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Original Research Article

# Pattern and Distribution of Head Injuries in Fatal Road Traffic Accidents in Indore Region of Central India

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**Abstract:** Head injuries are the most serious injuries in the term of morbidity and mortality. The objective of this study is to find out age, sex, pattern and distribution of scalp injuries, skull fracture and intracranial haemorrhage in fatal road traffic accident victims.This study was conductedin Mahatma Gandhi Memorial Medical College and M.Y. Hospital Indore Mortuary among the 200 post mortem cases of road trafficaccident (RTA) victims over the period of one yearfrom 1st October 2014 to 30th September 2015. Most common type of fracture was linear fracture. In the present study it was observed that most of the fractures were present on Frontal bone alone i.e. 46 (23.0%) followed by Temporal bone alone (n=33; 16.5%), in combine most common Parieto-temporal bone fracture was most common followed by Fronto- Parietal bone fracture (n=4; 2.0%).RTAs were more common in the younger age groups and in male sex. Head injury was the major cause of death in majority cases of RTAs mostly due to scalp injuries, skull fractures, Subdural and Subarachnoid Haemorrhages. This further shows the need of strict implementations of rules for controlling the speed of vehicle.
**Keywords:**Craniocerebral Heamorrhage; Road Traffic Accident; Scalp Injuries; Skull fractures.

## INTRODUCTION:

In medico-legal practice blunt head injuries are most frequently caused by traffic accident, fall from height, assault, train accident etc. Head injury has been defined as "a morbid state, resulting from gross or subtle structural changes in the scalp, skull, and/or the contents of skull, produced by mechanical forces". It has also been defined as physical damage to the scalp, skull or brain produced by an external force. However, such force/impact, responsible for the injury needs not be applied directly to the head[1].

Injuries to pedestrians when hit by car at speeds of over 23km/hr can be scooped on the car and suffer from head injuries when hit against the windscreen and later fall off sideways. In addition, when a pedestrian is struck by the car, he may project forwards or is lifted onto the car. Both primary and secondary impact injuries occur as the person is thrown to ground or may be crushed and run over. Bumper of the car causes injuries below the knee, the radiator hits the pelvis and the abdomen is hits by the fender. It has been found that the pedestrians sustain fracture of legs in about 25% cases while in 40% cases there is injury to chest and abdomen. The fracture of ribs and injury to heart and lungs are the commonest form of injuries[2].

Injury to bicyclist if caused by automobile injuries may be similar to those sustained by a pedestrian except that the impact will be lower on the body or only against to some part of bicycle itself. The secondary injuries may be more severe due to greater distance to fall. When a person travels by bicycle and get hit by a vehicle then fracture of bone, severe soft tissue injuries and bicycle spoke injury is produced particularly in children. Injuries due to running over may be present. Injuries to motorcyclist usually occur by running in front of a vehicle from one side to other. The cycle is hit and the person is thrown violently on the ground. At times they are thrown beneath a vehicle and crushed like any pedestrian. These result in most of the cases from being struck with a motor vehicle. The primary and secondary impact injuries are seen similar to the pedestrian being hit by a vehicle. Secondary injuries will occur from striking the ground and on occasions being dragged with the vehicle. The same type of injuries are found in pillion passengers. Classical injury in motor cyclist and pillion passengers

is fracture of skull usually from secondary impact on the ground. Temporal and parietal bone fracture, fracture of base of skull and counter-coup injury to the brain are seen. Temporo-parietal fractures are common which usually extends across the base of skull through pituitary fossa. Crash helmet reduces friction of head against the ground and although the head injuries may be less, there will be other effects such as broken neck or fractured ribs or limbs with internal visceral injuries. One type of injury peculiar to motorcyclists and scooter rider in collision with the rear of the truck when the vehicle will pass underneath the back but the head of rider impacts against the tailboard [2].

This study principally aims to find out age, sex, pattern and distribution of scalp injuries, skull fracture and intracranial haemorrhage among the fatal road traffic accident victims.

