

## Distribution and Pattern of Head Injuries in Fatal Road Traffic Accident Victims

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### Abstract:

**Background:** The only public health issue where youth death and impairment are still widely accepted by society and decision-makers is road traffic accidents. It is estimated that by 2020, road traffic accidents will claim the lives of around 1.9 million people yearly, killing about 3400 people every day worldwide. Low- and middle-income nations account for about 90% of RTA fatalities worldwide, while highly motorized nations only make up a small portion of that total despite housing more than 60% of all vehicles. RTAs are a significant epidemiological and medical-legal concern. In terms of morbidity and mortality, brain injuries are the most severe injuries that can result from traffic accidents.

**Aim:** The aim of the study is distribution and pattern of head injuries in fatal road traffic accident victims

**Material and Method:** The current investigation was carried out in the Department of Forensic Medicine and Toxicology and is a prospective study. For skull fractures arising from assault, railway accidents, road traffic accidents, injuries from firearms, and height falls, all autopsy cases were examined. Data and information in-depth regarding the instances were gathered. After being given the information, a post-mortem examination was carried out. Eighty fatal road traffic accident cases served as the basis for the data in the materials. At the time of autopsy, the condition of the scalp, cranial bones, meninges, intracranial hemorrhages, and brain parenchymal involvement were documented.

**Results:** Road traffic accidents are a significant cause of morbidity and mortality. 75 individuals had scalp injuries that were reported. In 5 cases, there were no scalp injuries. 60.0% of the victims—a total of 75—had contusions. Abrasions were only seen in 57.5% of cases, followed by lacerations in 67.5% of those. The majority of the scalp injuries occurred in the frontal region (51 injuries), then in the temporal (49 injuries), parietal (36 injuries), and occipital (11 injuries), in that order.

**Conclusion:** The number of road accidents is rising alarmingly, which is costing society's workers and resources. The majority of them are due to human mistake, and they can be avoided by spreading awareness of road safety among everyone. It was shown that cerebral bleeding caused death in the majority of patients, either directly or indirectly.

**Keywords:** Road Traffic Accident (RTA), Head Injury, Scalp injuries and Cause of death.

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### Introduction

"An unexpected, unplanned occurrence which may involve injury" is the definition

of an accident. A road traffic accident is any accident that involves a vehicle and

occurs on a public road. In the year 2000, road traffic accidents were the third most common cause of disease among people aged 15 to 19 and the number one cause of illness for children between the ages of 5 and 14.[1] Around 10% of fatal traffic accident injuries worldwide occur in India.[2] One of the top causes of death worldwide is injuries sustained in road accidents.[3] This includes falls from moving vehicles that result in injuries to or the demise of those involved, as well as collisions of an automobile with a rider, pillion rider, driver, passengers, pedestrian, or another automobile on the road. Spastically approximated figures for the number of fatalities and injuries from traffic accidents worldwide each year range from 1.2 million to 50 million.[4] The National Advisory Neurological Diseases and Stroke Council defines a head injury as the morbid condition brought on by obvious or subtle structural alterations in the scalp, skull, and/or the contents of the skull, which are brought on by mechanical forces. The impact that causes the injury need not, however, be applied directly to the head in order for the analysis to be complete.[5] All types of unintentional deaths, both natural and unnatural, accounted for 30.2% of deaths in 2005.[6]

RTA might be viewed as a condition that primarily affects males in young adults. India is hardly an exception to the global growth in RTA. In India, an estimated one road traffic accident (RTA) happens every four minutes, killing at least 25,000 lives annually. Although morbidity does not account for these social dimensions of this issue, RTA not only impacts the primary victims but also has countless secondary victims in the form of family and relatives who suffer financially, psychologically, and socially.[7] Next to cancer and heart disease, RTAs are ranked as the third most lethal killer. In the United Kingdom, the first motor vehicle-related mortality was recorded in 1896. In the twenty-first

century, accidents are a significant epidemic of non-communicable diseases. The burden of disease and mortality brought on by traffic accidents is rising in emerging nations. RTA cost nations worldwide between one and two percent of their GDP, according to a recent survey.[8] RTA is caused by a combination of factors, including a significant increase in the number of vehicles on the road, high-speed technology, inexperienced drivers operating unlicensed vehicles, poor roads, drunk or drugged drivers, willful or unintentional traffic rule violations, etc. RTA victims experience a variety of wounds, including abrasions, lacerations, contusions, and other exterior as well as internal wounds.[9]

