

**Pattern of Fatal Injury in Driver and Pillion Rider in Two Wheeler Accidents in Bihar****Prabhat Kumar<sup>1</sup>, Rohit Raj Singh<sup>2</sup>, Ravi Kumar Sharma<sup>3</sup>, Dharmendra Kumar<sup>4</sup>, Kaushal Kishore<sup>5</sup>, Bijay Kumar Prasad<sup>6</sup>**<sup>1</sup>Assistant Professor, Dept. of Forensic Medicine and Toxicology, RDJMMCH, Muzaffarpur<sup>2</sup>Senior Resident, Dept. of Forensic Medicine and Toxicology, RDJMMCH, Muzaffarpur<sup>3</sup>Assistant Professor, Dept. of Forensic Medicine and Toxicology, IMS & SUM, Hospital, Bhubneswar<sup>4</sup>Associate Professor, Dept. of Forensic Medicine and Toxicology, RDJMMCH, Muzaffarpur<sup>5</sup>Associate Professor, Dept. of Forensic Medicine and Toxicology, SKMCH, Muzaffarpur<sup>6</sup>Professor, Dept. of Forensic Medicine and Toxicology, RDJMMCH, Muzaffarpur

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**Abstract:**

**Background and Objectives:** Two-wheelers accounted for the highest share in total road crashes (1,62,280), contributing 33.8%, followed by cars, jeeps and taxis (1,13,267) contributing 23.6% and trucks, tempos, tractors and other articulated vehicles (1,01,085) contributing 21.0% and buses (37,487) contributing 7.8% to total road crash fatalities. 'New Birth' is rejoiced as a happy occasion and loss of a family member in the form of 'death' is mourned. To study the pattern of fatal injuries by two wheeler accidents. To compare the pattern of injuries sustained by two wheeler riders wearing the helmet and without helmet. To study the relationship between two wheeler accidents and various factors like age, sex, weight, height, time of incidence etc. and type of other vehicles involved.

**Materials and Methods:** Study is to be conducted on dead bodies received for medico legal autopsy at mortuary of Department of Forensic Medicine & Toxicology, AIIMS, Patna and Other medical College, Bihar. Study Duration of Two Years.

**Conclusion:** None of the victims who were wearing helmet of standard quality (ISI) had spot death. Spot death was seen in victim who had head injury with or without any other injury. And, ISI helmet definitely protects from head injury. 2-7 days was critical in significant number of cases for both groups wearing 1ST helmet and Non-ISI helmet.

**Keywords:** Sub Dural Hemorrhage, Subarachnoid Hemorrhage, Brain Stem Hemorrhage, fatal Injury.

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**Introduction**

Road traffic accident is the single most common cause of death in young population. In that sense, socially and economically it leads to heavy loss to the family, the society and after all to the nation. Unfortunately, in the developing countries like India, which is in the phase of rapid urbanization, two wheeler motor vehicles are the most common mode of transport [1]. The affordable investment it needs and roadway scenario of non- metro city and its suburban and neighbouring area, pull maximum number of young population to use two wheeler motor vehicle as means of their transport. A study of head injury associated death from motorcycle crashes in 1979 to 1986 in The United States, identified 15,194 deaths and nearly 600,000 years of potential life lost before 65 years of age [2]. Accepting and coping with "Survival For The Fittest", rash and negligent driving, improper

licensing methodology inadequate training for driving, violation of traffic rules & regulations, neglected traffic rules by public as well by authorities more so in nights, improper ownership & maintenance of vehicle, young people driving under emotion, truck drivers driving very rashly under influence of alcohol on highways, rash & negligent driving by bus drivers to maintain their strict time schedule, superadded by driving under the influence of alcohol which blunts the protective audio-visual reflexes while driving are few important predisposing factors responsible for gradually increasing motorized two wheeler road traffic accidents. Often pillion rider or passenger suffer from all the injuries including the head injuries more than the driver because protective audio-visual reflexes which is present in the driver is lacking in pillion passenger. In non metro city and its suburban