## MATERIAL AND METHODS

This study was conducted in Mahatma Gandhi Memorial Medical College and M.Y. Hospital Indore Mortuary, among the 200 post mortem cases of road traffic accident victims over the period of one year from 1$^{st}$October 2014 to 30$^{th}$September 2015. Inquest papers and other relevant documents of police,magnifying glass and measuring tape, photographic equipment, autopsy table and instruments.Study tool was used for schedule based data collection and observation based study at time of autopsy. In this study included allknown cases and having alleged history of death due to RTA and excluded unknown body**,** decomposed body,deceased having alleged history of sustaining other injury along with RTA injuries, other cases such as rail accidents, operated cases, fall from height etc. Data was collected and analysed by using Microsoft office excel 2010.

## OBSERVATIONS:-

In this study Out of 200 cases, in 114 cause of death was craniocerebral damage as a result of skull fracture. It was observed that most affected age group was between 21-30 years having total 65 cases (32.5%), followed by 31-40 years (19.0 %). All age groups are dominated by males with maximum sex differentiation in 21-30 years age group. (Table-1)Females were affected equal in age group of 21-30 and 31-40 years, whereas males were affected maximum in 21-30 years age group. In the present study males (n=156, 78.0%) outnumbered females (n=44, 22.0 %) significantly with male to female ratio of nearly 3.54:1. (Table-2).

In the present study it was observed that most common type of scalp injury was contusion present in 123 (61.5%) victims, followed by laceration present in 21 (10.5%) victims and Least common alone abrasion i.e.7 (3.5%). In combine, contusion with laceration was most common 12 (6.0%).(Table-3)

It was observed that most common region of scalp involved was parieto-temporal i.e. (n=44; 22.0%), followed by fronto-parietal i.e.(n=33; 16.5%).(Table-4 )

SDH alone constitute about 16.0% followed by SAH 15.5% and least common was EDH. In combine SDH with SAH was most common haemorrhage i.e. 44.0% and least common was SAH with IC haemorrhage i.e. 1.0%.(Table No.05) The region which most commonly involved was frontal region alone (6.0%) followed by occipital region alone i.e. (5%) and least common parietal region alone i.e.(n=1; 0.5%). (Table-6)

**Table 1: Showing distribution of cases of RTA according to age and sex. (n=200, either sex)**

| Age in years | Female (%) | Male (%) | Total |
|---|---|---|---|
| Less than 10 years | 1 (2.3) | 1 (0.6) | 2(1.0) |
| 11 – 20 | 8 (18.2) | 19 (12.2) | 27(13.5) |
| 21 – 30 | 11 (25.0) | 54 (34.6) | 65(32.5) |
| 31 – 40 | 11 (25.0) | 27 (17.3) | 38(19.0) |
| 41 – 50 | 9 (20.5) | 28 (17.9) | 37(18.5) |
| 51 – 60 | 4 (9.1) | 21 (13.5) | 25(12.5) |
| 61 – 70 | 0 | 6 (3.8) | 6(3.0) |
| Total | 44 (100) | 156 (100) | 200(100.0) |

**Table 2: Showing distribution of cases of RTA according to sex**.

| Sex | No. of cases | Percentage (%) |
|---|---|---|
| Female | 44 | 22.0 |
| Male | 156 | 78.0 |
| Total | 200 | 100.0 |

**Table 3: Showing distribution of cases of scalp injuries. (n=200, either sex)**

| Injury | No. of cases | Percentage (%) |
|---|---|---|
| Abrasion | 7 | 3.5 |
| Contusion | 123 | 61.5 |
| Laceration | 21 | 10.5 |
| Abrasion + Contusion | 5 | 2.5 |
| Abrasion + Laceration | 5 | 2.5 |
| Contusion + Laceration | 12 | 6.0 |
| Absent | 27 | 13.5 |
| Total | 200 | 100.0 |

