAGE
FRACTURE RIBS	70	77.8%
VISCERAL ORGAN INJURIES ( HEART & LUNG)	20	22.2%
TOTAL	90	100%

**Spinal cord injury** contributes 4% of total injuries. It includes fracture of vertebrae with laceration of spinal cord.

**Abdominal injury** constitutes about 3.7% (30) of total injuries. Abdominal injury includes visceral organ injury (liver, spleen, intestines).

**Neck injury** contributes 2.5% of total injuries which includes fracture of cervical vertebrae and major vessel injuries.

**Facial injury** contributes 2.2% of total injuries. Facial injuries includes fractures of the facial bone and mandible.

**Pelvic injury** contribute 2.1% of total injuries which includes pelvic bone fractures.

### Discussion

The rate of mortality due to road traffic accidents increasing day to day. The time of occurrence, alcohol intoxication, rash driving, and other factors are acting major role on it. Seasonal variation, fast driving without safety measures, work tension are resulting road traffic accidents. In our present study 330 total cases, out of 818 injuries, 497 cases account for head injury which is 60.7%. Almost similar pattern of head injury injuries in road traffic accidents observed in various studies. As in studies by Singh R, Singh-69%, Singh, Younis, Rehab & Adel, Rana-96.8%), Singh H, Dhatarwal SK-97.6%), Rao D-(87%), Gurjeet & Joshi(65%), Moharamzad, Yashar & Taghipour, Hamidreza -(9.58%) mostly on Skull injuries<sup>32</sup>Egypt, Injuries, Deaths. Road traffic accidents (RTAs)<sup>4567</sup>. Urban residence as the common correlates with almost every study due to heavy traffic by over population. The most common gender was noted in our study male (81.8%), similar to findings by Singh R, Singh-(74.35%), Moharamzad, Yashar & Taghipour, Hamidreza-(80.5%), Tambuzzi, Stefano(54%)<sup>378</sup>. This shows though women are said to be less vehicle used, intoxication of alcohol is rare compared to men fall prey to thought of losing their lives. In our study also the time of occurrence between 2PM-10PM due to work exhausted and returning to home after finishing their jobs and so on and bit different from other studies. As per our study, majority of deceased belong to age group-41-50 yrs (21%), which is a bit different from other studies Tambuzzi, Stefano(54%)<sup>8</sup>, where more predominant age group was adult (74.3%) by Younis, Rehab & Adel, Rana<sup>2</sup>Egypt, Injuries, Deaths. Road traffic accidents (RTAs). This variation might be possibly due to variation in working people compared to young adults. The working class bear more stress, are more addicted to substance abuse which often leads to rash driving ultimately ending up in deaths.

### Conclusion

Head injury plays a major role in road traffic accidents causing death. Head injuries resulting from RTA's pose significant risk to individuals's health and well-being. Timely medical intervention,

rehabilitation, and support play essential roles in minimizing the impact of the injuries affected individuals and families. Preventive measures such as seatbelt use, helmet enforcement, and adherence to traffic rules are crucial in reducing the incidence and severity of head injuries in RTAs. Continued public awareness, research, and policy implementation are vital in addressing this critical issue and enhancing road safety.

Public awareness campaigns, stringent enforcement of traffic regulations, infrastructure improvements, and technological advancements like advanced driver assistance systems (ADAS) all play crucial roles in reducing the frequency and severity of accidents. Education, training, and promoting responsible driving behaviours are equally important in fostering a culture of road safety. By combining these efforts, we can strive towards a safer road environment, saving lives, minimizing injuries, and ensuring the well-being of all road users.

**Conflict of Interest:** None Declared

**Source of Funding:** Self

**Ethical Clearance:** Ethical committee approval obtained from Institutional Ethical Committee Government Rajaji hospital, Madurai.

### References

1. ROAD ACCIDENTS IN INDIA ROAD ACCIDENTS IN INDIA ROAD ACCIDENTS IN INDIA.; 2021. www.morth.nic.in
2. Younis R, Adel R. Forensic Medical Study of Road Traffic Accident Cases Admitted to Minia University Hospital. *Mansoura J Forensic Med Clin Toxicol.* 2019;27(2):1-11. doi:10.21608/mjfmct.2019.52465
3. Singh R, Singh HK, Gupta SC, Kumar Y. Pattern, severity and circumstances of injuries sustained in road traffic accidents: a tertiary care hospital-based study. *Indian J Community Med.* 2014 Jan;39(1):30-4.
4. Singh H, Dhattarwal SK. PATTERN AND DISTRIBUTION OF INJURIES IN FATAL ROAD TRAFFIC ACCIDENTS IN ROHTAK (HARYANA). *JIAFM.* 2004;26(1).
5. Rao D. Fatal road traffic collisions-An autopsy based study. *IP Int J Forensic Med Toxicol Sci.* 2021;6(3):113-117. doi:10.18231/j.ijfmts.2021.024
6. Singh G, Joshi R, Kumar A, Resident J, Head. Original Article Assessment of Pattern Head Injury, Skull Fractures in Road Traffic Accidents Cases. *Int J Heal Allied Sci.* 2021;5:28-31.
7. Moharamzad Y, Taghipour H, Firoozabadi NH, et al. Mortality pattern according to autopsy findings among traffic accident victims in Yazd, Iran. *Chinese J Traumatol (English Ed.* 2008;11(6):329-334. doi:https://doi.org/10.1016/S1008-1275(08)60067-X
8. Tambuzzi S, Rittberg W, Cattaneo C, Collini F. An Autopsy-Based Analysis of Fatal Road Traffic Collisions: How the Pattern of Injury Differs with the Type of Vehicle. *Trauma Care.* Published online 2021. <https://api.semanticscholar.org/CorpusID:244595063>.