and neighbouring area where proper transport facilities for school and/ or college going students are not available, middle or upper middle class families are left with non-other option than to provide two wheeler to their wards [3]. These young fellows, while carrying female friends as co-passenger have the attitude to experiment with motorized two wheeler to impress and please her, which make them rash and negligent driver and victim of accident leading to morbidity or even mortality. Road traffic accident is the most common (about 34%) cause of death in a non-metro city and its suburban and neighbouring area and around. About half of them are victims of two wheeler accidents. In two wheeler road traffic accidents, out of all injuries, head injuries are the most common cause of immediate mortality or long-term morbidity or mortality. Proper use of helmet, of standard quality (ISI marked, full face helmet), protect from head injuries and so from fatality very significantly [4]. Unfortunately, as people feel inconvenience in using helmet, they do not use it as a habit on regular basis. Among those who use it, most of them use helmet of sub-standard quality (Non-ISI marked) local made or open face type to save some money from buying the helmet of standard quality (ISI marked) In the present study, attempt is made to study the pattern of injuries in fatal two wheeler accidents in relation to various factors like changing road traffic scenario, extent & nature of injuries with special reference to head injury, age, sex, height, weight, accident time, survival time, cause of death, type of two wheeler involved, other vehicle involved in crash and influence of alcohol on accident, to widen the medical horizon in the field of diagnosis role of treatment if victims survived after accident and also to study the role of helmet in preventing such fatal injury [5].

### Objectives

To study the pattern of fatal injuries by two wheeler accidents. To compare the pattern of injuries sustained by two wheeler riders wearing the helmet and without helmet. To study the relationship between two wheeler accidents and various factors like age, sex, weight, height, time of incidence etc. and type of other vehicles involved.

To evaluate the role of helmet in prevention of fatal head injuries and other injuries among two wheeler riders as well as pillion riders.

To study the pattern of injuries vis-à-vis type and quality of helmet in relation to the sustained injuries.

### Materials and Methods

Study is to be conducted on dead bodies received for medico legal autopsy at mortuary of Department of Forensic Medicine & Toxicology, All India Institute

of medical Sciences patna, Bihar Study duration of Two years..

### Inclusion Criteria

- Fatal cases, which were either rider or pillion passenger/rider of the two-wheeler vehicle, involved in road traffic accidents.
- Death due to head injuries as well as other injuries in two-wheeler road traffic accidents.

### Exclusion Criteria

- Those victims of two-wheeler accidents who were neither rider nor pillion rider/passenger of two-wheeler vehicles.
- Those cases in which history with certainty about usage and non-usage of helmet is not available.
- Those cases who sustained apparently fatal injuries but survived with disabilities.

Detailed relevant information regarding the nature of accidents, types of vehicles involved, hours of occurrence, whether the victim was rider or pillion rider/passenger whether the victim was wearing helmet or not, if yes, then whether it was ISI Standard or not. Other factors like age, sex, height, weight, time of death, duration of survival etc. will also be noted.

During the postmortem examination the ethanolic smell emanating from the internal viscera were cross matched blood alcohol level and/or urine alcohol level which was estimated in the departmental laboratory and only those cases were considered to be under the influence of alcohol whose blood alcohol level was 30mg % (Indian Standard) or more. Those cases were not included in the study that were highly mutilated or examined in advance stage of death. The scalp was incised across the vertex with a sharp scalpel one mastoid process to other mastoid process and the flaps were retracted in front up to the eyelids and beginning of the nape neck on the back any hematoma or contusion of the scalp was noted, and the exposed skull was cleaned and examined for any fracture. The skull was then sawn through all around above the level of ears. Care was taken in sawing, so that duramater and underlying structures were not damaged. The skull was then freed and removed. The duramater was examined and the superior longitudinal sinus was opened and examined. The duramater was now cut along the line of the cut surface of the skull. Anterior attachment of the falx cerebri was cut and the upper cut portion of the duramater was stripped off.

Detailed examination of other regions of the body was also done and rest of the cavities opened for inspection to know the other associated injuries of the various systems.

**Results**

A study was conducted on the "pattern of fatal injuries by two-wheeler accidents" in a non-metro city,

Patna" on the dead bodies received for medico legal autopsy at mortuary of department of Forensic Medicine & Toxicology, AIIMS, Patna, Study duration of two Years.

