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Pattern of Head Injuries in Motorised Two-Wheeler Riders Involved in Fatal Road Traffic Accidents: A Retrospective Autopsy based Study

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Abstract

Objective: Road traffic accidents is one of the leading causes of death in India. Due to the rapid increase in the number of two-wheeler commuters, the number of fatalities in victims involved in fatal two-wheeler accidents has also increased substantially. The aim of this study was to determine the pattern of head injuries in victims involved in fatal motorised two-wheeler accidents. **Methods:** A retrospective study was conducted in 100 cases. **Results:** It was found that most of the victims were males. Motorcycles and mopeds were more frequently involved in fatalities when compared to scooters. Head injury was the commonest cause of death. This may be due to the fact that, in straddle type of seated position adopted by riders on motorbikes and mopeds causes the rider to fall sideways in the event of an accident and the impacting surface is usually the side of the head, this was corroborated with the injuries sustained over the head. This is not the case in scooters, as the position of the legs over the footrest in front allows for more manoeuvrability and prevents the rider from falling sideways. **Conclusion:** Hence, this study comes to the conclusion that scooters are a safer alternative to motorcycles and mopeds as a means of transport.

Keywords: *Road Traffic Accidents, Head injury, Motorcycles, Scooters, Skull fractures, Safety*

Introduction

India has experienced rapid growth in motorization in the last decade, with concomitant increases in road traffic accident (RTA) related mortality.[1]

Motorised two wheeler (MTW) account for a large proportion of vehicles on the roads[2]and two wheelers accounted for a highest share in total road accidents. [3] It is the leading cause of mortality for young adults of less than 45 years and a major burden of disease across all age groups.[4] Despite these established facts, motorcycle use as a means of transportation is on the rise worldwide.[5]

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Injury to the head is the commonest cause of mortality and morbidity following two-wheeler crashes and motor cyclists are about 25 times more likely than passenger car occupants to die in traffic crashes.[6]

The head being the most vulnerable part of the body is involved frequently and lead to morbidity and mortality in road traffic accidents.[7] The aim of this study was to analyse the pattern of head injuries in riders involved in fatal motorised two-wheeler crashes.

Material and Method

This is a retrospective study of autopsy findings in 100 cases of MTW rider fatalities, conducted by the author, from 2012 to 2017 at Jawaharlal Institute of Postgraduate Medical Education & Research, Pondicherry. Most of the cases are from areas in and around Pondicherry treated in Jawaharlal Institute of Postgraduate Medical Education & Research.

The aim of this study was to describe the pattern of head injuries in MTW riders involved in fatal of RTA.

History of the cases i.e. age, sex, vehicles involved was obtained from the police inquest forms, case files and autopsy reports. The data was recorded in a proforma and analysed.

Results

Of the 100 cases, the highest number of victims belonged to the most productive age group of 21 to 30 and 31 to 40 comprising of 42 (42%) and 25 (25%) cases respectively. Overwhelming majority of the victims were males accounting for 99 (99%) cases. The duration of survival was found to be 2 to 7 days in 61 (61%) of the victims. The type of MTW driven by the victims were motorcycles in 72 (72%), mopeds 21 (21%) and scooters in 7 (7%) cases (Fig. 1).

Commonest mode of injury was found to be collision with a two-wheeler in 26 (26%) cases closely followed by impact with a light vehicle (car) in 23 (23%) cases and skid and fall in 22 (22%) cases. In majority of the victims, the cause of death was due to cranio-cerebral (Head) injury sustained in 82 (82%) cases (Fig. 2).

Based on the pattern of injuries over the head, the external injuries to the scalp (contusion/laceration) was found over the parietal region in 26 (26%) cases followed by the occipital region in 19 (19%) cases and no external injuries over the scalp was found in 35 (35%) cases (Table 1). Subscalpular haematoma was most commonly seen over the temporal region in 63 (63%) cases and parietal region in 61 (61%) cases, it was found to be intact in only 7 (7%) cases (Table 2). In the vault of the skull, the temporal bone was most involved with fractures seen in 36 (36%) cases followed by the frontal bone in 28 (28%) cases and in the base of skull, the fractures were found mainly over the anterior and middle cranial fossa in 26 (26%) and 25 (25%) cases respectively (Table 3). No skull fractures were present in 21 (21%) cases. The commonest type of skull fracture was fissured fracture in 44 (44%) cases followed by comminuted fracture in 33 (33%) cases. A combination of subdural and subarachnoid haemorrhage was the most common intracranial haemorrhage seen in 74 (74%) cases.