Internal wounds can include fractures, visceral organ ruptures, the devastation of significant arteries, etc. RTA fatalities may be brought on by early (such as hemorrhage, injury to vital organs, vagal inhibition, neurogenic shock, embolism, etc.) or late (such as infection, injury sequelae, etc.) causes. Many of these people can be saved from death by early injury detection and timely treatment.[10] Particularly in hit-and-run instances, a thorough and in-depth analysis of the injuries aids in the reconstruction of RTAs, which in turn aids the investigating officer in the identification and punishment of individuals guilty for the accident. Additionally, research on injuries linked to fatal outcomes aids in the development of policies to reduce RTA-related fatalities. This study was conducted to determine the prevalence of head injuries in this region of the nation, evaluate the prevalence rates across India, and comprehend the dynamics of head injuries.[11]

### Material and Methods

The current investigation was carried out in the Department of Forensic Medicine and Toxicology and is a prospective study. For skull fractures arising from assault, railway accidents, road traffic accidents, injuries from firearms, and height falls, all

autopsy cases were examined. Data and information in-depth regarding the instances were gathered. After being given the information, a post-mortem examination was carried out. Eighty fatal road traffic accident cases served as the basis for the data in the materials. At the time of autopsy, the condition of the scalp, cranial bones, meninges, intracranial hemorrhages, and brain parenchymal involvement were documented.

#### Inclusion criteria:

- At Medical College Mortuary and District Hospital Mortuary, autopsies were performed on each of the cases of skull fractures.
- The study will include every instance of a vehicle collision with multiple injuries to the body.

#### Exclusion criteria:

- Except for those who suffered from skull fractures, all the victims were

autopsied at the District Hospital and Medical College Mortuaries.

- Other patients admitted to the hospital include those who were assaulted or fell accidentally.
- Decomposing bodies and accidents without a clear cause.
- Refusing to consent to the study.
- Dragged dead.
- Victims were sent right away to a more advanced center.

**Statistical Analysis:** The data was statistically analyzed, and the results were displayed as tabular data, bar diagrams, and pie charts. When necessary, X-rays and photographs are taken. The findings are summarized, examined, commented, and drawn upon.

**Result:** This study was undertaken to evaluate several epidemiological parameters causing the accidents and their common pattern of injury and outcome. Road traffic accidents are a significant cause of morbidity and mortality.

**Table 1: Sex-wise distribution of RTA victims**

Sex	Number of Cases	Percentage
Male	72	90
Female	08	10
Total	80	100

In our study, most of the victims were males (72 cases-90.0%). The number of female victims was 8 only (10%). This finding clearly indicates the male preponderance in road traffic accidents.

**Table 2: Scalp Injuries of RTA Victims**

	Site	Contusion	Abrasion	Laceration
Frontal	R	8	8	7
	L	11	8	9
Parietal	R	5	4	10
	L	5	3	10
Temporal	R	9	8	7
	L	8	11	6
Occipital	R	1	2	3
	L	1	2	2

There were 75 individuals who had scalp injuries. In five cases, there were no scalp wounds. A total of 60.0% of the victims had contusions. Abrasions were the most frequent injury, occurring in 57.5% of cases, whereas lacerations occurred in 67.5% of cases. 51 injuries were found in the frontal region of the scalp, which was then followed by 49 injuries in the temporal, 36 injuries in the parietal and 11 injuries in the occipital regions.

**Table 3: Intracranial injuries in the victims of RTA**

Intracranial Injury	Number of Victims	%
Extradural hemorrhage	15	18.75%
Subdural hemorrhage	65	81.25%
Subarachnoid hemorrhage	70	87.5%
Intracerebral hemorrhage	22	27.5%
Intraventricular hemorrhage	14	17.5
Contusions	50	62.5%
Lacerations	3	3.7%

All of the participants in the current study had some sort of intracranial damage. In 70 (87.5%) patients, subarachnoid hemorrhage was discovered. There was subdural bleeding in 65 (81.25%) patients. In 22 cases (27.5%), intracerebral bleeding was present. Extradural hemorrhage occurred in 15 (18.75%) cases, followed by intraventricular hemorrhage in 14 (17.5%) of the cases. The area of the brain with the greatest damage was the frontal lobe. The brain's occipital area suffered the fewest injuries. Only the cerebellums of four people had damage.

