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A study on the pattern, distribution and fatality of head injuries in accidental deaths of two wheeler riders in a population of Haryana

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ABSTRACT

The term accident has been defined as an “occurrence in a sequence of events which usually produces unintended injury, death or property damage”. Among all accidental deaths, road traffic injuries claim 1.2 million lives every year and form the main bulk of deaths from un-natural causes in the world.[1]

The present study was undertaken to know the pattern and distribution of injuries in cases of accidental deaths of two-wheeler riders and to know the fatality of head injuries in cases of accidental deaths of two-wheeler riders. In our study, head was involved in 86% of the cases, followed by extremities (upper-85% and lower-72%), face (64.0%), chest (front & back) in 55.0 %, abdomen and pelvis in 46.0% cases and neck in 4% cases. In the cases of injuries over the head, injury to scalp region was seen in 85 (85.0%) cases, skull in 52 (52.0%) cases and brain in 20 (20.0%) cases. Head injury was the most common fatal injury comprising 65% of the total cases and it was the major cause of death in 46.0 % of victims.

Keywords: Accidental Deaths; Two-Wheeler Riders; Head Injury; Fatal Injury; Traffic Laws.

INTRODUCTION

There is a steep rise in vehicular accidents in the present era due to urbanization and tremendous growth in the road transport sector. Population explosion is a catalysing factor for a number of accidents. It is well said that accidents do not just happen; they are caused. The causes in given situation may vary since accidents are multi-factorial and hence they call for an inter-sectoral approach to both prevention of accidents and care of the injured persons.

Epidemiological techniques are especially appropriate for the study and control of road traffic accidents because so many variables are involved in their causation. The epidemiological studies concern three analogous factors viz. the road user, the vehicle and the road. There are differences in the road use and pattern of road traffic injuries across different countries. Regional differences exist in the pattern of injury sustained by different types of road users that can have significant implications in the development of prevention policies. [2]

India is undergoing major economic and demographic transition coupled with increasing urbanization and motorization. Motorized two-wheelers being economical are very common mode of public transportation. Mortalities and morbidities are more common in head injuries for both riders and pillion riders of two-wheelers. Two-wheelers like motorcycle (motorbike), scooters/mini-scooter and mopeds are commonly used vehicles for personal transport throughout the world. In developed countries motorcycling is for fun, sports and outing. However, in developing countries two-wheelers are commonly used for personal transport whereas in some countries, motorcycles are also used as means of public transport and as a form of employment for youths. [3]

Thus keeping this global epidemic of fatal road traffic accidents in mind, the present research work was carried out to study the epidemiology of fatal two-wheelers road traffic accidents with reference to incidence based on age, sex, occupation, rural-urban distribution, type of road users killed, type of vehicle (s) involved, probable cause of accident, hour and time of accident, pattern and distribution of injuries (including the fatal injury) and cause of death with the aim of studying various causative factors of accidents and accordingly suggesting suitable methods for better management and prevention of the same.

RESULTS

MATERIALS AND METHODS

The present study was undertaken in the Department of Forensic Medicine, PanditBhagwatDayal Sharma Post Graduate Institute of Medical Sciences, Rohtak. A total number of 100 cases of accidental deaths of two-wheeler riders/pillion-riders were included in the study. The study group comprised of cases of accidental deaths of two-wheeler riders/pillion-riders brought for autopsy to the mortuary of the department. The cases of accidental deaths of two-wheeler riders in whom there was no suspicion regarding the accidental manner of death were included in the study and cases where the circumstances regarding the manner of accident were not clear or appeared to be suspicious were excluded from the study.

The demographic profile of the victims were recorded on the proforma formulated for the study and the particulars related to the victim and contributory factors if any, were noted.

During autopsy, thorough external and internal examination of the body was done and the detailed description of all the injuries were noted in each case so as to determine the pattern and distribution of the injuries sustained by two-wheeler riders and to know the fatal injuries sustained by them.

