

## ORIGINAL ARTICLE

# Autopsy Based Prospective Study About Pattern of Head Injuries in Deceased of Road Traffic Accidents at Central India (Indore) Region

Baveja VS,<sup>1</sup> Singh BK,<sup>2</sup> Pendro TS,<sup>3</sup> Sharma LK,<sup>4</sup> Sahu S.<sup>5</sup>

IIIrd Year PG Resident,<sup>1,4,5</sup> Associate Professor,<sup>2,3</sup>

1-5. Dept. of Forensic Medicine & Toxicology M.G.M. Medical College, Indore.

## Abstract:

Head injury is one of the most dreaded injuries which has more than one modalities and a spectrum of consequences, death being the most dreaded closely followed by disability. Head injuries may be accidental, homicidal or suicidal in nature. Among the aforementioned manners of death, accidental deaths have constituted as the most common manner of death. Road traffic injuries are the leading cause of death globally and the principal cause of death in the age group of 15-49 years.<sup>1</sup> Two-wheelers were the most commonly involved vehicles in Road traffic accidents. Majority of the two wheeler users were not using helmets. Scalp injuries in the form of contusions were the most common. Linear type of fracture was the most common among the victims of RTA. Subdural haemorrhage along with subarachnoid haemorrhage was the most common type of intracranial haemorrhage observed among the victims.

**Keywords:** Road traffic accidents; Two-wheelers; Hospitalisation; Fracture.

## Introduction:

Head injury is one of the most dreaded injuries which has more than one modalities and a spectrum of consequences, death being the most dreaded closely followed by disability. Head injuries may be Accidental, Homicidal or suicidal in nature. Among the aforementioned manners of death, Accidental deaths have constituted as the most common manner of death.

Vehicular accidents can be defined as 'An event that occurs on a way or street open to public traffic; resulting in one or more persons being injured or killed, where at least one moving vehicle is involved. They involve high human suffering and socioeconomic costs in terms of premature deaths, injuries, loss of productivity, and so on.'<sup>2</sup>

Owing to the constantly improving yet still poor state of the infrastructure, casual attitude towards road safety and the challenges faced in implementing road traffic rules have ensured that the number of road traffic accidents and the number of fatalities caused as a result of these road traffic accidents have been rising year after year. The rise in population along with the rise in vehicles of all shapes and sizes on the roads have further contributed to the road traffic accidents. The pattern of injuries inflicted to the head is very diverse.

The head being the most vulnerable part of the body, is involved frequently in road traffic accidents (RTA). Head injury is the single most important cause of mortality in road traffic accidents. It has been defined as, "a morbid state, resulting from gross or

subtle structural changes in the scalp, skull and/or the contents of the skull produced by mechanical forces"<sup>3</sup>

A total of 3, 66,138 road accidents have been reported by States and Union Territories (UTs) during the calendar year 2020, which claimed 1,31,714 lives and caused 3, 48,279 injuries.<sup>4</sup> While in comparison to 2019 there is a remarkable fall in the number of road accident cases that happened in 2020, but this fall can be majorly attributed to the nationwide lockdown that was imposed in India which restricted the movement of people exempting only the emergency services.

In short, head injury is a major health and socioeconomic problem that affects all populations, regardless of age, sex, income, or geographic region.<sup>5</sup>

A total of 4,37,396 road accident cases were reported during 2019. Road accident cases in the country have decreased from 4,45,514 in 2018 to 4,37,396 in 2019. The fatalities in road accidents have increased by 1.3% (from 1,52,780 in 2018 to 1,54,732 in 2019).<sup>4</sup>

The main intention behind conducting this study is to analyse and understand the pattern of head injuries in vehicular accidents and to establish their co-relation with factors such as type of vehicle used, usage of helmet and the anatomical sites of the head involved.

## Materials and Methodology:

The study was carried out in the mortuary of Department of Forensic Medicine and Toxicology, M.G.M Medical college, Indore after getting approval from the institutional Ethics Committee. Data for one year starting from February 2021 was compiled and presented here. A structured proforma was designed to enter the data. The collected data was analysed and the statistical method used are descriptive statistics which comprise percentages, ratios and proportions.

