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Original Research Paper

Patterns of Head Injuries in Road Traffic Accidents Involving Two wheelers: An Autopsy Study

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Abstract

Road traffic accidents (RTA) have been the bane of the modern civilization accounting for considerable loss to the nation. Head injuries are leading causes of death from motorcycle crashes with many deaths occurring despite optimal use of the available treatment facilities. Hence the present study was conducted to know the patterns of head injuries in fatal accidents involving riders and pillion riders of two wheelers. This study was conducted from 1st April 2009 to 30th Sept 2010 at Victoria Hospital Mortuary, Bangalore. The present study entirely focuses on the patterns of head injuries in fatal accidents involving riders and pillion riders of two wheelers who were autopsied during this period.

A total of 245 cases of deaths due to two wheeler accidents were reported for the autopsy. Riders constituted (76.33%) and pillion riders (23.67%). Most victims were male (87.75%), skull fractures (67.75%) were observed in the two wheeler accidental death. Linear fracture (55.43%) was the commonest pattern of fracture observed in these accidents. Sub-dural haemorrhage was also the commonest intracranial haemorrhage and rib injuries were commonly associated with head injuries.

Key Words: Road traffic accidents, Riders, Pillion riders, Two wheelers, Skull fractures

Introduction:

Road Traffic accident is an unplanned event occurring suddenly, unexpectedly and inadvertently in an unforeseen circumstance. Incidences are more common among the two wheeler vehicles. Head was the most common site to be injured in RTAs.[1] As motorized two wheeler vehicles constitute a large portion of the vehicle fleet in India The exponentially increasing number of automobile vehicles, poor adherence to traffic rules and regulations such as maintaining lane discipline, driving in zigzag patterns by public, poorly maintained and congested roads, abuse of alcohol, and lack of awareness about helmets and new generation of high speed vehicles are altogether responsible for accidents.

The mechanical forces like shearing, strains and biophysical motion that occur during accidents to the head are responsible for patterns of injuries. Road traffic accident is the third major preventable cause of death.

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In this study a sincere effort has been made to study the patterns of head injuries in riders and pillion riders involving two wheelers road traffic accidents and to suggest measures to be taken to decrease the road traffic accidents involving two wheelers.

Materials & Methods:

A cross sectional study of total of 245 cases of deaths due to fatal road traffic accidents involving riders and pillion riders of two wheelers have been studied. All cases of deaths due to head injuries in fatal road traffic accidents involving riders and pillion riders of two wheelers of both sexes all age groups, treated and untreated, irrespective of duration of survival was included in the study.

Cases other than two wheeler road traffic accidents to Victoria Hospital Mortuary are not included in this study. Detailed autopsy examination was done on the request from the investigating officer in annexure 146(i) and (ii). Relevant information was collected from police, relatives and friends of deceased. Rokitansky en-mass evisceration technique was followed in conducting the autopsy. [2] Then with all these findings, post-mortem conclusion as to the cause of death in each case was drawn and analyzed.

Observations and Results:

All cases of deaths due to two wheeler RTA involving riders and pillion riders were

autopsied in the Victoria Hospital Mortuary, Bangalore attached to Bangalore Medical College and Research Centre irrespective of Sex, Age groups treated and untreated and duration of survival for a period of 18 months from April 2009 to September 2010.

A total number of 245 cases of two wheeler Riders / Pillion riders' road traffic accidents were recorded. There were 187 (76.33%) two wheeler riders and 58 (23.67%) were pillion riders. The cases are seen more in the male victims (87.75% as compared to females (12.25%). (Table 1)

Our study showed that the two wheeler RTAs are more in the third (115cases) & fourth decades (55cases) constituting 47.75% and 22.44% of total 245 victims. It was followed by 20 to 39 years constitutes 70.20% of total victims. (Table 2)The time was divided into 4 periods of 6 Hours interval. In this aspect of study most of the accidents have occurred during 6PM–12 midnight for Riders (43.52%) & Pillion riders (44.55%) and least during 12midnight– 6 AM for Riders (18.06%) & Pillion riders (16.83%). (Table 3)

Present study showed that the place of occurrence of RTA was more in the urban areas (74.29%) as compared to rural areas (25.71%). (Table 4) Among the total 187 RTA cases involving Riders, the evidence of Helmets used was recorded in 120 (64.17%) of the victims while 67 (35.83%) did not use it. None of the pillion riders were wearing helmets at the time of accidents. (Table 5)

In this study Basal plus Linear fracture of Vertex constituted 44 cases (23.53%), out of 187 riders and 11cases out of 58(18.97%) of pillion riders. Linear fracture of vertex only comprised 13.90% cases in riders, 18.97% cases in pillion riders followed by fractures of the base only in 11.23% in riders and 13.79% in pillion riders, Depressed fractures of vertex was found 5.60% in riders and 4.87% in Pillion riders.