Table 1: Showing Age and Sex-wise distribution of the cases

Age groups (in years)	Male		Female		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
0-10	1	1.08	1	12.5	2	2
11-20	19	20.65	0	0	19	19
21-30	27	29.34	1	12.5	28	28
31-40	15	16.30	0	0	15	15
41-50	13	14.13	4	50	17	17
51-60	11	11.95	1	12.5	12	12
> 60	6	6.52	1	12.5	7	7
Total	92	100	8	100	100	100

Table 2: Showing accidental deaths of two-wheelers rider and pillion-rider

Victim	Male		Female		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
Rider	68	73.9	0	0	68	68
Pillion Rider	24	26.1	8	100	32	32
Total	92	100	8	100	100	100

Table 3: Showing percentage of helmet used or not

Vehicle Used	Helmet				Total	
	Absent		Present			
	Number	Percentage	Number	Percentage	Number	Percentage
Motorbike	93	95.9	3	100	96	96
Scooter	4	4.1	0	0	4	4
Total	97	100	3	100	100	100

Table 4: Showing probable cause of accidents of the two-wheeler occupants.

Cause of accident	Number	Percentage
Rash driving by offending vehicle	63	63
Due to skid	24	24
Stray animals on roads	7	7
Alcohol influence	4	4
Improper parking of tractor	1	1
Poor visibility	1	1
Total	100	100

Table 5: Showing distribution of the cases according to the sites of injuries

Site of injury	Number	Percent
Head injuries	86	86.0%
Face	64	64.0%
Neck	4	4.0%
Chest (front & back)	55	55.0%
Abdomen & Pelvis	46	46.0%
Upper Limbs	85	85.0%
Lower Limbs	72	72.0%
Total number of injuries	426	
Mean number of Injuries per case	4.26	

Table 6: Showing types of injuries in the occupants of two-wheelers

Type of Injury	Frequency	Percentage
Abrasion	89	89.0
Fracture	83	83.0
Contusion	82	82.0
Laceration	79	79.0
Crush wound	5	5.0

Table 7: Showing cause of death in the victims

Cause of Death in Victims	Frequency	Percent
Head Injury	46	46.0
Head & Thorax injury	11	11.0
Head & lower extremity injury	9	9.0
Abdominal Injuries	9	9.0
Head, Abdominal & lower extremity Injuries	5	5.0
Head & Abdominal Injuries	3	3.0
Thoraco-abdominal Injuries	3	3.0
Multiple Injuries	3	3.0

Thorax & lower extremity Injuries	2	2.0
Lower extremity injury	2	2.0
Head & Neck Injury	1	1.0
Head, Thorax & lower extremity Injury	1	1.0
Head & Pelvic Injuries	1	1.0
Thorax Injuries	1	1.0
Thoraco-abdominal & lower limb injuries	1	1.0
Abdominal & lower extremity Injuries	1	1.0
Pelvic & lower extremity Injuries	1	1.0
Total	100	100.0

Table 8: Showing distribution of cases according to Fatal Injury (ies)

Fatal injury (ies)	Number of cases	Percentage
Head Injury	65	65
Head Injury and Lung Laceration	6	6
Head Injury and Liver Laceration	5	5
Head Injury and Spleen Laceration	3	3
Head Injury and Liver & Spleen Laceration	1	1
Head Injury and Pelvic Injury	1	1
Lung, Liver and Spleen Laceration	1	1
Lung and Liver Laceration	3	3
Lung Laceration	2	2
Liver Laceration	3	3
Spleen Laceration	3	3
Liver and Kidney Laceration	1	1
Liver Laceration and Abdominal Aorta rupture	1	1
Small Intestine Rupture	1	1
Lower Extremity Injury	3	3
Multiple Injuries	1	1
Total	100	100

Table 9: Showing distribution of cases according to regions involved in Head Injury

Scalp Injury (85%)		Skull Injury (52%)		Brain Injury (20%)	
Type of Injury	Percentage	Fracture (Bone involved)	Percentage	Type of Haemorrhage	Percentage
Contusion	54.0%	Temporal	48.0%	Sub-Dural	59.0%
Abrasion	22.0%	Occipital	33.0%	Sub-arachnoid	49.0%
Laceration	18.0%	Frontal	30.0%	Extra-dural	7.0%
		Parietal	28.0%	Intra-ventricular	5.0%
		Ant. Cranial Fossa	13.0%		

DISCUSSION

Accidents constitute complex phenomena of multiple causations. The etiological factors may be classified into two broad categories - human and environmental.[4] Up to 90% of the factors responsible for causation and prevention of accidents are attributed to human factors. The

important human factors could be related to the age, sex, lack of adequate training and experience, consumption of alcohol, lack of vigilance, 'the way of life' concept, 'problem drivers', emotional instability and disturbances, accident proneness, fatigue, visual efficiency, physical and mental defects, speed of driving in relation to traffic conditions and reaction time.[1]

Keeping in view the increasing incidence of fatal road traffic accidents, different workers have studied various epidemiological aspects of such fatalities in the past. The present study was undertaken to study fatal two-wheeler road traffic accidents with reference to pattern and distribution of head injury. Findings of the present study were then compared with the findings of previous studies.

