Original Article

Pattern of head injury among two wheelers in road traffic accidents in Uttar Pradesh: Autopsy based retrospective study

Authors

Dr Amrendra Kumar¹, Dr Rajendra Kumar²*

¹Senior Resident, Department of Forensic Medicine & Toxicology, AIIMS, Patna
²Assistant Professor, Department of Pharmacology, PIMS, Lucknow

*Corresponding Author

Dr Rajendra Kumar
Assistant Professor, Department of Pharmacology, PIMS, Lucknow, UP, India

Abstract

Objective: To describe the pattern of head injury among two wheelers in road traffic accidents in Uttar Pradesh.

Methods: A cross sectional study of total of 312 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.

Results: The mortality due to two wheeler RTA was highest among the age groups of 21-30 years of age (28.5%) and was lowest in the age >60 years (3.8%). The mortality due to two wheelers RTA was found to be higher among males (63.5%) than females (36.5%). The mortality due to two wheelers RTA was found to be higher among riders (69.9%) than pillion riders (30.1%). The mortality due to two wheelers RTA was found to be higher among whom accident occurred in afternoon (39.4%) than evening (25%), morning (21.8%) and mid-night (13.8%). The mortality due to two wheelers RTA was found to be higher among urban areas (69.2%) than rural (30.8%). The mortality due to two wheelers RTA was found to be higher among Depressed fracture of vertex (31.1%) than Communated Fracture of vertex (25%), Basal Fracture (24.4%), Linear Fracture of vertex (14.1%) and Crush fracture of skull (5.4%). The mortality due to two wheelers RTA was found to be higher among EDH (46.8%) than ICH (21.2%), SDH (17.9%) and SAH (14.1%).

Conclusion: 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.

Keywords: Road traffic accidents, Head injury, Mortality.

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. 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. 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 the skull, produced by mechanical forces”. Head injury is the major contributing factor in all trauma cases causing mortality and is the commonest cause of mortality and morbidity following two-wheeler crashes.

The World Health Organization (WHO) puts Road Traffic Accident (RTA) as the sixth leading cause of deaths in India that is 4 times more than in some developed countries such as the United Kingdom and Sweden and still increasing rapidly. Fatalities of RTAs in India are estimated to increase up to 150% by 2020. Some of the factors that increase the risk of road crashes in India are unsafe traffic environment, poor road infrastructure, and encroachments.

Due to lack of protection around the riders and pillion riders, they come into direct contact with hitting objects, thus motorcycle is the least safe form of transportation. Of particular significance are motorcycle accidents that involve passengers without wearing helmets, which result in severe injuries. However, helmet regulation in India is not uniform and poorly enforced. Few reports have shown the differential analysis of injuries and their severity among riders and passengers, especially the pattern of injuries in pillion riders are not well studied.

The present study was conducted to describe the pattern of head injury among two wheelers in road traffic accidents in Uttar Pradesh.

**Material and Methods**

A cross sectional study of total of 312 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 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 were not included in this study. Detailed autopsy examination was done. Relevant information was collected from police, relatives and friends of deceased. Rokitansky en-mass evisceration technique was followed in conducting the autopsy. Then with all these findings, post-mortem conclusion as to the cause of death in each case was drawn and analyzed.

The results are presented in frequencies and percentages.

**Results**

The mortality due to two wheeler RTA was highest among the age groups of 21-30 years of age (28.5%) and was lowest in the age >60 years (3.8%) (Table-1).

The mortality due to two wheelers RTA was found to be higher among males (63.5%) than females (36.5%) (Table-2).

The mortality due to two wheelers RTA was found to be higher among riders (69.9%) than pillion riders (30.1%) (Table-3).

The mortality due to two wheelers RTA was found to be higher among whom accident occurred in afternoon (39.4%) than evening (25%), morning (21.8%) and mid-night (13.8%) (Table-4).

The mortality due to two wheelers RTA was found to be higher among urban areas (69.2%) than rural (30.8%) (Table-5).

The mortality due to two wheelers RTA was found to be higher among Depressed fracture of vertex (31.1%) than Commnated Fracture of vertex (25%), Basal Fracture (24.4%), Linear Fracture of vertex (14.1%) and Crush fracture of skull (5.4%) (Table-6).

The mortality due to two wheelers RTA was found to be higher among urban areas (69.2%) than rural (30.8%) (Table-5).

The mortality due to two wheelers RTA was found to be higher among Depressed fracture of vertex (31.1%) than Commnated Fracture of vertex (25%), Basal Fracture (24.4%), Linear Fracture of vertex (14.1%) and Crush fracture of skull (5.4%) (Table-6).

