DOI Number: 10.37506/v20/i1/2020/mlu/194315

A Three Year Study of Skull Fracture Patterns in Fatal Road Traffic Accidents in a Tertiary Care Hospital Mortuary in Imphal From 2015-2018

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Abstract

Fatal road traffic accident cases with skull fractures were studied for three years from July 2015 to June 2018 from the medicolegal autopsy cases coming to the Mortuary of the Regional Institute of Medical Sciences, Imphal. The patterns of skull fractures in various types of victims involved in accidents with different types of vehicles were analyzed in detail. It was observed that skull fractures were encountered most commonly in pedestrian victims.Of the various types of skull fractures, comminuted fracture was observed in maximum number of cases (31.5%). Preventive and interventional measures in the form of wearing helmets by two wheeler riders ,strict implementation of traffic rules and prompt emergency services especially neurosurgery facilities which can help in reducing the incidence of road traffic accident fatalities are suggested.

Key words: *Road traffic accidents, incidence of victims, skull fracture patterns*

Introduction

Road traffic accident (RTA) is a collision between vehicles; between vehicles and pedestrians; between vehicles and animals; or between vehicles and geographical or architectural obstacles. Road traffic accidents are human tragedy. They involve high human suffering and socioeconomic costs in terms of premature deaths, injuries, loss of productivity, and so on.[1]

According to Ministry of Road Transport and Highways Transport Research Wing, Govt. of India, New Delhi,the total number of road accidents increased by 2.5 per cent from 4,89,400 in 2014 to 5,01,423 in 2015. The total number of persons killed in road accidents increased by 4.6 per cent from 1,39,671 in 2014 to 1,46,133 in 2015. Road accident injuries have also increased by 1.4 percent from 4,93,474 in 2014 to 5,00,279 in 2015.The severity of road accidents, measured in terms of number of persons killed per 100 accidents has increased from 28.5 in 2014 to 29.1 in 2015. The analysis of road accident data 2015 reveals that about 1,374 accidents and 400 deaths take place every day on Indian roads which further translates into 57 accidents and loss of 17 lives on an average every hour in our country.[3] Road traffic injuries are currently estimated to be the ninth leading cause of death across all age groups globally, and are predicted to become the seventh leading cause of death by 2030.

Craniocerebral injuries are responsible for more than one-fourth of all traumatic deaths and nearly two-third of road traffic accidents. Incidence of head injury is steadily rising all over the world. The burden is serious as majority of head injury victims belong to young and productive age group.[4]

The present study has been undertaken at the department of Forensic Medicine of a tertiary care teaching hospital in northeast India, to assess the pattern of skull fractures in relation to the type of victim to help in evaluating the method of prevention of head injuries in road traffic accidents.

Materials and Method

After obtaining approval from the Institutional ethics Board of the institute, a retrospective study was

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undertaken in the Department of Forensic Medicinea tertiary care teaching hospital in northeast India, from July 2015 to June 2018. Only cases of head injuries due to vehicular accidents were included in the study.Cases where fatal head injury is associated with fatal injuries on other parts of the body, both of which having jointly contributed towards the death were also included in the study.Decomposed bodies were excluded from the study. Details of the victim, type of vehicle involved, nature of the accident and time of occurrence were obtained from the post mortem report and the inquest papers.Statistical analysis was done at the end of the study to evaluate the findings in term of percentages, to determine the difference in the pattern of craniocerebral injuries between the type of victims and vehicles involved.

Results

During the period of July 2015 and June 2018, medico legal post-mortem examinations of 667 cases were conducted in the mortuary of Forensic Medicine department of Regional Institute of Medical sciences, Imphal. Out of these 667 cases, 236 (35.38%) were cases of fatal road traffic accidents. In these 236 cases of the fatal road traffic accidents (RTA), head injuries were observed in 133 (56.35%) cases and 103(11.29%) cases had no head injuries, as shown Table 1.

From the various types of road users in this series, the maximum victims of fatal RTAs having head injuries were pedestrians (30%) followed by motorcyclists (24%) and drivers of 3 or 4 wheelers and occupants of 3 or 4 wheelers with (15% each). The detailed findings are shown in Table 2.

Out of those 133cases, 94 (70.67%) cases had fractures of skull either in vault or base or in both. Vault and base fracture combined was seen in 57 (42.85%) cases had vault and base fracture and 26 (19.54%) cases had only vault fracture and 11 (8.27%) cases had only base fracture. In 39 (29.32%) cases the skull was found to be intact. Table 3 show the details. All these cases had scalp injuries in forms of abrasion, contusion, laceration, or haematoma singly or in combination with other injuries.