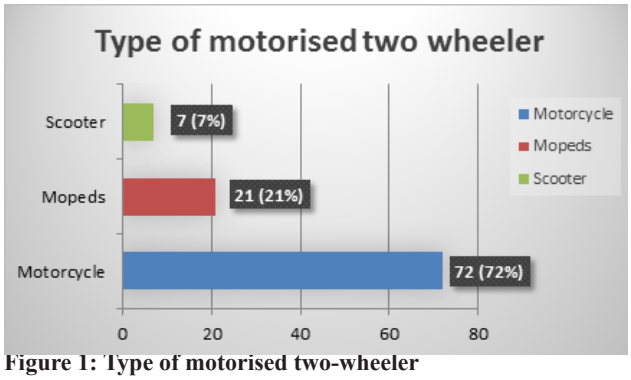

Figure 1: Type of motorised two-wheeler

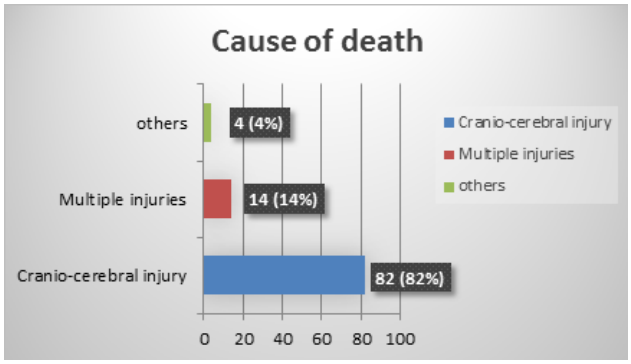

Figure 2: Cause of death

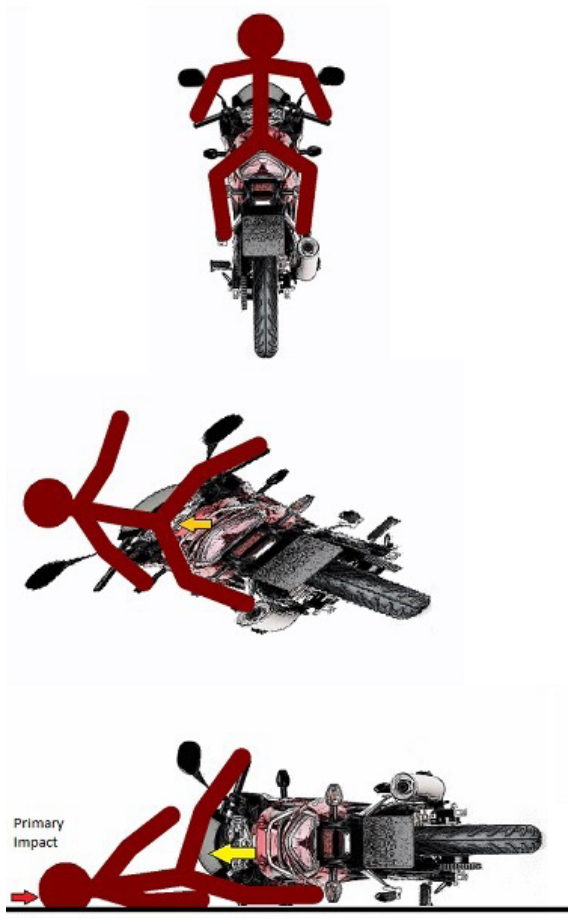

Figure 3: Sketch representing fall off motorcycle in the event of an accident.

Table 1: Region of the scalp involved in injuries (external) sustained (contusion/laceration)(combined injuries were separated region wise).