**Table 4: Showing distribution of cases of scalp injuries according to region. (n=200, either sex)**

| Region of scalp injury | No. of cases | Percentage (%) |
|---|---|---|
| Frontal | 36 | 18.0 |
| Frontal + Occipital | 2 | 1.0 |
| Frontal + Parietal | 2 | 1.0 |
| Frontal + Parieto –Temporal | 1 | .5 |
| Frontal + Temporal | 7 | 3.5 |
| Fronto – Parietal | 33 | 16.5 |
| Occipital | 8 | 4.0 |
| Parietal | 4 | 2.0 |
| Parieto – Occipital | 10 | 5.0 |
| Parieto –Temporal | 44 | 22.0 |
| Parieto –Temporal + Frontal | 6 | 3.0 |
| Temporal | 20 | 10.0 |
| Absent | 27 | 13.5 |
| Total | 200 | 100.0 |

**Table5: Showing distribution of cases according type of intracranial haemorrhages. (n=200, either sex)**

| Haemorrhages | No. of cases | Percentage (%) |
|---|---|---|
| SDH | 32 | 16.0 |
| SAH | 31 | 15.5 |
| IC | 3 | 1.5 |
| EDH | 00 | 00 |
| EDH+SDH | 6 | 3.0 |
| EDH+SDH+SAH | 3 | 1.5 |
| SAH+IC | 2 | 1.0 |
| SDH+SAH | 88 | 44.0 |
| Absent | 35 | 17.5 |
| Total | 200 | 100.0 |

**Table 6: Showing distribution of cases according to regions of intracranial haemorrhages. (n=200, either sex)**

| Regions | No. of cases | Percentage (%) |
|---|---|---|
| Frontal | 12 | 6.0 |
| Temporal | 5 | 2.5 |
| Parietal | 1 | .5 |
| Occipital | 7 | 3.5 |
| Parieto-Temporal | 51 | 25.5 |
| Fronto-Parietal | 39 | 19.5 |
| Parieto-Occipital | 15 | 7.5 |
| Frontal+Occipital | 4 | 2.0 |
| Frontal+Parieto-Occipital | 2 | 1.0 |
| Frontal+Parieto-Temporal | 2 | 1.0 |
| Fronto-Parietal+Parieto-Occipital | 2 | 1.0 |
| Fronto-Parietal+Parieto-Temporal | 7 | 3.5 |
| Fronto-Temporal+Occipital | 1 | .5 |
| Parieto-Temporal+Fronto-Parietal | 1 | .5 |
| Parieto-Temporal+Frontal | 2 | 1.0 |
| Parieto-Temporal+Fronto-Parietal | 1 | .5 |
| Parieto-Temporal+Occipital | 4 | 2.0 |
| Parieto-Temporal+Parieto-Occipital | 5 | 2.5 |
| Temporal+Fronto-Parietal | 2 | 1.0 |
| All | 2 | 1.0 |
| Absent | 35 | 17.5 |
| Total | 200 | 100.0 |

**DISCUSSION:**

In this study the age of the victims varies from 05-70 years. Maximum deaths were between 21-40 years (51.5%), were equal incidence in Female between age group 21-30 and 31-40 years; ( 25.0%).This finding is consistent other studies where most of the peoples were from age group 21-40 years Kamdar BA et al [3] among them 62% victims were between the ages of 12-60 years; of these, 28% were between 12-30 years and 34% between 30-60 years; Chandra J *et al.;* [4] common age group involved was 21-40 years (46.01%), Salgado MSL et al [5] the highest numbers of fatalities were found in the age group 20-29 years, Tirpude BH *et al.;* [6] 31-40 years of age as the most susceptible group was found. In the present study out of total cases maximum were males i.e. 156 (78.0%). Females were 44 (22.0%). Male to female ratio was 3.5:1 i.e. Males outnumbered the females.