Of the various types of skull fractures, comminuted fracture was observed in maximum number of cases in this series constituting 42 (31.5%) cases followed by fissured fracture seen in 26 (19.54%)cases, crushed fracture in 9 (6.76%) cases, depressed and depressed comminuted fracture in 7 (5.26%) cases each and sutural fracture in only 5 (3.75%) case. Table 4 illustrates the different types of skull fractures.

Most of the pedestrians sustained fissured fracture of the skull (33.3%) followed by comminuted fracture (26.7%) and crushed fracture (6.7%). On the other hand, majority of the motorcyclists (41.7%) sustained comminuted fracture of skull followed by fissured fracture (25%). Interestingly, pillion riders of two wheelers commonly sustained comminuted fracture (44.4%). Comminuted fracture was also observed in 33.3% each of the drivers of 3 or 4 wheeler and occupants of 3 or 4 wheelers. This is illustrated in Table 5.

Table 6 illustrates the site of skull fracture in relation to the type of victims. In the skull fracture sustained by pedestrians, maximum bone to be involved singly was temporal bone (13.3%). It was followed by frontal, temporal + occipital bone seen in 4(13.3%) cases. Motor cyclists and occupants of 3 or 4 wheelers had skull fractures with involvement of all the skull bones i.e. 20.8% 13.3% respectively. Drivers of 3 or 4 wheelers and pillion riders had maximum involvement of fronto temporal bone as seen in 3 (20%) cases and 2 (22.2%) cases respectively. While cyclists had maximum involvement of parietotemporal bone (20.8%).

Table 1: Showing incidence of victims with and without head injuries in 236 fatal RTA cases

Category of victims	No. of cases	Percentage
Cases with head injuries	133	56.35%
Cases without head injuries	103	11.29%

Table 2: Showing the types of victims.

Types of victim	No. of cases	Percentage
Pedestrians	37	27.81%
Cyclists	9	6.7%
Motorcyclists	30	22.55%
Pillion riders	13	9.77%
Drivers of 3 or 4 wheelers	22	16.54%
Occupants of 3 or 4 wheelers	22	16.54%
Total	133	100%

Table No.3: Showing incidence of fracture of vault, base and combined

Fracture site	No. of cases	Percentage
Vault only	26	19.54%
Base only	11	8.27%
Vault and Base	57	42.85%
Intact	39	29.32%
Total	133	100%

Table 4: Showing different types of skull fractures

Types of fractures	No. of cases	Percentage
Fissured #	26	19.54%
Comminuted #	42	31.57%
Depressed#	7	5.26%
Depressed comminuted #	7	5.26%
Sutural #	5	3.75%
Crushed #	9	6.76%
Intact	36	27.06%
Total	133	100%

Table 5: Showing types of skull fractures in relation to types of victims

Types of victim	Types of skull fracture							
	Fissured # (%)	Comminuted # (%)	Depressed # (%)	Depressed Comminuted # (%)	Sutural # (%)	Crushed # (%)	Intact (%)	P.C (%)
Pedestrians (37)	33.3	26.7	3.3		3.3	6.7	26.7	100
Cyclists (9)	42.8	28.6		28.6				100
Motorcyclists (30)	25	41.7	8.3			8.3	16.7	100
Pillion rider (13)		44.4				11.2	44.4	100
Drivers of 3 or 4 wheelers (22)	26.7	33.3		6.7			33.3	100
Occupants of 3 or 4 wheelers (22)	6.7	33.3					60	100

Table No 6: Showing Site of Skull fractures in relation to types of victims

Types of victim	Site of skull fractures					
	Frontal Bone	**Parietal bone**	**Temporal bone**	**Occipital bone**	**All skull bones**	**Intact**
Pedestrians (37)	8 (26.6%)	4 (13.4%)	6 (20%)	1 (3.3%)	3 (10%)	8 (26.7%)
Cyclists (9)	2 (28.6%)	3 (42.9%)	1 (14.3%)	0	1 (14.3%)	
Motor cyclists (30)	7 (29.1%)	5 (20.95%)	2 (8.3%)	1 (4.2%)	5 (20.8%)	4 16.7%
Pillion riders (13)	2 (22.2%)	1 (11.1%)	0	0	2 (22.2%)	4 (44.4%)
Drivers of 3 or 4 wheelers (22)	4 (26.6%)	3 (20%)	1 (6.7%)	0	0	7 (46.7%)
Occupants of 3 or 4 wheelers (22)	3 (20.1%)	0	0	0	2 (13.3%)	3 66.6%

Discussion

In this present study, out of 667 medico legal autopsy, 236 were of fatal road traffic accidents accounting to 35.38 %. These findings are similar to the studies done by Chavali K H et al[6], Das D K,[2] and Sharma B R et al[5], which showed that vehicular accidents comprised less than 36% of the total medico-legal autopsies.

