

A DESCRIPTIVE STUDY OF PATTERN OF FATAL HEAD INJURY IN HELMETED AND NON-HELMETED VICTIMS OF TWO WHEELER ACCIDENTS

P. A. Sheeju¹, K. Prasannan²

¹Assistant Professor, Department of Forensic Medicine, Government Medical College, Thrissur, Kerala.

²Professor & Head, Police Surgeon, Department of Forensic Medicine, Government Medical College, Thrissur, Kerala.

ABSTRACT

BACKGROUND

Motor vehicle crashes are a major cause of fatality all over the world. By 2020, motor vehicle injury is projected to become the third leading contributor to the global burden of disease in the world. Motor cyclists are about 25 times more likely than car occupants to die in Road Traffic Accidents. Data on the incidence and types of crashes is required to guide safety policy. Knowledge of how injuries are caused and of what type they are of valuable instrument for identifying interventions and monitoring the effectiveness of intervention. The present study was done to find out the factors that contribute for motor cycle crashes and to study the injury pattern seen in helmeted and non-helmeted victims.

MATERIAL AND METHODS

Victims of two wheeler accidents brought for autopsy in a Govt. Medical College were studied from October 2010 to August 2011. Two wheelers include motor cycles, scooters and mopeds. Bicycles were excluded from the study. Accidents include all types; against all types of vehicles running on the road, collision with any object, surface or any animal or fall from vehicle.

The details of the accident were collected in a printed proforma from relative/witnesses and from police officials. The injuries were entered in the specific columns of proforma. Data was analysed with MS Excel.

RESULTS

Death due to head injury is more in non-helmeted (52.5%) compared to helmeted drivers (43.8 %) whereas injury to chest and abdomen and limbs are more in helmeted. Combination of injuries (Head+Chest+Abdomen) predominated in helmeted drivers (18.8%) compared to 5% in non-helmeted drivers. Spinal injuries were more in helmeted than in non-helmeted.

CONCLUSION

The pattern of head injury was analysed in detail in helmeted and non-helmeted drivers. This will help in detailing of pattern of head injury in both groups.

KEYWORDS

Helmet, Head Injury, Road Traffic Accidents, Two Wheeler Accidents.

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INTRODUCTION: Head injury accounts for majority of death in victims of RTA. According to World Health Organization, more than 90% of deaths occur in low and middle income countries.⁽¹⁾ By 2020, Road Traffic Accident injuries will rise in the 6th place as a major cause of death worldwide.⁽²⁾

Injury to the head is the commonest cause of mortality and morbidity following two wheeler crashes. Even though wearing helmet by two wheeler riders is a statutory requirement, it has not been implemented strictly in most parts of the country. Current evidences worldwide indicate that it does reduce the mortality rate.⁽³⁾

It also depends how much compliant people are in wearing helmet and also to ensure they are wearing quality helmets and wearing it properly. If that is not ensured, then the desired results may not be forthcoming.

The present study is aimed to compare the injury pattern in helmeted and non-helmeted victims of two wheeler accidents.

OBJECTIVE: To compare the injuries, in particular head injury sustained in helmeted and non-helmeted victims of two wheeler accidents.

MATERIALS AND METHODS: Victims of two wheeler accidents brought for autopsy in Govt. Medical College were studied. Any person killed immediately or dying within 30 days as a result of road traffic accident is considered as a victim of RTA.⁽¹⁾ But for practical purposes all persons dying following two wheeler accidents are considered for the study. Two wheelers include motor cycles, scooters and mopeds. Bicycles were excluded from the study.

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Corresponding Author:

Dr. K. Prasannan,

Professor, HOD & Police Surgeon,

Department of Forensic Medicine, Government Medical College,

Thrissur-673008, Kerala.

E-mail: ranjiprasannan@gmail.com

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Accidents include all types: Against all types of vehicles running on the road, collision with any object, surface or any animal or fall from vehicle.