## Corresponding Author

Dr. Sweekriti Sahu

Email : sweekriti4sahu@gmail.com

Mobile No.: +91 7725880321

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**Table 1. Distribution of head injuries due to RTA Based on type of vehicle involved (N-125).**

Total no. of Road Traffic Accidents (%)	Two-wheeler (%)	Three wheeler (%)	Four Wheeler (%)	Pedestrian (%)
125 (100)	98 (78.4)	2 (1.6)	0 (0)	25 (20)

**Table 2. Distribution of head injuries based on rider or pillion wearing helmet in case of two wheeler (n-98).**

Wearing Helmet (%)	Not wearing helmet (%)
16 (16.33)	82 (83.67)

**Table 3. Distribution of head injuries based due to rta on the basis of distribution of type of scalp injuries in the victim (n-125).**

Type of scalp injury	Number of cases	Percentage
Abrasion	5	4
Contusion	103	82.4
Laceration	6	4.8
Contused abrasion	3	2.4
Contused laceration	7	5.6
Absent	1	0.8
Total	125	100

**Table 4. Distribution of head injuries due to rta based on distribution of region of scalp injuries in the victim (n-150).**

Region of scalp injury	Number of cases	Percentage
Frontal	21	16.8
Parietal	4	3.2
Temporal	10	8
Occipital	3	2.4
Multiple	86	68.8
Absent	1	0.8
Total	125	100

**Observation and Results:**

A total of 125 cases of fatal RTAs brought to the mortuary were carefully observed. The type of vehicle most commonly involved was two-wheeler 98 (78.4%) (Table-1). Usage of helmet among two-wheeler users was seen in only 16 (16.33%) cases (Table-2). The most commonly observed scalp injury was contusion seen in 103 (82.4%) (Table-3). The most commonly involved area of scalp individually was Frontal 21 (16.8%) and multiple areas of the scalp were involved in 86 (68.8%) (Table-4). Most common type of skull fracture seen in the victims was Linear 45 (36%) (Table-5). The most commonly fractured individual bone of the skull was Temporal in 20 (24%) cases (Table-6). The most common type of intracranial haemorrhage observed in the victims was combination of subdural and subarachnoid haemorrhage 91 (72.5%) (Table-7). Multiple regions of the brain were found to have intracranial haemorrhages in maximum cases 89 (71.2%) (Table-8).

**Discussion:**

In our study, out of all the cases of head injuries that were studied, the maximum cases were those of road traffic accidents constituting 83.33% of cases. Road traffic injuries are the leading cause of death globally and the principal cause of death in the age group of 15 to 49 years.<sup>1</sup>

In this study, maximum number of road traffic accidents were found to be due to the victim using a two-wheeler. The next most common victims of road traffic accidents in our study were found to be pedestrians. Two wheelers are inherently unsafe in nature

since the rider and pillion are exposed to the elements of nature. The poor state of road infrastructure which comprises not just the state of roads but also the lack of road signs, poor lighting, construction/renovation activity, improper parking etc. make the two wheeler users more prone to accidents. This finding was found consistent with that of Pathak A et al.,<sup>6</sup> Ravikumar R,<sup>7</sup> Barman et al.,<sup>8</sup> Uddin MJ,<sup>9</sup> Radha PK et al.<sup>10</sup>

In a study conducted by Bhatt SB et al.,<sup>11</sup> Gupta A et al.,<sup>12</sup> Nandeibam et al.,<sup>13</sup> Tambuzzi S et al.,<sup>14</sup> pedestrians were most commonly involved in deaths as a result of head injury. In our study, pedestrians have been found to be the second most common victims of fatal road traffic accidents. This finding is inconsistent with the findings of our study as this can be attributed to the several factors like number and density of population, vehicles, adherence to traffic laws etc.

Helmets are of paramount importance and play a significant role in preventing injuries but the lack of awareness and compliance among users means that not all 2 wheeler users put a helmet on.

Also, while riders are usually the ones who are seen using helmet, it is the pillion riders who more often than not never use helmet making them more prone to head injuries. Two-wheeler users often try to accommodate more than one pillions. Hence, the higher number of occupants often leads to imbalance and the lack of helmet makes the occupants more prone to head injuries.

Pathak A et al.,<sup>6</sup> Thube HR et al.<sup>27</sup> and Bhat MA et al.<sup>21</sup> conducted a study in which it was found that 87.17%, 84% and 91.09% victims respectively on two wheelers had not used helmet. This finding is consistent with the findings of the current study.

In studies conducted by other authors, Bhoi S et al.<sup>15</sup> and Ravikumar R,<sup>7</sup> Yadukul S et al.<sup>16</sup> it has been found that 50 %, 64.17%, 50.90% cases respectively, the riders were found to be wearing helmets. This finding is inconsistent with our study because in our study maximum victims were found to have not wearing the helmet at the time of the incident.

This can be attributed to the higher awareness and/or better adherence among two wheeler users of the author's study and possibly better execution of road safety rules in a city like Bangalore. Ravikumar<sup>7</sup> found that none of the pillions were wearing helmets. This finding is consistent with our study.