Commutated fractures were the least common in both riders and pillion riders. No fracture of skull was found in 62 cases, out of 187 riders and 17 cases out of 58 Pillion riders. (Table 6) We observed Sub dural haemorrahage (SDH) in 92.80% followed by sub arachnoid haemorrahage (SAH) in 76.80%, Intra cranial haemorrahage (ICH) in 17.60% and least is extra dural 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 is EDH in 7.30% in cases where skull fracture occurred.

EDH, SDH & SAH in relation to skull without fracture were found as SDH in 82.75% followed by SAH in 62.06%, ICH in 20.68% and least is EDH in 6.89% in riders, SDH in 100%, followed by SAH in 75.00%, and ICH in 25.00% in pillion riders. (Table 7)

Rib fractures were the most common injury seen other than the head injury in 54.40% in riders and 61.11% in pillion riders followed by long bone fractures in 16.00% in riders and 16.67% cases in pillion riders. (Table 8)

Discussion:

In the present study, motorcycle riders included 187(76.33%) and pillion riders comprised 58(23.67%) of 245 cases. Male preponderance was noted, as most of the motorcyclists were Male accounting for 215(87.75%) and Females accounting for 30(12.25%) similar to the findings of studies of Kumar et al [4] were males belonging to 88.22% and females 11.77% and in the study of Singh YN et al [14] males belong to 86.96% and females belong to 13.04%.

Most Vulnerable age groups is the active population of the study resulting were those persons of third decade 48.13% followed by fourth decades 24.06% showing 72.20% of riders and 63.80% of pillion riders. Findings found in the studies by Kumar A et al [4] results show that the younger economical active groups 21-30years followed by 31-40 years, highest number of fatalities (54.24%) was in the 21-40years were predominantly involved as these age groups are found using the roads frequently and are generally rash drivers.

Peak timing of occurrence of RTA was 06.00 PM to 12.00 midnight followed by 12.00noon to 06.00PM which is probably due to heavy and unequal distribution of the traffic at these closing hours of the people and the rider is generally exhausted after day's work.

Sirathanont [5] demonstrated most of motorcycle crashes were between 06.00 PM – 09.00 PM. Ding et al [6] reported most of the head injuries occurred between 04.00 PM – 11.00 PM peaking at 9.00 PM.

It is observed that incident were more in the Urban areas this reveals the common outdoor working time of the urban regions. Findings observed in Singh Y N et al [14] found 16.98% of victims from rural areas.

Helmet use was infrequent among Motor cyclists in our study. 67(35.82%) Riders, among 187 riders have not been wearing a helmet at the time of accident. None of the pillion riders have been wearing Helmet. Failure to wear a helmet resulted in a significantly higher incidence of head injury and death among both riders and pillion rider motorcycle

crashes as found in Nupur pruthi et al and Sharma BR et al. [15, 17] Study in Mumtaz B et al [9] where frequency of helmet use is 56.6% and that of non users in 43.3%.

Most of the riders had worn substandard helmets which resulted in severity of the head injury. Use of an approved helmet at the time of collision significantly reduces the likely hood of sustaining head injuries, severe traumatic brain injuries, intracranial lesions and serious neuro-motor disability as suggested by Cawich SO et al. [13]

None of the pillion riders wore the helmets; lack of wearing the helmet resulted in increased incidence of head injuries in pillion riders also. To reduce the incidence of head injury in pillion riders they should wear crash helmet as suggested by Modi. [7]

It may be observed that head injuries constituted as a major pathology behind the death of the deceased, similarly studies by Bairagi KK et al. [16] the most of the head injuries are associated with skull fractures which increases the fatality of victims. [21]

Skull fractures are not a dictum to be present in all fatal head injury cases. In this study skull fractures were present in 166 (67.75%) cases. Compared to 69.63% of cases in the study by Kumar A et al and Singh B et al. [4, 20]The dominant type of skull fractures found was the linear (fissured) fracture in 55.43% cases followed by basilar fracture in 17.47%, Crushes fracture in 18.07%, Communated fracture in 5.42% and depressed fracture in 3.62%. Fissured fracture was the most commonly observed fracture (57%) in study of Menon A et al and Shivakumar BC et al. [11, 18]

The commonest variety of Intra Cranial Hemorrhage found was subdural haemorrhage 90.83%, followed by sub arachnoid haemoharrage 70.53%, Intra cerebral hemorrhage 20.64% and least is extra dural hemorrhage found in 4.75% of cases as studied by others. [5, 19] The most common cause of death which was Intra Cranial Haemorrhage from head injury in study by Nzegwu.et al. [12]