Region of scalp	Number of cases (n=100)
Frontal (F)	10 (10%)
Parietal (P)	26 (26%)
Temporal (T)	10 (10%)
Occipital (O)	19 (19%)
Intact	35 (35%)

Table 2: Region of the scalp involved showing sub-scalpular haemorrhage (combined sub-scalpular haemorrhage were separated region wise):

Region of scalp	Number of cases (n=100)
Frontal (F)	46 (46%)
Parietal (P)	61 (61%)
Temporal (T)	63 (63%)
Occipital (O)	53 (53%)
Intact	7 (7%)

Table 3: Bones involved at the site of skull fracture(combined fractures were separated region wise)

Site of skull fracture*	Number of cases (n=100)
Frontal (F)	28 (28%)
Parietal (P)	17 (17%)
Temporal(T)	36 (36%)
Anterior cranial fossa	26 (26%)
Middle cranial fossa	25 (25%)
Posterior cranial fossa	20 (20%)
Intact	21 (21%)

* occipital bone included in fractures of posterior cranial fossa

Discussion

Exploding population, increasing registration of automobiles, habitual tendency of violating rules and chaotic traffic systems have greatly contributed to rapid strides in RTA's.[8] Most of the victims belonged to the budding age group of 21 to 40 years comprising of individuals in their prime (students, breadwinners). Most of the victims were male accounting for 99 cases. Motorcycles (72%) and mopeds (21%) were more frequently involved in fatalities when compared to scooters (7%). The mode of injury was found to be collision with another two-wheeler (26%) followed by impact with a light vehicle (car) (23%) and skid and fall(22%). Cranio-cerebral injury (82%) was the commonest cause of death, injuries to the head was more common in other similar studies .[9,10,11,12,13]

Based on the pattern of head injuries, external injuries over the scalp involved the parietal (26%) and occipital region (19%). Incidentally, no external injuries (35%) over the scalp could be made out but it should be kept in mind that injuries like contusion may be difficult to determine under the scalp hair. Subscalpular haematoma was most commonly seen over the temporal (63 %) and parietal region (61 %). Skull fracture was most commonly found over the temporal bone (36 %) caused mainly due to impact over the side of the head. The anterior (26 %) and middle cranial fossa (25 %) were the most common base of skull fractures. The skull was intact in 21% of the cases. Fissured fracture (44 %) was the commonest type of skull fracture which was found in other similar studies.[14]The commonest intracranial haemorrhage was a combined form of subdural and subarachnoid haemorrhage (74 %) which was also found in similar studies.[15,16]

From this study, it is found that the head is most vulnerable to injuries and head involvement is responsible for or is a major contributor to death.It was found that in many of the studies[4,7,8] the type of MTW has not been mentioned except in one study which states that crashes in geared motorcycles is greater than in non-geared two-wheelers.[17] This is found to be true to some extent in this study, but for the fact that mopeds (21%) are non-geared vehicles and has been found to be significantly more involved in fatal accidents than scooters (7%). This may be due to the fact that both geared motorcycles and mopeds are straddle (legs on either side) type of vehicles so, in the event of an accident, when the vehicle falls to one side the rider is forced to fall sideways and the primary impacting surface is usually the side of the head (Fig 3), this can be corroborated with the pattern of injuries over the head i.e. subscalpular haematoma over the temporal region (63%), fracture of the temporal

bone (36%), base of skull fractures (71%) all which are usually found in motorcycle riders involved in fatal accidents.[18,19] This is not the case in scooters, were the legs placed over the footrest in front provides a more flexible mode of exiting from the vehicle when involved in an accident preventing fatal head injuries. This may be the reason why fatalities in female riders involved in two-wheeler accidents are less, as the MTW preferred by females are scooters.

Conclusion

It is found that head injury (82%) is the commonest cause of fatalities in riders of MTW. The commonest MTW involved in fatal accidents were motorcycles (72%) and mopeds (21%) followed by scooters (7%). The reason for increased incidence of head injuries in straddle type of vehicles like motorcycles and mopeds is, when involved in an accident, it forces the rider to fall sideways and the primary impacting surface of the body is the side of the head, this can be corroborated with the subscalpular haematoma over the temporal region (63%), fracture of the temporal bone (36%) and base of skull fractures (71%) which is commonly seen in impact over the side of the head. Fatal head injuries are less common in scooters probably due to the position of the legs over the footrest in front which allows for more manoeuvrability and prevents the rider from falling sideways. It was also found that fatalities among females were significantly lower, most probably because the mode of two-wheeler transport preferred by females are scooters which is less prone to fatal crashes due to reasons discussed. From this study, it is found that scooters are a much safer alternative to motorcycles and mopeds as a means of MTW form of transport.

Source of Support : Nil

Conflict of Interest : Nil

Ethical Clearance: Not necessary as it is a retrospective study and identity of the victims have not been revealed.

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