Out of 236 fatal road traffic accident (RTA) victims, 56.35 % of victims (133 cases) died due to head injuries. This findings is almost similar with the findings of AroraS et al[15], Gouda SH et al[7], Rahman MA et al[12], and Emara AM et al[10]. They also reported incidences of head injuries in fatal RTAs as above 50%.

Pedestrians (27.81%) followed by motorcyclists, (22.55%) constituted the majority of the victims. Similar findings were found by Sharma BR et al[5], Chavali KH et al[6], Gupta S et al[9], and Kumar S et al[13]in their studies. This may be due to the fact that in our set up majority of the road users are pedestrians and two wheelers. Their lack of traffic sense, ignorance of traffic rules, craze for speed, lack of proper footpath and presence of vendors and other commercial installations by the side of the roads, etc. make pedestrians and motorcyclists prone to RTA. However Kadam SS et al[14]found drivers, Gouda HS et al[7]found motorcyclists and Rahman MA et al[12]found occupants of vehicle to be the common victims involved in RTA.

Literature says that in one of four fatal head injuries, skull escapes fracture.[16]The presence of skull fracture is an indication of the severity of force applied. In contrast to the vault, the base of the skull presents many jagged areas. The relative movement of the brain against the skull results in more damage to its inferior surface or base. In the present study, 94 (70.67%) cases had skull fractures. 57 (42.85%) cases had vault and base fracture and 26 (19.54%) cases had only vault fracture and 11 (8.27%) cases had only base fracture. In 39 (29.32%) cases the skull was found to be intact. Gouda HS et al[7] and Nair SS et al[15] also found that vault and base combined fracture was more than vault and base fracture alone, whereas many authors Arora S et al[11], Rahman MA et al[12], Gupta S et al[9] found vault fracture to be more common than base and vault-base combined fracture.

In this study, of the various types of skull fractures, comminuted fracture was observed in maximum number of cases in this series constituting 42 (31.5%) cases followed by fissured fracture seen in 26 (19.54%)cases, crushed fracture in 9 (6.76%) cases, depressed and depressed comminuted fracture in 7 (5.26%) cases each and sutural fracture in only 5 (3.75%) case. However, Modi A D et al[4], Gupta S et al[9] and Kumar S etal[13]found fissured fracture to be the commonest of all the skull fractures. It may be because this type of fracture is more common in cases where the head strikes by forcible contact with a broad resisting surface, as in road traffic accidents.

In the present study, majority of the motorcyclists (41.7%) sustained comminuted fracture of skull followed by fissured fracture (25%). Interestingly, pillion riders of two wheelers commonly sustained comminuted fracture (44.4%). But several authors viz. Shivakumar BC et al[17], Ravikumar R et al[8], Kumar S et al[5] found linear fracture the commonest amongst the motorcyclists and pillion riders.

In the skull fracture sustained by pedestrians, the bone most commonly involved singly were temporal and frontal bones (46.6%). Maximum workers viz. AroraS et al[11], Modi AD et al[4] and Gupta S et al[9] found that temporal bone was the most commonly fractured single bone of the skull in RTAs. Motor cyclists had skull fractures with involvement of the frontal bone(29.1%) cases. Cyclists had maximum involvement of parieto-temporal bone (57.2%), which is consistent with the findings of AroraS et al[11]who found parieto-temporal to be the most commonly fractured bone in combined form.

Conclusion

Head injury due to road traffic accidents often leads to fatal outcomes. In the present study,fatal head injuries in road traffic accidents are relatively high in pedestrian victims compared to the other road users. This emphasizes the need for measures to ensure the safety of pedestrian road users. Wearing helmets by two wheeler riders, strict implementation of traffic rules and prompt emergency services especially neurosurgery facilities can help in reducing the incidence of road traffic accident fatalities.

Conflict of Interest : Nil

Acknowledgement : Nil

Source of Funding: Nil

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