**Table 1: Out of total 110 cases, there were 59 drivers and 51 were pillion riders/passengers. The following table shows the type of victim and their percentage: -**

Type of Victims	Number of Victims	Percentage
Drivers	59	54
Pillion Rider	51	46

**Table 2: Out of 110 cases, 23 Victims were wearing helmet and 86 were not wearing helmet. 1 victims were wearing turban**

Sl. No.	Type of Victims	Number of Victims	Percentage
1.	Victims with Helmets	23	21%
2.	Victims without Helmet	86	78%
3.	Victims with Turban	1	1%

**Table 3: Out of 23 victims with helmets, following were the pattern of standard of helmet:-**

Sl. No.	Type of Helmet	No. of Victims	Percentage
1.	Standard Quality (ISI-marked)	7	31.58%
2.	Nonstandard Quality (including half or Open Face type)	16	68.42%

**Table 4: The following table shows the incidence of protective measures taken and their percentage**

Sl. No.	Type of Victims	No. of Victims	Percentage
1.	Female With Alcohol	0	0%
2.	Female Without Alcohol	25	100%

In the present study it was observed that 21.67% victims were under influence of alcohol. This percentage is slightly less than that observed in other major cities because trend of alcoholism in non- metro cit like Patna is less than that seen in other major cities. None of these victims were under influence of alcohol. This could be related as trend of alcoholism in females in smaller cities is not very common unlike in other major cities.

**Table 5: Vehicles involved**

Sl. No.	Type of Vehicle	No. of Victims	Percentage
1.	Scooter	26	23.61%
2.	Motorcycle	83	75.28%
3.	Scooty	1	1.11%

As better external appearance, higher mileage performance and convenience to use, pull maximum number people to use 'Motorcycle' among two wheeler vehicle as mode of transport as shown in the data.

**Table 6: Period of survival**

Period of Survival	Number of Victims	Percentage Out of 110
Sopt death	18	16.38%
Within 6 hrs	12	10.55%
Within 6 to 24 hrs	21	18.89%
Within 24 to 48 hrs	6	6.11%
<b>2-7 days</b>	<b>38</b>	<b>35%</b>
8-12 days	5	4.44%
13-17 days	4	3.89%
18-31 days	2	2.22%
More than a month	2	2.5%

Majority (35%) of victims had survived up to 2-7 days, which is the critical period in view of treatment. If proper treatment given they could have been salvaged. 70.55% had died in up to 7 days.

**Table 7: Period of survival in victim with isi helmet and with non-isi helmet**

Period of Survival		Number of Victims with ISI Helmet	Percentage Out of 7	Number of Victims without Non-ISI Helmet	Percentage Out of 16
1.	<b>Spot death</b>	<b>0</b>	<b>0%</b>	<b>2</b>	<b>11.54%</b>
2.	Within 6 hrs	2	20.83%	2	13.46%
3.	<b>Within 6 to 24 hrs</b>	<b>1</b>	<b>12.5%</b>	<b>4</b>	<b>25%</b>
4.	Within 24 to 48 hrs	1	8.33%	1	6.25%
5.	<b>2-7 days</b>	<b>2</b>	<b>25%</b>	<b>10</b>	<b>58.85%</b>
6.	8-12 days	1	8.33%	1	6.25%
7.	13-17 days	1	12.50%	1	6.25%
8.	18-31 days	1	8.33%	1	6.25%
9.	More than a month	0	0%	1	6.25%

None of the victims who were wearing helmet of standard quality (ISI) had spot death. Spot death mostly happened if victim had head injury. And, ISI helmet definitely protects from head injury. 2-7 days was critical in significant number of cases for both groups wearing ISI helmet and Non-ISI helmet.

### Discussion

“Despite the general downward trend observed in North America and Europe during the last decade, Road traffic accidents are like the leading cause of death in many countries among 05-44 years old” (WHO, 1999) [6].

The review of US mortality data from 1979 to 1986 identified 15194 deaths and nearly 600,000 years of potential life lost before age 65 years that were associated with head injuries from motorcycle crashes. Males from 15-24 years of age accounted for 69% of deaths. Sosin, Sacks and Holmgren. In India, over 80,000 persons die in the traffic crashes annually over 12,00,000 are injured seriously and about 3,00,000 disabled permanently. In India for individual more than 4 years of ages, more life years are last due to traffic crashes than due to cardiovascular accidents or neoplasm. According to a study conducted by the National Transportation, Planning and Research Centre (NTPRC) of New Delhi and Thiruvanthapuram, every 4 minutes a person is killed or injure in road traffic accidents in India which has a network at 1,500,000 roads [7].

