



Original Article

Study of Skull fractures and Intracranial Hemorrhage in fatal cases of Road Traffic Accidents

Prabhakaran Selvam¹, Vijayaragavan Murugesan², Shraavan Venkatraman³

¹Assistant Professor, Department of Forensic Medicine & Toxicology, Dhanalakshmi Srinivasan Institute of Medical Sciences & Hospital, Perambalur, Tamilnadu

²Assistant Professor, Department of Forensic Medicine & Toxicology, Trichy SRM Medical College Hospital & Research Centre, Tiruchirapalli, Tamilnadu

³Assistant Professor, Department of Pharmacology, Sri Manakula Vinayagar Medical College & Hospital, Puducherry

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Corresponding Author:

Dr. Prabhakaran Selvam

Assistant Professor, Department of Forensic Medicine & Toxicology, Dhanalakshmi Srinivasan Institute of Medical Sciences & Hospital, Perambalur, Tamil Nadu

Email ID – prabhusspp@gmail.com

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ABSTRACT

Background: In road traffic accidents, Head injury is a major cause of mortality. Skull fractures and intracranial haemorrhages contributing significantly to fatal outcomes. This study is aimed to analyse the pattern of head injuries, intracranial haemorrhages, cause of death in fatal RTA cases and use of safety measures.

Methods: An autopsy based study was conducted in the Department of Forensic Medicine and Toxicology, B. J. Medical College, Ahmedabad for a duration of one year. Among 1138 fatal RTA cases, 847 head injury cases fulfilling the inclusion criteria were analysed. Data regarding type of road user, underscalp contusion, Skull Fractures, Intracranial Haemorrhage, safety measures and cause of death from such cases were studied.

Results: Two-wheeler users constituted the majority of victims (65.4%), followed by four-wheeler occupants (21.7%) and pedestrians (12.9%). Temporal region was the commonest site of underscalp contusion (29.4%). Multiple skull fractures were frequently observed. 52.9% of cases showed Intra-cranial haemorrhage in the form of SAH and SDH, 31.8% of cases showed multiple types of Intra-cranial haemorrhages and EDH was reported in 13.7% of cases. 79.1% did not use helmets in two wheeler. Head injury alone accounted for about 78.7% of deaths.

Conclusion: Skull fractures and Intracranial hemorrhages were major contributors of mortality. Two-wheeler users without helmets were predominantly involved. Study is also emphasizing the importance of helmet use and strict road safety measures.

Keywords: Intracranial hemorrhage, Skull fractures, Road traffic accident, Helmet users, Head injury.

INTRODUCTION

Head injuries contribute to significant proportion of unnatural deaths worldwide and their relevance in terms of forensic aspects is important. One-half of traumatic fatalities are attributed to only head injury.¹ Head is more vulnerable to trauma. The degree of trauma that would rarely be lethal to other areas of body can be lethal to head. The patterns of head injury observed during autopsy were analysed and evaluated meticulously because trivial amount of trauma to head may also prove to be fatal. Understanding about the type and site of fractures helps not only in cause-of-death certification but also to reconstruct the sequence of events, weapon type, and mechanism of injury.² Autopsy remains the gold standard for establishing precise injury patterns in dead. Due to an evolving population and the rapid speed of technology that brings thrill in vehicular experience, an exploratory study is required on road traffic accidents (RTAs).³

Head injury due to road traffic accidents result in structural changes inside the skull and scalp and death. However, many studies are available across the world and India to describe the pattern of head injury as results of road traffic accident^{4,5} but such studies are scant in Ahmedabad. Hence this study was undertaken with the aim of studying the pattern of head

injury and intracranial haemorrhages leading to death in Ahmedabad and also the use of personal safety measures and analysis of the cause of death in road traffic accident.

MATERIALS AND METHODS:

This study was conducted at the Department of Forensic Medicine and Toxicology at B. J. Medical College, Ahmedabad during the period from January 2019 to December 2019. Data for the present study was collected from the autopsy reports and from police information forms 146 (i) and (ii) of road traffic accident cases brought to mortuary of Civil Hospital, B. J. Medical College, Ahmedabad. A proforma was prepared to collect the data based on the deceased particulars with complete external and internal examination of those involved in head injury cases of road traffic accident.

For the present study, the particulars of deceased selected for proforma were as follows. Type of vehicle user along with safety measures (Seat belt in four-wheeler, helmet in two-wheeler), Underscalp contusion and its site, Skull fracture and its site, Intracranial haemorrhage and its distribution and the cause of death. Head injury cases of road traffic accident at Civil

Hospital, Ahmedabad during January 2019 to December 2019 were included.