Observation of this study is similar as that of most of the studies of motorized vehicle accidents shown in following table:-

**Table-7: Previous study**

| Studies | Male (%) | Female (%) |
|---|---|---|
| Present Study (2015) | 78.0 | 22.0 |
| Sharma BR *et al*[7] | 80.70 | 19.30 |
| Sirathanout J *et al* [8] | 69.0 | 31.0 |
| Fitzharris M *et al.* [9] | 88.1 | 11.9 |
| Behera C *et al.* [10] | 93.6 | 6.4 |
| Jha S *et al.* [11] | 78.0 | 22.0 |
| Shivkumar BC *et al* [12] | 88.0 | 12.0 |
| Surrender J *et al* [13] | 77.27 | 22.73 |
| Ravikumar R [14] | 87.75 | 12.25 |
| Kakeri SR *et al.*[15] | 88.0 | 12.0 |
| Radha PK *et al.* [16] | 87.5 | 12.5 |
| Reddy A *et al.* [17] | 87.0 | 13.0 |
| Banzal RK *et al.*[18] | 90.5 | 9.5 |

This may be due to the effect that males are prime bread earners of the family and they are more commonly exposed to outdoor activities travelling between the home and place of work while woman remains mainly indoor in house hold work hence less exposed.

Scalp injury which was found to be most common in this study of contusion type present in 123 (61.5%) victims, followed by laceration in 21 (10.5%) victims. This is in consistence with Shivakumar BC *et al.;* [12] Contusion of the scalp (98%) was most common injury among other type of scalp injury whereas the laceration of the scalp was noted in 19 (38%) cases, Pothireddy S *et al*[19] In head, scalp injuries were present in 92% of cases among which contusions (75%) were more common than lacerations (43%) and abrasions (8%) and Kakeri SR *et al.;* [15] in this injury to scalp was found in 149 cases, contusion is most common which constituted 137(76.1%) whether along or in combination with other injuries.

The predominance of contusion and laceration in scalp can be explained by the heavy blunt force, loose areolar space available for blood accumulation beneath scalp, minimal musculature of the scalp and the velocity of victim of fall on the ground.

In this study SDH alone (n=32; 16.0%) was most common, followed by SAH (n=31; 15.5%) and least common was EDH. This is similar with the study of Sharma BR *et al.;* [7] which stated that among head injury victims most common type of hemorrhage is subdural seen in 62.40% of victims while subarachnoid, extradural and intracerebral haemorrhages were seen in 23.5%, 16% and 9% cases respectively. study of Ravikumar R*et al.;* [14] stated that Subdural haemorrahage (SDH) was seen in 92.80% followed by subarachnoid haemorrahage (SAH) in 76.80%, Intra cranial haemorrahage (ICH) in 17.60% and least common was extradural haemorrahage (EDH) in 4.83% in riders in this study while in pillion riders SDH in 87.80%, followed by SAH in 68.29%, ICH in19.51% and least was EDH in 7.30% in cases where skull fracture occurred.

Frontal region alone (n=12; 6.0%) was most common involved among victims in this study consistent with study of Pothireddy S *et al.;* [19] where Frontal lobes involved in 91% victims.

Based on finding of study there are some recommendations like Encourage governments to make the roads safe. Government and public identify local safety problems. Government and public plan safe and efficient transport systems that accommodate drivers as well as vulnerable road users, such as bicyclists and pedestrians. Government and public encourage enforcement of traffic safety laws and regulations and campaign for firm and swift punishment for traffic offenders. Government and public have responsibly by Abiding by the speed limit on roads, never driving when over the legal alcohol limit, always wearing a seat-belt and properly restraining children, even on short trips, wearing a crash helmet when riding a two-wheeler.

This study finally concluded that Male and younger age was most affected with road traffic accidents. In RTA victims' craniocerebral damage was commonest cause of death as a result of skull fractures. Frontal and parieto-temporal region was commonly affected. As a result of injury sub dural haemorrhage along with sub arachnoids haemorrhage were occurred in most of them.

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