The details of the accident were collected from police inquest, statements from investigating officers, statements from relative/witnesses. In hospitalised cases, details including laboratory investigation reports are collected from case sheet. General examination findings and injuries are documented and also photographed.

Period of Study: Oct 2010 to August 2011.

Study Design: Descriptive study.

Study Group: Drivers and pillion riders involved in accidents and succumbed to death. (N=135).

Data collected and entered in MS Excel.

Approval has been granted by Institutional Ethics Committee, Government Medical College.

OBSERVATIONS AND ANALYSIS: 135 cases of victims of fatal two wheeler accidents were studied; 127 (94.1%) were male and 8 were female (5.9%). All the females were pillion riders. The age range varied from 11 to 74 years. Distribution of accidents according to the age of the victim: Majority of the victims were between 20 and 50 years (75.54%), Table-1
N=135.

Age-years	Frequency	%
10-19	14	10.37
20-29	55	40.74
30-39	26	19.25
40-49	21	15.55
50-59	8	5.95
60-69	10	7.40
70-79	1	0.74

Table 1

84 (62.2%) were drivers and 51 (37.8%) were pillion riders.

Occupation of the Victims: Skilled labourers constituted 18.5%. Next were students (13.3%).
N=135.

Occupation	Frequency	%
Student	18	13.3
Business	9	6.7
Govt. Service	4	3
Skilled Labourer	25	18.5
Executive	2	1.5
Sales man	9	6.7
Manual Labourer	17	12.6
Professional	4	3
Others	47	34.8

Table 2

Helmet use in Drivers and Pillion Riders: History regarding the use of helmet was collected from police and relatives. At times police were not sure of helmet use and relatives/bystanders make bogus claim of wearing helmet by victim. Such cases were treated as unknown. Out of drivers, only 38.1% were using helmet at the time of accident. None of the pillion rider was using the same. (Table-3). In 27.4%

of cases, definite history regarding helmet use was not available. N=135.

	Driver N=84	%	Pillion Rider N=51
Helmeted	32	38.1	0
Non-helmeted	29	34.5	51
Not known	23	27.4	0
Total	84	100	51

Table 3

Type of Vehicle used by victims involved in the accident: Majority of the vehicle involved was motorcycle (95.6%) Table-4.

Type	Frequency	%
Motor bike	129	95.6
Scooter	6	4.4
Total	135	100

Table 4

Nature of Accidents: Majority of accidents were front on collisions (46.7%) followed by hit from back (11.1%) and skid and fall (10.4%) Table -5.

Accident	%
Front on Collision	46.70
Rear end hit	11.10
Skid and fall	10.40
Hitting object/surface	6.70
Hit while overtaking of another vehicle	5.90
Side on collision	5.90
Two wheeler overtaking Another vehicle	4.40
Tail gaiting	2.20
Giddiness and fall	1.50
Trying to open umbrella	1.50
Others	1.50
Not known	1.50

Table 5

Type of other vehicles involved in the accident: Majority were heavy vehicles. Bus (21.5%), lorry (17%), tipper (11.1%) and bike (10.4%) and car (9.6%) Table 6.

Vehicle	Frequency	%
Bus	29	21.5
Lorry	23	17
Tipper	15	11.1
Bike	14	10.4
Car	13	9.6
Jeep	3	2.2
Omni van	3	2.2
Pick up van	2	1.5
Auto	1	0.7
Tempo	1	0.7
Hit a bike & run over by lorry	1	0.7
Bicycle	1	0.7
Not Known	1	0.7

Table 6

Injuries Present on the Victims:

Injuries to Scalp: Scalp injuries were present in 81.48% of cases. The victims sustained contusion more than any other injury followed by laceration. Similar findings were obtained by Gupta S et al.⁴

47.4% of victims showed contusion 14.8% lacerations of scalp (Table-7).