Head injury in decomposed bodies, where proper interpretation of injuries is not possible due to extensive decomposition, head injury cases in unknown bodies without proper history, extensive burns involving head, where there is difficulty in interpretation of injuries and intracranial hemorrhages, infarctions were excluded.

The data collected were compiled in a master chart and analysed by calculating sum, range, distribution and percentage. The data was also tabulated and appropriate inferences were drawn. The present study data was compared with similar studies. Merits and demerits with possible causes, reasons, solutions were deduced.

RESULTS

Total 3803 autopsies were conducted at mortuary of Civil Hospital, Ahmedabad during the period from January 2019 to December 2019. Among the 1138 road traffic accident cases, 847 cases of head injury were selected for this study after applying exclusion criteria. Distribution of cases according to type of user and site of underscalp contusion are shown in Table 1 and 2. Two-wheeler contribute for majority of cases (65.4%) and temporal site being the major site of underscalp contusion (29.4%) followed by frontal and parietal.

Distribution of cases according to the site of skull fractures is shown in Figure 1 where multiple sites of injury contribute for the majority followed by no fracture with parietal being the least. As shown in Figure 2, the extradural hemorrhage contribute for major cases (31.8%) followed by sub-dural hemorrhage. Among users of two-wheeler, maximum number of cases were of Users without helmet 438 (79.1%) in comparison with the cases with the users with helmets 116 (20.9%) (Figure 3). Among users of four wheelers, maximum number of cases (78.7%) head injury alone is a cause of death compared to the cases of head injury associated with injuries to other parts of body (21.3%) (Figure 4)

TABLE 1: DISTRIBUTION OF CASES ACCORDING TO TYPE OF USER IN CASE OF RTAs

TYPE OF USER	NO. OF CASES	PERCENTAGE
Pedestrian	110	12.9 %
Two-Wheeler	554	65.4 %
Four-Wheeler	183	21.7 %
Total	847	100 %

TABLE-2: DISTRIBUTION OF CASES ACCORDING TO SITE OF UNDERSCALP CONTUSION

SITE OF UNDERSCALP CONTUSION	NUMBER OF CASES	PERCENTAGE
Frontal	161	19 %
Temporal	249	29.4 %
Parietal	159	18.7%
Occipital	140	16.6 %
Diffuse	60	7.1%
No Contusion	78	9.2%
Total	847	100 %