### Discussion

One of the major causes of hospitalizations, fatalities, disability, and socioeconomic losses worldwide is skull fractures and related injuries. Its prevalence is quickly rising as a result of numerous contemporary civilization-related causes. Lack of sufficient planning and failure to create infrastructure to deal with the dangers of contemporary society can be used to explain the rapidly rising incidence. In the current study, assaults, falls from great heights, and traffic accidents all resulted in skull fractures among the victims. In the current study, males predominated in terms of sex or gender in cases of traffic accidents, and out of 80 study participants, 72 (90.0%) were men and 8 (10%) were women. It's because men are typically more active outdoors and were traditionally the family's breadwinner, while women are typically housewives. The fact that younger people in this age group are

typically the family's principal wage earners and are more active, have a tendency to take unwarranted risks, and are therefore more susceptible to accidents and fractures, can be used to explain a large number of instances in this age range.

This dominance of the males has also been reported by various workers B. C. Shivakumar et al 2012[12] opined that preponderance of males over females with an M/F ratio of 7.33. R. Ravikumar 2013[13] study entirely focuses on the patterns of head injuries in fatal accidents most victims were male (87.75%) and our studies are consistent. The predominance of men is explained by the fact that men, who make up the majority of families in this region and typically work outside the home and take care of the home duties, are more exposed to the dangers of the road, industry, and violence.

Dhaval J. Patel, 2015[14] study shows that the most commonly affected site is the parietal region (27.61%), which is followed by multiple sites >1 involvement (23.80%), The least affected site is the occipital region (7.61%). This was not comparable with our results. Samina Rehman et al. 2012 [15], Ravindra S Honnunar et al. 2011[16], and Manoj Kumar et al. 2013[17] studies show that Frontal bone fracture was the common bone fracture. Our findings conflict with that of this study. The occipital bone in the midline may be 15 mm or even more thin than the temporal bone, which may only be 4 mm thin. As a result of the direct effects

of its RTA, the temporal bone suffered the most bone fractures in our study.

This could be explained by the fact that traffic accidents are a complicated phenomenon with various causes. The increase in RTAs is brought on by pedestrian and motorist negligence, driver exhaustion, poor visibility brought on by lack of street lighting, urbanization, and the phenomenal growth of the road transportation industry. The primary reason for the rise in RTAs is the population increase. Many RTA incidents have been caused by congested roads, speeding, poor traffic planning, a lack of helmet use, alcohol drinking, and breaking traffic laws. The brain's occipital area suffered the fewest injuries. Only the cerebellum of four people had damage. These findings are consistent with the studies done by Tyagi1986.[18]

Hemalatha N. Gambhir Singh O 2007[19] Road Traffic Accidents (RTA) is the single most common cause of skull fracture in 43 cases (86%). The present study is also consistent with the studies of Lalit Kumar et al.2014 [20] where the majority of victims are of Road Traffic Accidents 298 (59.60%) cases followed by Fall from Height 101 (20.20%) cases and Mohd Kaleem Khan et al.2012 [21] study shows cases of road traffic accident were the most common mode of fatal injury comprising 102 (62.97%) case.

According to the study, head injuries are the leading cause of death, making the creation of emergency trauma care facilities including departments for neurology, radiology, and orthopedics necessary to lower morbidity and mortality. The avoidance of a family breadwinner's death will immediately aid the family in avoiding a financial problem and indirectly aid the nation by reducing crime. The majority of victims are from the middle socioeconomic level, have a secondary education, and are employed as unskilled employees. A lot of incidents happened on weekends and throughout the

winter season. The majority of occurrences happened during the daytime on public roads. The most frequent pattern of crashes was 2WH to LMV. Two-wheelers and pedestrians are the two most prevalent types of road users. At the time of the tragedy, the majority of the victims didn't wear helmets. Fissured fractures are the most typical type of skull fracture. SDH is the most typical form of intracranial hemorrhage. The main reason for traffic accidents on the road is human mistake. We anticipate that our research will be useful in comprehending these issues and will make a positive impact on the country.