Injuries to Scalp:

Injury	Frequency %
Contusion	47.4
Laceration	14.8
Contusion + Laceration	9.6
Abrasion	5.2
Abrasion + Contusion	2.2
Abrasion + Contusion+ Laceration	1.5
Abrasion + Laceration	0.7

Table 7

Scalp injuries in helmeted and non-helmeted victims:

50% of non-helmeted sustained contusion while 46.9% of helmeted also had contusion and laceration was 21.9% and 12.5% each (Table- 8). The incidences of contusion in both groups are almost same whereas lacerations are more in helmeted. Increase in lacerations in helmeted may be due to breakage of helmet with broken pieces causing laceration.

Injury	Helmeted N=32	%	Non-helmeted N=80	%
Abrasion	1	3.1	5	6.3
Contusion	15	46.9	40	50
Laceration	7	21.9	10	12.5
Abrasion + Contusion	1	3.1	2	2.5
Contusion + Laceration	3	9.4	8	10
Abrasion + Contusion + Laceration	1	3.1	1	1.25

Table 8

Facial Injuries in Helmeted and non-helmeted victims: Facial injuries especially abrasions and contusions were more in helmeted group. Abrasions present in 34.4% in helmeted while it was 20% in non-helmeted. Non-helmeted suffered more lacerations (Table-9).

N=112	Helmeted N=32	%	Non-helmeted N=80	%
Abrasion	11	34.4	16	20
Contusion	1	3.1	0	0
Laceration	2	6.3	8	10
Abrasion + laceration	3	9.4	13	16.3
Contusion + Laceration	0	0	1	1.3
Abrasion + Contusion + Laceration	0	0	1	1.3

Table 9

Facial bone fracture in helmeted and non-helmeted:
Facial bone fracture is more in helmeted group (Table 10).

Facial Bone	Helmeted %	Non-helmeted %
Nasal	9.4	6.30
Maxilla	18.75	13.75
Mandible	18.8	13.8

Table 10

Skull fracture in helmeted (N=32) and non-helmeted (N=80) victims: Skull vault fissured fracture was higher in helmeted than non-helmeted (40.63% and 33.75%). Skull base fractures were higher in non-helmeted. (Table-11)

Fracture Type	Helmeted %	Non-helmeted %
Skull Vault - Fissure Fracture	40.63	33.75
Skull vault - Comminuted fracture	15.63	21.25
Skull vault - Depressed Fracture	3.13	2.5
Skull vault - Diastatic Fracture	6.25	6.25
Skull base - fissure fracture	34.38	37.5
Skull base - Comminuted fracture	15.63	25

Table 11

Focal brain injury in helmeted and non-helmeted: Presence of subarachnoid haemorrhage was same in both groups. Subdural haemorrhage and contusions were higher in non-helmeted. (Table-12)

Injury	Helmeted %	Non-helmeted %
SAH	62.5	62.5
SDH	31.25	35
Contusion	28.12	43.75
Laceration	25	23.75
EDH	3.12	1.25
Intracerebral Haemorrhage	3.12	13.75

Table 12

Spine fracture in helmeted and non-helmeted: Incidence of spinal fracture in the cervical region is almost same in both groups, whereas thoracic spine fracture is more in helmeted. (Table 13)

Region	Helmeted %	Non-helmeted %
Cervical	15.62	13.75
Thoracic	12.5	2.5
Lumbar	3.12	0

Table 13

Cause of death in helmeted (N =32) and non-helmeted (N=80). Death due to head injury is more in non-helmeted (52.5% and 43.8 %) whereas injury to chest and abdomen and limbs are more in helmeted. (Table-14)

Cause of death	Helmeted %	Non-helmeted %
Head injury	43.8	52.5
Head+chest	12.5	15.6
Head+chest+Abdomen	18.8	5
Chest+Abdomen	3.1	5
Lower limb+Blood aspiration	3.1	0
Head and neck injury	3.1	0
Abdomen+lower limb	6.3	0
Head+chest+ Pelvis+lower limb	3.1	0
Cervical spine injury	0	2.5
Abdomen+Pelvis	0	2.5
Head+ Vertebra	0	2.5
Head+Abdomen	0	2.5
Chest+lower limb	3.1	1.3