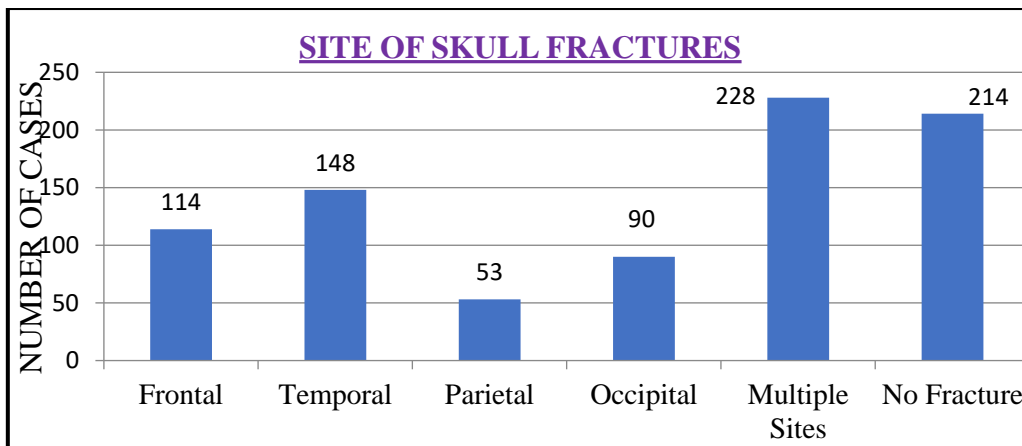


Figure 1: DISTRIBUTION OF CASES ACCORDING TO THE SITE OF SKULL FRACTURES

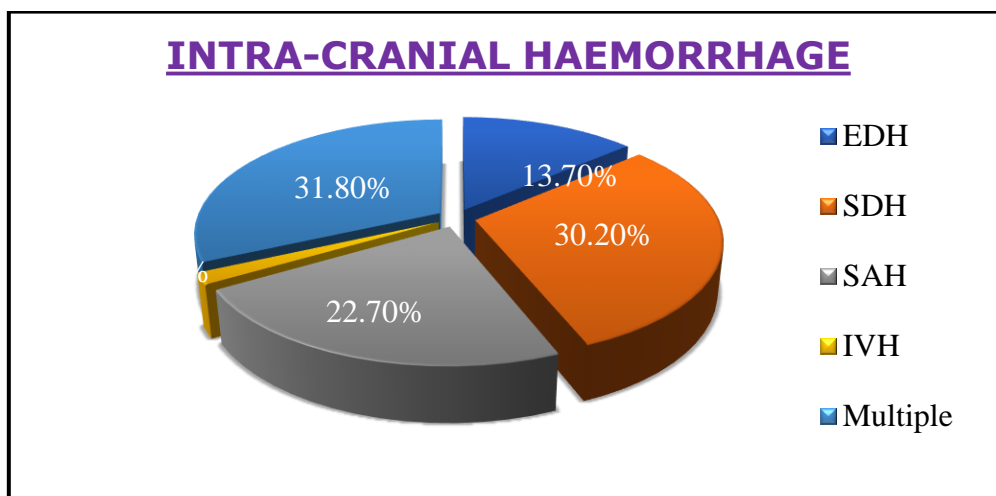


Figure 2: DISTRIBUTION OF CASES ACCORDING TO INTRA-CRANIAL HAEMORRHAGE



Image 1 - Linear fracture & Underscalp Hematoma B.J Medical College, Ahmedabad (2019)

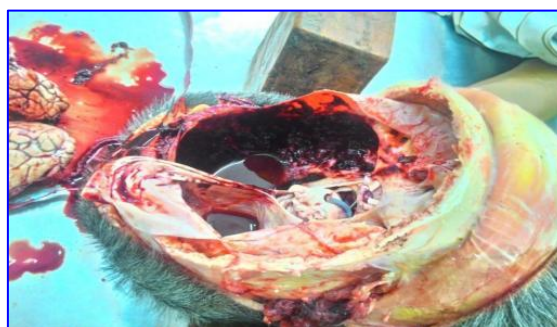


Image 2 - Subdural Hemorrhage B.J Medical College, Ahmedabad (2019)



Image 3 - Subarachnoid Hemorrhage B.J Medical College, Ahmedabad (2019)

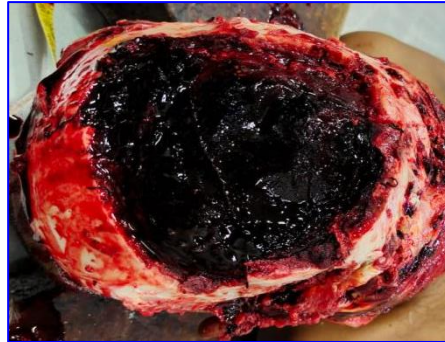


Image 4 - Extradural Hemorrhage B.J Medical College, Ahmedabad (2019)