### Conclusion

The number of road accidents is rising alarmingly, which is costing society's workers and resources. The majority of them are due to human mistake, and they can be avoided by spreading awareness of road safety among everyone. Streetlighting, road improvements, and the posting of traffic signs are all necessary. It is necessary to strictly enforce the rules governing vehicle operation, headgear use, and seat belt use.

Therefore, cerebral bleeding was the most frequent reason for RTA-related fatality in our study. It was shown that cerebral bleeding caused death in the majority of patients, either directly or indirectly. To lower the frequency of road traffic accidents, it is necessary to emphasize the value of wearing a seat belt, a helmet, and obeying traffic laws. A terrible financial burden for a developing nation like India is a traffic accident. RTA-related head injuries are a well-known major health issue that affects the people of this nation and is a leading cause of mortality and disability. It is imperative that the responsible authorities take prompt, appropriate action to decrease the number of head injuries related to RTAs and safeguard this vulnerable population.

## References

1. Park K. Accidents and Injuries. In: Textbook of preventive and social medicine Jabalpur, India, Banarsidas Bhanot Publishers. 2007;19:340-342.
2. WHO ICD-10 'International Statistical Classification of Diseases and Related Problems'. Geneva: World Health Organization. 10(1):891-943.
3. Peden M, McGee K, Krug E (eds). Injury: A leading cause of the global burden of disease, 2000. Geneva Switzerland: WHO; 2002.
4. World Health Organization. World Report on Road Traffic injury prevention. 2009.
5. Vij K. Textbook of Forensic Medicine and Toxicology, New Delhi. Elsevier; 2005;3: 407.
6. NCRB. National crime records bureau, Ministry of Home Affairs, Govt. of India. 2005;4.
7. Nath N C. Road traffic accident – The present scenario and how to prevent it. JIMA. 2004;102(4):190.
8. District Statistician. A view on statistics of Belgaum district. Belgaum: Zilla Panchayat. 2005.
9. Patel NS. Traffic fatalities in Lusaka, Zambia. Med Sci Law. 1979;19(1):61-5.
10. Nandy A. Principles of Forensic Medicine. Calcutta: New Central Book Agency. 2010;3: 515.
11. Meera TH, Nabachandra H. A Study of Pattern and Injury Severity Score in Blunt Thoraco-abdominal Trauma Cases in Manipal. Medico-Legal Update. 2005-06; 5(2):47-52.
12. B. C. Shivakumar et al: Pattern of Head Injuries in Mortality due to Road Traffic Accidents involving Two-Wheelers J Indian Acad Forensic Med. 2012;32(3):22-7.
13. R. Ravikumar: Patterns of Head Injuries in Road Traffic Accidents Involving Two Wheelers: An Autopsy Study J Indian Acad Forensic Med. October-December 2013;35(4): 349-352.
14. Dhaval J Patel et al - Study of road traffic accidental deaths (RTA) in and around Bastar 110 region of Chhattisgarh: J Indian Acad. Forensic Med, 2015;32(2):110- 112.
15. Samina Reedman et al - incidence of head injuries at district bar khan Baluchistan JFJMC: 2012;6(3):117-119.
16. Ravindra S Honnungar et al -An Epidemiological Survey of Fatal Road Traffic Accidents and their Relationship with Head Injuries J Indian Acad. Forensic Med. 2011; 33(2): 135-137.
17. Manoj Kumar et al - Head Injuries Sustained by Children Due to Fall from Height: A Comprehensive Study J Indian Acad. Forensic Med. 2013; 35(4):305-307.
18. Tyagi AK, Sharma GK, Kumar B. Craniocerebral damage by blunt force impact. J Indian Acad Foren Med. 1986; 1:24-39.
19. O. Gambhir Singh et al: Evaluation of Mechanical Injuries in Homicidal Deaths (A retrospective study of 5 years) JIAFM, 2007;29(3); 18-22.
20. Lalit Kumar et al - Patterns of Head Injury at Tertiary Care Hospital; International Journal of Scientific c Study; 2014;1(5):5-850.
21. Mohd Kaleem Khan et al - A Study of Pattern of Fatal Head Injury at J.N.M.C. Hospital, Aligarh Indian Journal of Forensic Medicine & Toxicology; 2012;6(2):53-56.