Table 14

DISCUSSION: Injuries to two wheeler riders constitute a significant proportion of severe traffic accident injuries. In the present study pattern of head injury in the victims of fatal two wheeler accidents are observed and analysed with regard to the use of helmet. Majority of the vehicles involved were motorbikes (95.6%). Males (94.10%) outnumbered females. The mean age of the victim was 33.57. Maximum incidence was in the third decade. Drivers formed 62.2% and pillion riders 37.8%. Skilled labourers constituted 18.5% followed by students (13.3%).

Despite helmet being made compulsory for two wheeler riders only 38.1% of drivers were wearing helmet. None of the pillion riders were wearing helmet.

Injuries to the scalp were present in 81.48% of cases, contusion was more than any other injury (47.4%) followed by laceration (14.8%). Similar findings were obtained by Gupta S et al.⁽⁴⁾ Scalp contusions and lacerations were present slightly less in helmeted victims when compared with non-helmeted group. Helmets afford protection to scalp injuries. Non-helmeted riders suffered more facial lacerations, 28.75% as compared to helmeted victims (15.62%). Facial bone fracture is also more in helmeted group. Helmet seems to have afforded no particular protection against facial bony injuries.

According to Johnson et al non-helmeted here motorcyclists were three times more likely to suffer facial fractures than those wearing helmets.⁽⁵⁾ The incidence of fissure fracture of skull vault was more in helmeted riders (40.6%) than in non-helmeted (33.75) in contrast to other studies.⁽⁶⁾ Fracture of base of skull was more in non-helmeted (37.5%) than in helmeted (34.37%). Focal brain injuries were generally more in non-helmeted group. So obviously helmets give protection against traumatic brain injury. The incidence of cervical spinal injury doesn't show marked difference whereas thoracic and lumbar spine injury was higher in helmeted group. Cause of death was head injury in 52.5% of non-helmeted cases where as in helmeted it was only 43.8% confirming the protection given by helmet in TBI.

SUMMARY AND CONCLUSIONS: Data on the incidence and types of road traffic accidents as well as detailed understanding of the circumstances that leads to accidents is required to guide safety policy. Knowledge how injuries are caused and what type they are, will be valuable instrument for identifying interventions and monitoring the effectiveness of interventions. This study was done to analyse the injury patterns in helmeted and non-helmeted victims of fatal two wheeler accidents.

135 cases brought for post-mortem examination in Department of Forensic Medicine, Government Medical College, Kozhikode were studied and analysed.

1. Findings.
2. Sex of the victims: Males 94.1%, Females 5.9%. Females were all pillion riders.
3. Age: Ranged from 11 to 74 years. Maximum number of victims in the third decade (40.74%).

4. Drivers 62.2%, pillion riders 37.8%
5. Profession of victims: Skilled labourers 18.5%, students 13.3%, manual labourers 12.6%.
6. Helmet use: Drivers -38.10%; Pillion riders-Nil.

Type of Accidents: Front on collision with another vehicle: 46.7%; Hit on back: 11.1%; Skid and fall: 10.4%.

Type of Vehicle Involved: Collision with heavy vehicle: 49.6%.

Common Scalp Injury: Contusion (47.4%) – slightly more in non-helmeted.

Scalp Laceration: More in helmeted.

Facial injuries including fractures: More in helmeted.

Skull vault fissure fracture: More in helmeted.

Skull vault comminuted fracture: More in non-helmeted.

Fracture of base of skull: More in non-helmeted.

Subdural haemorrhage and contusion brain: More in non-helmeted.

Subarachnoid haemorrhage: Incidence same in both groups.

Intracranial haemorrhage: More in non-helmeted.

Thoracic spine fracture: More in helmeted.

Cervical spine fracture: Incidence similar in both groups.

Cause of death: Head injury more in non-helmeted.

Head injury combined with chest, abdomen: More in helmeted.

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