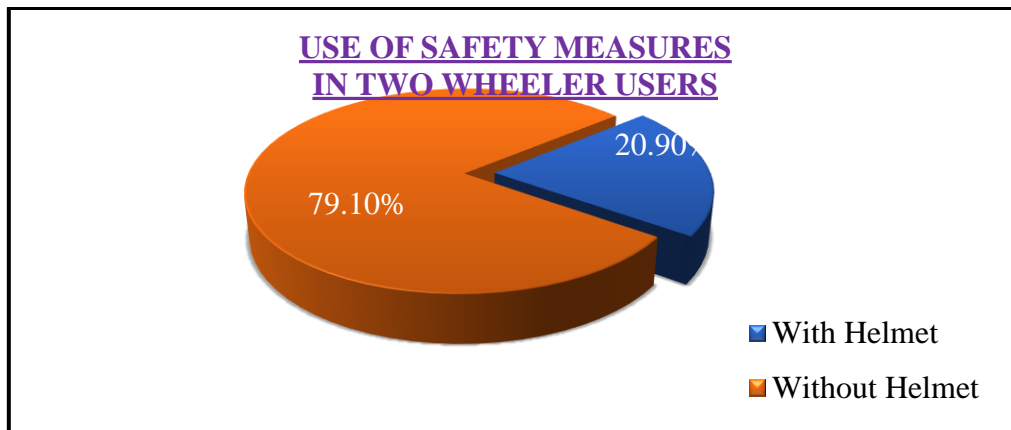


Figure 3: DISTRIBUTION OF CASES BASED ON USE OF SAFETY MEASURES

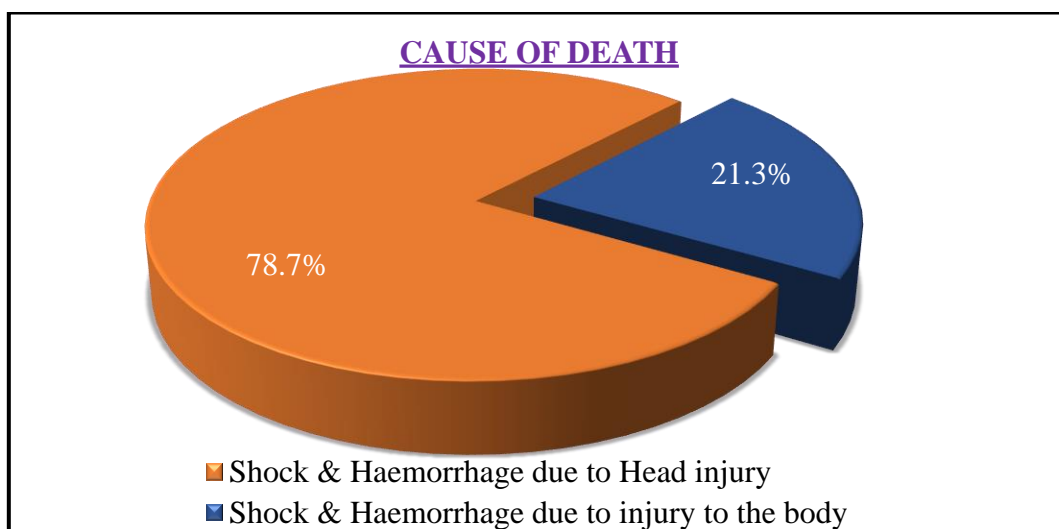


Figure 4: DISTRIBUTION OF CASES ACCORDING TO CAUSE OF DEATH

DISCUSSION:

Road traffic accidents (RTAs) remain one of the leading causes of traumatic head injuries worldwide, particularly among the younger and economically productive age groups.⁶ Skull fractures and intracranial hemorrhages are among the most

serious consequences of head trauma, often resulting in significant morbidity and mortality. The present study aimed to evaluate the pattern of skull fractures and intracranial hemorrhage in cases of RTAs and to assess their association with demographic variables, mechanism of injury, and outcome.

The present study was compared with more than 10 significant studies related to Head Injury cases that was done in India. It is evident that study of Jain et al is corresponding with the present study showing maximum number of underscalp contusion in temporal region.⁷ Comparison of type of skull fracture with similar studies done by other authors. It was evident that in all the studies, maximum skull fractures were found to be linear type of fracture. Comparison of type of intracranial haemorrhage with similar studies done by other authors. It is evident that Sub-dural haemorrhage was seen in the most of the victims of all studies consistent with the findings of the present study, followed by Sub arachnoid haemorrhage and least number of cases are showing Intra-ventricular haemorrhage which is also consistent with the findings of the present study. Comparison of use of safety measures with similar studies done by other authors. It was evident that in all the studies maximum two wheeler user of RTA were found to be without helmet in consistent with the findings by Kaushal M et al.⁸

Subdural hemorrhage was among the most frequently encountered patterns due to tearing of bridging veins following acceleration-deceleration injuries. Similar findings have been reported in studies evaluating traumatic brain injury in road traffic accident victims. The coexistence of multiple intracranial hemorrhages in several cases suggests that RTAs often involve high-energy trauma leading to complex patterns of brain injury. Cases with combined SDH and SAH or SDH with cerebral contusions generally showed poorer outcomes, indicating the importance of early neuroimaging and aggressive management. The role of helmet use is particularly relevant in the context of traumatic head injuries.⁹ With the usage of protective device, there is a significant reduction in incidence and severity of skull fractures. This highlights the need to strength traffic regulation and public awareness regarding road safety in reducing the burden of traumatic brain injuries.

Fatal rides cost India 5% of its GDP every year. Over 24 years from 2014 to 2038, if India could halve the deaths and injuries because of road traffic, its GDP could increase by 7% (2018 World Bank Report).¹⁰ There are many causative factors involved in road traffic accidents. The number of Road Accidents has increased between 2014 and 2018. The single most important thing a person can stay healthy and alive is to pay close attention to the way they drive. Traffic safety education should be given in schools for production of skilled and responsible drivers in future.

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Conflict of Interest: Nil

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