A study, in Delhi by Chandra, J, Dogra T D, Dikshit, P C, stated that roadside vehicular accidents death was a penalty paid by us for modern civilization. In there total series 3227 medico legal autopsies conducted for a period over 10 years (1966-1976) they reported accidental deaths in 70.62% of the cases and out of which 49.76% were due to vehicular accidents. Mast common victim involved was the pedestrian comprising 50.7% followed by motorcyclists (18.28%) [8].

In the present study total 110 cases were studied over the period of one year. Among them 54% were drivers and 46% were pillion passengers/riders. Sosin, Sacks, and Holmgren in their study had observed 14% of motorcyclist's with head injury

associated deaths were passenger. Wagle et al in their study on 83 motorcyclists had observed 69.88% were without helmet and they suffered significantly high injury. 9 of the 10 patients declared dead on arrival to the hospital were non-helmeted. Helmets do reduce the risk of serious head injury and do not increase the risk of cervical spine injury [9].

Hundley et al in their study on non-helmeted motor cyclists had found 69.2% were helmeted and 30.8% were non-helmeted. Helmet use was associated with lower injury severity, mortality and resources utilization [10]. Non-helmeted motorcyclists have worse outcomes than their helmeted counterparts and they monopolize more hospital resources and incur higher hospital charges [11]. Lin et al in their study on crash severity, injury pattern and helmet use in adolescent motorcycle riders had observed more injuries to the external skin, face and head, and more severe injury occurred in non-helmeted than helmeted riders [12]. Kraus et al in their study had concluded that motorcyclists are more vulnerable to fatal and severe injuries in crashed than any other vehicle. Motorcycle crash fatality rates are highest of all road vehicle fatality rates. Fatality rates per hundred million vehicle miles driver are 20 times greater for motorcycle riders than for occupants of passenger cars. Helmet decreases the severity of head injury, the likelihood of death and overall cost of medical care [13]. After implementation of compulsory helmet use law, the proportion of riders who had no head injury almost doubled among fatally injured riders and increased 23.8% among non-fatally injured riders. Hotz et al in their study on impact of a repealed motorcycle helmet law in the state of Florida, concluded that helmet usage decreased from 83% in 1999 to 56% in 2000 [14]. The number of brain injury during this same time period increased from 18 to 35 and number of fatality from 2 to 8. It also states that helmet use decreased the severity of head injury, mortality and cost of medical care in motorcycle related crashed [15]. This finding is consistent with Krans, Riggins and Franti where they have stated that male drivers sustained relatively more serious motorcycle collision injury than female driver and female

passenger. Singh et al had observed that 91% of victims were male. Sood et al in their study mentioned that out of 302 cases, 252 (83.44%) were males and 50 (16.56%) were females. 3 (6%) of the females were drivers and rest were passengers. Wagle et al in their study on 83 motorcyclists had observed that 97.59% were male and rest 2.41% was female. Sosin et al had observed 90% of victim were male [16]. Mishra in his study stated that there were very few females because very low numbers of females drive motorcycles. Krans, Riggins, Franti had observed that male driver sustained relatively more serious motorcycle collision injuries than male passenger, female driver and female passenger. The severity of injury was related to age, speed at time to collision, and were highest for drivers not wearing helmet. More trained the motorcyclists more prone to accident. In the present study, 18 cases (16.38%) had spot death. All of them had head injuries. All of them were either not wearing helmets or if they were wearing helmet it was of sub-standard quality (Non-ISI) [17]. Maximum number of cases 38 (35%) had survived up to 2-7 days. 12 victims (10.55%) had survived up to 6 hours, 21 (18.89%) up to 6 to 24 hours, 7 victims (6.11%) up to 24 to 48 hours, 5 victims (4.44%) up to 8 to 12 days, 4 victims (3.89%) up to 13 to 17 days, 3 victims (2.22%) up to 18 to 31 days and 2 victims (2.5%) had survived up to more than a month. Out 110 cases, 77 (70.55%) victims had survived up to from few hours to 7 days after accident. This first seven days is the most critical period for their survival. If proper care and adequate treatment were given to victims during this period they could be revived and brought back to their normal life [18]. The period of survival depends upon type of injury. The victims who were wearing helmet had more survival period. This was much more in victims who wearing helmet of standard quality (ISI).

### Conclusion

None of the victims who were wearing helmet of standard quality (ISI) had spot death. Spot death was seen in victim who had head injury with or without any other injury. And, ISI helmet definitely protects from head injury. 2-7 days was critical in significant number of cases for both groups wearing 1ST helmet and Non-ISI helmet.

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