The mortality due to two wheelers RTA was found to be higher among EDH (46.8%) than ICH (21.2%), SDH (17.9%) and SAH (14.1%) (Table-7).
Table 1: Distribution of mortality according to the age

| Age in years | No. (n=312) | %  |
|--------------|-------------|----|
| 0-10         | 24          | 7.7|
| 11-20        | 56          | 17.9|
| 21-30        | 89          | 28.5|
| 31-40        | 81          | 26.0|
| 41-50        | 36          | 11.5|
| 51-60        | 14          | 4.5 |
| >60          | 12          | 3.8 |

Table 2: Distribution mortality according to gender

| Gender     | No. (n=312) | %  |
|------------|-------------|----|
| Male       | 198         | 63.5|
| Female     | 114         | 36.5|

Table 3: Distribution mortality due to Fatal RTA involving Riders/Pillion Riders of Two Wheelers

| Riders/Pillion Riders | No. (n=312) | %  |
|-----------------------|-------------|----|
| Riders                | 218         | 69.9|
| Pillion Riders        | 94          | 30.1|

Table 4: Distribution of mortality according to place of accident

| Riders/Pillion Riders | No. (n=312) | %  |
|-----------------------|-------------|----|
| Urban                 | 216         | 69.2|
| Rural                 | 96          | 30.8|

Table 5: Distribution of mortality according to time of Accident

| Time of Accident | No. (n=312) | %  |
|------------------|-------------|----|
| Morning          | 68          | 21.8|
| Afternoon        | 123         | 39.4|
| Evening          | 78          | 25.0|
| Mid-night        | 43          | 13.8|

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

| Types of Skull Fracture   | No. (n=312) | %  |
|----------------------------|-------------|----|
| Linear Fracture of vertex | 44          | 14.1|
| Communate Fracture of vertex | 78       | 25.0|
| Depressed fracture of vertex | 97       | 31.1|
| Basal Fracture            | 76          | 24.4|
| Crush fracture of skull   | 17          | 5.4 |

Table 7: Distribution of mortality according to Intra Cranial Hemorrhages

| Intracranial Hemorrhages | No. (n=312) | %  |
|--------------------------|-------------|----|
| EDH                      | 146         | 46.8|
| SDH                      | 56          | 17.9|
| SAH                      | 44          | 14.1|
| ICH                      | 66          | 21.2|

Discussion
In this study, the mortality due to two wheeler RTA was highest among the age groups of 21-30 years of age (28.5%) and was lowest in the age >60 years (3.8%). In the study by Sanjay[9], out of 34 cases, the highest number of victims were in the age group of more than 50 years in 12(35%) cases followed by age group between 21 to 30 years in 10(29%) cases and age group between 31 to 40 years in 6(11%) cases. Another study[1] showed that the two wheeler RTAs are more in the third (115cases) & fourth decades (55 cases) constituting 47.8% and 22.4% of total 245 victims. It was followed by 20 to 39 years constitutes 70.2% of total victims. The present study found that the mortality due to two wheelers RTA was found to be higher among males (63.5%) than females (36.5%). Sanjay[9] showed that most of the victims were males with 20(59%) cases, the number of female fatalities were also quite high accounting for 14(41%) cases. The findings of this study contradict a study which states that females who sat sideways had fewer injuries and lesser mortality as compared to male passengers who sat astride[10]. However, similar to the findings of this study, Kumar et al[11] were males belonging to 88.2% and females 11.8% and in the study of Singh et al[12] males belong to 86.96% and females belong to 13%. In this study, mortality was higher among riders (69.9%) than pillion riders (30.1%). Ravikumar[1] reported motorcycle riders were 187(76.3%) and pillion riders comprised 58(23.7%) of 245 cases. This study found that most of the cases were those who got accident in afternoon. Sirathanont and Kasantikul[13] demonstrated most of motorcycle crashes were between 06.00 PM – 09.00 PM. Ding et al[14] reported most of the head
injuries occurred between 04.00 PM – 11.00 PM peaking at 9.00 PM. In the present study, the mortality due to two wheelers RTA was found to be higher among urban areas (69.2%) than rural (30.8%). Findings observed in Singh et al.\textsuperscript{12} found 16.98% of victims from rural areas.

In the present study, the mortality due to two wheeler RTA was found to be higher among Depressed fracture of vertex (31.1%) than Communated Fracture of vertex (25%), Basal Fracture (24.4%), Linear Fracture of vertex (14.1%) and Crush fracture of skull (5.4%). The mortality due to two wheelers RTA was found to be higher among EDH (46.8%) than ICH (21.2%), SDH (17.9%) and SAH (14.1%). Ravikumar\textsuperscript{1} found that skull fractures are not a dictum to be present in all fatal head injury cases. In this study skull fractures were present in 166 (67.8%) cases. The dominant type of skull fractures found was the linear (fissured) fracture in 55.43% cases followed by basilar fracture in 17.5%, Crushes fracture in 18.1%, Communated fracture in 5.4% and depressed fracture in 3.6%. Fissured fracture was the most commonly observed fracture (57%) in study of Menon and Nagesh\textsuperscript{15}(2005) and Shivakumar et al.\textsuperscript{16}.