Age incidence

In the present study, the most vulnerable age-group was between 21-30 years (28%) followed by 11-20 years (19%). This is due to the fact that these groups are the most active groups of the society. Sharma et al (2007) observed that 36% of the victims were in age group of 21-25 years.[5]Kakeri et al (2014) also observed that majority of the victims (29.5%) were in the age group of 20-30 years which is almost similar to the finding of present study.[8]

Sex incidence

Males were predominantly involved in the present study constituting 92 cases (92.0%) while female population comprised of 8 cases (8.0%). Males outnumbered females in the ratio of 11.5:1.

This was consistent with the earlier studies done by Sharma et al (2007), Mcharo (2012), Ravikumar (2013) and Kakeri et al (2014) who observed that males outnumbered females in ratio of 1.7:1, 6.4:1, 7.1:1 and 5.1 respectively. [6,7,8] This was due to the fact that males are engaged in outdoor activities, so have higher risk of accidents.

Victim-rider/ pillion-rider

In the present study, riders were victim in 68 cases (68.0%) and pillion-riders in the remaining 32 cases (32.0%). All the 8 cases (8.0%) of female victims were pillion-riders.

Sharma et al (2007) noticed that out of 134 autopsy cases of two-wheeler accidental deaths, riders were 88 (66.0%) and pillion-riders were 46 (34.0%).[5]Mcharo (2012) observed in his study that 46.7% of the cases of motorcycle crash injuries were found to be riders which is inconsistent with the present study.[6] Ravikumar (2013) observed in his study that majority of the victims (76.33%) were riders and 23.67% were pillion-riders.[7]

Helmet used or not

In the present study, only 3 victims (3.0%) were reported to have worn helmet at the time of accident. All of them were riders. None of the pillion-riders or female victims wore helmet at the time of accident. Out of 3 helmeted victims, scalp laceration and skull fracture were present in 2 cases and in 1 case contusion of scalp was seen. Intracranial haemorrhages were seen in all the 3 victims.

This was contrary to the studies of Sharma et al (2007), Mcharo (2012) and Ravikumar (2013) in which 46.0%, 44.9%, 64.18% and 13.5% of the victims respectively, wore helmet at the time of accident. [5, 6, 7]

Distribution of injuries

In the present study, head injuries (86.0%) were present in maximum number of cases followed by extremities (upper-85% and lower72%), face in 64.0% cases, chest (front and back) in 55.0% cases, abdomen and pelvis in 46.0% cases and neck in 4% cases.

This is consistent with the study of Oberoi et al (2011) which showed that head/ face was involved in 26.26% of cases, chest in 18.18%, abdomen in 4.24%, pelvis in 7.87%, and neck and spine in 1.80%. [9]

In the present study, upper extremities were involved more frequently (85.0% cases) than lower extremities (72.0% cases) which is contrary to the study of Oberoi et al (2011) which showed that lower extremities were involved more commonly (21.8%) than upper extremities (20.0%). [9]Mcharo (2012) in his study noticed that extremities (72.0%) were commonest body region involved followed by head region (34.1%), which is not consistent with the findings of present study. [6]

Pattern of injuries

In the present study, abrasion was the most common type of injury observed which was seen in maximum number of cases (89.0%). It was followed by fractures (83.0%), contusions (81.0%), lacerations (79.0%) and crush wounds in 5.0% of the cases.