A fracture of the skull with associated brain injury is the most common cause of death in our study. We found multiple injuries in most of cases involving other systems a typical feature of fatal motor cycle accidents as mentioned by Parikh CK. [8] Apart from the head injuries, other system injuries were also noted. Rib fractures were commonest other system injury found in 44.44% of cases. Similar to the findings of the study by Sauter C et al and Kumar A et al [10, 5]

Conclusion:

In this study it has been observed that the human error is mainly responsible for fatal RTA. Though it is a most difficult task to control human errors involved, sincere efforts made in this direction can reduce the mortality and morbidity. Preventive measures of all epidemic diseases are based on the cause. Similarly for reducing fatalities among victims of two wheeler road traffic accidents, it is essential to study the cause of RTAs, which revolve around factors responsible as Human errors, Machine (Vehicle) errors, and environment. [3]

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Table 1: Total Deaths due to Fatal RTA involving Riders/Pillion Riders of Two Wheelers

	Male (%)	Female (%)	Total (%)
Riders	177(94.7)	10(5.3)	187(76.3)
Pillion Riders	38(65.5)	20(34.5)	58(23.7)
Total	215	30	245

Table 2: According to the Age Group

Age (yrs)	Riders (%)	Pillion Riders (%)
0 – 9	0(0.00)	0 (0.0)
10 – 19	10(5.4)	6(10.3)
20 – 29	90(48.1)	27(46.6)
30 – 39	45(24.0)	10(17.2)
40 – 49	15(8.0)	4(7.0)
50 – 59	18 (9.6	8(13.8)
60 – 69	5 (2.7)	3(5.2)
≥70	4(2.1)	0(0.0)
Total (n=245)	**187**	**58**

Table 3: Time of Accident

Time Interval	Riders (%)	Pillion Riders (%)
6 AM – 12Noon	39(18.0)	5(16.8)
12 Noon– 6PM	60(27.8)	11(27.2)
6PM – 12Mid Night	94(43.5)	10(44.6)
12Mid Night – 6AM	23(10.6)	03(11.4)
Total	216	29

Table 4: Place of Accident

Rural/Urban	Rural (%)	Urban (%)
0 – 9	0 (0.0)	0(0.0)
10 – 19	3(4.8)	13(7.1)
20 – 29	26(41.3)	91(50.0)
30 – 39	19(30.1)	36(19.8)
40 – 49	5(7.9)	14(7.7)
50 – 59	8(12.7)	18(9.9)
60 – 69	2(3.2)	6(3.3)
≥70	0(0.0)	4(2.2)
Total (n=245)	**63**	**182**

Table 5: According to Evidence of Using Helmets among Riders

Helmets Used	Used (%)	Not Used (%)
0 – 9	0(0.0)	0(0.0)
10 – 19	7(5.8)	3(2.5)
20 – 29	59(49.1)	31(25.8)
30 – 39	31(25.8)	14(11.7)
40 – 49	10(8.3)	5(4.1)
50 – 59	8(6.7)	10(8.3)
60 – 69	3(2.5)	2(1.7)
≥70	2(1.7)	2(1.7)
Total (n=187)	**120 (64.1)**	**67(35.9)**

Table 6: Types of Skull fractures in RTA Involving Riders & Pillion Riders

Types of Skull Fracture	Riders (%)	Pillion Riders (%)
Linear Fracture of vertex	26(13.9)	11 (18.9)
Communated Fracture of vertex	4(3.2)	2(4.9)
Depressed fracture of vertex	7(5.6)	2(4.9)
Basal Fracture	21(11.2)	8(13.8)
Basal Fracture +linear fracture of vertex	44(23.5)	11(19.0)
Crush fracture of skull	23(12.3)	7(12.0)
No Fracture	62(33.1)	17(29.3)
Total	**187(76.3)**	**58(23.7)**

Table 7: Intra Cranial Hemorrhages in Riders & Pillion Riders

Riders	EDH (%)	SDH (%)	SAH (%)	ICH (%)
Skull With Fracture	6(4.8)	116 (92.8)	96 (76.8)	22 (17.6)
Skull Without Fracture	2(6.9)	24(82.8)	18(62.1)	6(20.7)
Pillion Riders				
Skull With Fracture	3(7.3)	36(87.8)	28(68.3)	8(19.5)
Skull Without Fracture	0(0.0)	8(100)	6(75.0)	2925.0)

Table 8: Injuries in Vital Organs other than Head Injuries in Riders & Pillion Riders

	Riders (%)	Pillion Riders (%)
Ribs Fractures	68(54.4)	22(61.1)
Long Bones Fractures	20(16.0)	6(16.7)
Pelvis Fracture	2(1.6)	2(5.6)
Vertebral Fracture	10(8.0)	3(8.3)
Visceral Lacerations	25(20.0)	3(8.3)
Total	**125(77.6)**	**36(22.4)**