Ravikumar\textsuperscript{1} reported that the commonest variety of Intra Cranial Hemorrhage found was subdural haemorrhage 90.8%, followed by sub arachnoid haemoharrage 70.5%, Intra cerebral hemorrhage 20.6% and least is extra dural hemorrhage found in 4.8% of cases. The most common cause of death which was Intra Cranial Haemorrhage from head injury was reported in the study by Nzegwu et al.\textsuperscript{17}.

**Conclusion**

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.

**References**

1. Ravikumar R. Patterns of Head Injuries in Road Traffic Accidents Involving Two wheelers: An Autopsy Study. J Indian Acad Forensic Med. 2013; 35 (4).
2. Tandle RM, Keoliya AN. Patterns of head injuries in fatal road traffic accidents in a rural district of Maharashtra-Autopsy based study. Journal of Indian Academy of Forensic Medicine. 2011; 33(3):228-31.
3. Narwade N, Narwade P, Ghosalkar M, Shaikh TP, Sharma Y, Khan N, et al Clinical profile and management of head injury at tertiary health care center in rural area, India. International Journal of Research in Medical Sciences. 2017; 3(11):3137-40.
4. Sonawane S, Jambure M. Patterns of head injuries in road traffic accidents: An autopsy study. International Journal of Current Research. 2015; 7(12):23733-7.
5. Pathak A, Desania NL, Verma R. Profile of road traffic accidents and head injury in Jaipur (Rajasthan). Journal of Indian Academy of Forensic Medicine. 2008; 30(1):6-9.
6. Pruthi N, Chandramouli BA, Sampath S, Devi BI. Patterns of head injury among drivers and pillion riders of motorised two-wheeled vehicles in Bangalore. The Indian Journal of Neurotrauma. 2010; 7(2):123-7.
7. Murphy J, Nyland J, Lantry J, Roberts C. Motorcyclist “biker couples”: A descriptive analysis of orthopaedic and non-orthopaedic injuries. Injury. 2009; 40(11):1195-9.
8. Fitzharris M, Dandona R, Kumar GA, Dandona L. Crash characteristics and patterns of injury among hospitalized motorised two-wheeled vehicle users in
urban India. BMC Public Health. 2009; 9:11

9. Sanjay S. A Retrospective Autopsy-Based Study on the Pattern of Head Injuries in Pillion Riders Involved in Fatal Road Traffic Accidents and Proposed Safety Measures. International Journal of Medical Toxicology and Forensic Medicine. 2018; 8(2):71-78.

10. Sood S. Survey of factors influencing injury among riders involved in motorized two-wheeler accidents in India: A prospective study of 302 cases. Journal of Trauma and Acute Care Surgery. 1988; 28(4):530–4.

11. Kumar A, Lalwani S, Agarwal D, Rauti R, Dogra TD. Fatal Road Traffic Accidents and their relationship with head injuries, An Epidemiological survey of 5 years; Indian Journal of Neurotrauma 2008, 5(2): p63-67.

12. Singh YN, Bairagi KK, Das KC. An epidemiological study of road traffic accident victims in medico-legal autopsies, JIAFM, 2005, 27(3); 166-169.

13. Sirathanout J. Kasantikul V. Mortality and injury from motorcycle collision in phetchaburi province, J. Med Assoc. Thai 2003; 86; p97-102.

14. Ding SL, Pai L, Wang JD, Chen KT. Head injuries in traffic accidents with emphasis on the comparisons between motorcycle–helmet users and non users. J Formos Med Assoc. 1994; 93; S42-8.

15. Menon A, Nagesh KR. Pattern of fatal head injuries due to vehicular accidents in Manipal, Journal of Indian Academy of Forensic Medicine, 2005, 27(1); 19-22.

16. Shivakumar BC, SrivastavaPrem Chandra, Shantakumar HP. Patterns of head injuries in mortality due to road traffic accidents involving Two-Wheelers. JIAFM, 2007; 32(3), p239-242

17. Nzegwu MA, Aligbe JU, Banjo AAF, Akhiwu W and Nzegwu CO. Patterns of Morbidity and Mortality amongst motorcycle riders and their passengers in Benin City, Nigeria, Annals of African medicine, 2008; 7(2); p82-85.