Oberoi et al (2011) noticed that fracture was most common type of injury seen in 31.3% of two-wheelers road traffic accident victims followed by abrasions in 29.9%, lacerations in 29.1% and contusions in 9.7% of the cases. These observations

were dissimilar to the present study.[9]Pothireddy and Karukutla (2013) observed the similar view that abrasion was common type of injury present over the body area except over the head region where contusion was seen more commonly.[10]

Head injury

In cases of head injury, scalp injuries were seen in 85.0% of the cases followed by skull injuries in 52.0% and brain injuries in 20.0% of the cases. Out of injuries to scalp, contusion was most commonly seen (54.0%) followed by abrasion (22.0%) and laceration (18.0%). Skull fractures were seen in 52.0% of the cases in which temporal bone was most frequently fractured (48%) followed by occipital bone in 33%, frontal bone in 30% and parietal bone in 28% of the cases. Subdural haemorrhage was seen most commonly (59%) followed by sub-arachnoid haemorrhage (49%), extradural haemorrhage (7%) and intra-ventricular haemorrhage only in 5% of the cases. Brain contusions were seen only in 3% of the cases.

Ravikumar (2013) noticed in his study that skull fractures were seen in 67.75% of the victims. Linear fracture (55.43%) was the commonest pattern of fracture observed in these accidents. Sub-duralhaemorrhage followed by sub-arachnoid was the commonest intracranial haemorrhage.[7]Pothireddy and Karukutla (2013) observed that contusion of the scalp was more common (87.78%) injury as compared to the laceration (43.4%). Contusion of brain was seen in 60.3% cases and laceration in 13.74% cases. Fractures of skull were seen in 69.46%

of the cases. Intracranial haemorrhages were present in 76% of the cases in which sub-dural and sub-arachnoid haemorrhages were dominant. [10]

Fatal injury (IES)

In the present study, head injury was the most common fatal injury comprising 65% of the total cases followed by combined head injury and lung laceration comprising 6% of cases; combined head injury and liver laceration comprising 5% of cases.

The findings of the present study are consistent with the study ofOberoi et al (2011) in which head injury was also the most common fatal injury comprising 66% of the cases, followed by chest injuries (12%) and abdominal injuries (8%).[9]Pothireddy and Karukutla (2013) also observed that most of the victims (69%) died primarily of head injury.[10]

Cause of death

The present study revealed that head injury alone was the major cause of death in 46.0% of victims followed by combined head and thorax (11.0%), combined head and lower extremities and abdominal injuries (9.0% each).

The study done by Oberoi et al (2011) also observed that injuries to the head/face (26.26%) was the most common cause of death in the victim of two- wheeler accidents.[9]Ravikumar (2013) in his study on the pattern of head injuries in road traffic accidents involving two-wheelers also noticed that head injuries constituted as a major cause of death in occupants of two-wheelers.[7]

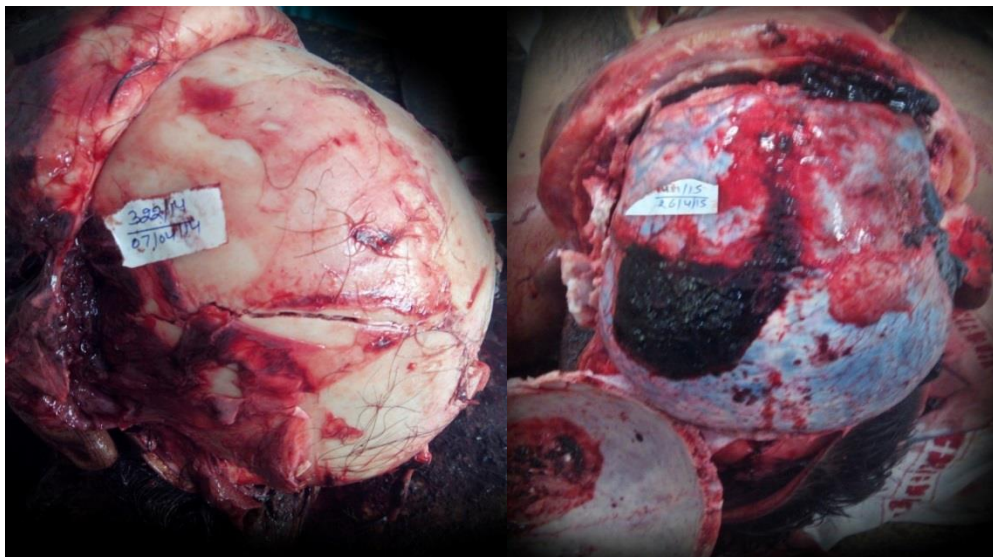


Image 1: Skull Fracture

Image 2: Extra-dural Hematoma



Image 3: Sub-dural Hematoma



Image 4: Sub-arachnoid Hemorrhage

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