The most widely found type of scalp injury was contusion. This finding was found to be consistent with other researches done by Pate RS et al.,<sup>17</sup> Sundaragiri et al.,<sup>18</sup> Chourasiya S et al.<sup>19</sup> Singha

**Table 5. Distribution of head injuries due to rta based on distribution of skull fracture in the victim (n-125).**

Type of skull fracture	Number of cases	Percentage
Fissure/linear	45	36.0
Depressed	10	8.0
Comminuted	13	10.4
Diastatic/sutural	4	3.2
Ring fracture	0	0
Pond fracture	0	0
Hinge	0	0
Basal	4	3.2
Multiple	15	12.0
Absent	34	27.2
Total	125	100

**Table 6. Distribution of head injuries due to rta based on distribution of region of skull fracture in the victim (n-125).**

Region of skull injury	Number of cases	Percentage
Frontal	12	9.6
Parietal	5	4
Temporal	30	24
Occipital	4	3.2
Multiple	36	28.8
Absent	38	30.4
Total	125	100

**Table 7. Distribution of head injuries due to rta on the basis of type of intracranial haemorrhages (n-125).**

Type of Hemorrhages	Number of Cases	Percentage
EDH	0	0
SAH	8	6.4
SDH	20	16
ICH	0	0
SDH + SAH	91	72.8
EDH + SDH	1	0.8
EDH + SDH + SAH	2	1.6
SDH + SAH + ICH	0	0
Absent	3	2.4
Total	125	

**Table 8. Distribution of head injuries on the basis of distribution of region of intracranial haemorrhages (n-125).**

Regions	No. of cases	Percentage (%)
Frontal	0	0
Parietal	1	0.8
Temporal	2	1.6
Occipital	2	1.6
Multiple	118	94.4
Absent	2	1.6
Total	125	100.0

YN,<sup>20</sup> Bhat MA et al.,<sup>21</sup> Malik Y et al.,<sup>22</sup> Gupta A et al.<sup>12</sup>

Individually, frontal region of the scalp has been found to be most commonly involved followed by the temporal region in our study which is consistent with the findings of Wankhede MN.<sup>23</sup> In a study conducted by Bhat MA et al.,<sup>21</sup> combination of scalp regions were studied for contusions and they found frontal, parietal and temporal region to be involved in maximum cases. Multiple regions of the scalp were found to be involved in maximum number of victims in our study. This finding is consistent with the findings of Bhat MA et al.<sup>12</sup> who also found combination of areas to be involved.

The most commonly found individual fracture of skull in our study is fissure/linear which is consistent with the findings of Patil MA et al.,<sup>24</sup> Pathak A et al.,<sup>6</sup> Rupani R et al.,<sup>25</sup> Singha YN et al.,<sup>20</sup> Ahmad M et al.,<sup>26</sup> Thube HR et al.,<sup>27</sup> Pate RS et al.,<sup>17</sup> Sundaragiri et al.<sup>18</sup> The second most common individual fracture found in our study was comminuted followed closely by depressed fracture of the skull.

The temporal bone of the skull was found to be the most commonly involved. This finding of our study is consistent with Ahmad M et al.,<sup>26</sup> Gupta A et al.,<sup>29</sup> Bhat et al.,<sup>21</sup> Kulkarni PR et al.,<sup>30</sup> Waghmode AH et al.,<sup>31</sup> Gupta A et al.,<sup>12</sup> Bhat MA et al.<sup>21</sup>

Sahu G et al.,<sup>32</sup> Singha YN<sup>20</sup> found parietal bone to be the most commonly fractured followed by temporal bone, this is not

consistent with our findings. The higher involvement of temporal bone in skull vault fractures can be attributed to the squamous part of the temporal bone being relatively thin and hence more prone to getting fractured as compared to others.

In our study SDH with SAH combined were most common haemorrhages. This finding is consistent with that of Patil AM et al.,<sup>24</sup> Pathak A et al.,<sup>6</sup> Singha YN et al.,<sup>20</sup> Sundaragiri S et al.,<sup>18</sup> Chourasiya S et al.,<sup>19</sup> Giri SK et al.,<sup>33</sup> Bhat M A et al.,<sup>21</sup> Das PP et al.<sup>34</sup> Individually, SDH was the most common intracranial haemorrhage observed which is consistent with the findings of Pathak A et al.,<sup>5</sup> Sahu G et al.,<sup>32</sup> Ravikumar R,<sup>7</sup> Singha YN et al.,<sup>20</sup> Ahmad M et al.,<sup>6</sup> Waghmode AH et al.,<sup>31</sup> Das PP et al.<sup>34</sup> In our study we found that more than one regions of the head were found to be involved in maximum cases when it came to intracranial haemorrhages.

**Conclusion:**

It was found that among road traffic accidents, majority of the cases occurred where a 2 wheeler was involved. Among the two-wheeler users, there was a very small proportion that used helmet. The usage of helmets has a crucial role to play in the prevention of head injuries. The extent of head injury was found to be variable in the victims. Considering the magnitude of problem caused by RTA, a strict implementation of the various safety measures like usage of helmet, usage of mobile phones, following traffic rules should be done so as to reduce the number of Road Traffic Accidents.

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