Original Research Article

Patterns of head injury in injured motorcyclists wearing helmets and not wearing helmets presenting to the emergency

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Abstract

Background: Injury from motorcycle is a considerable cause of deaths and disability. It is becoming one of the most serious public health problems, not only in developed countries but higher in low and middle-income countries. **Aim:** Current study aimed to compare the patterns of head injury in injured motorcyclists wearing helmets and those not wearing helmets presenting to the emergency department of a tertiary care institute and to identify the impact of helmet use on severity of traumatic brain injury. **Method:** An observational cross sectional study for patients who sustained head injuries related to motorcycle crashes between March 2014 and March 2015. A total of 200 patients were selected of which 100 wearing helmet and 100 not wearing helmet, in the age group 18-80 years. Participant bio data, injury history, injury associated symptoms, alcohol consumption, and neurological findings, and Glasgow Coma Scale were measured using questionnaires. Frequencies, Mean (SD) and chi-square was employed in the analysis. Results were considered significant at $p<0.05$. **Results:** 18-38 years age(58.50%) was the most common group to sustain a head injury. The most common presenting complaint was vomiting (64.5%) followed by loss of consciousness (60.5%; n=121), post traumatic amnesia (20%). 31 % ENT bleeding, and 22 % seizure. 45 % of patients had a GCS score of moderate head injury(9-12), 34.5% in score 13-15, and 20.5%had score of 3-8. Among the helmet wearers, 26% had history of alcohol consumption, 22% among the non helmet wearers had alcohol consumption. 82.1% (n= 23) of non-helmet wearers had an EDH greater than 10 mm size. Among the patients with SAH with a midline shift ≥ 5mm was seen in 25.9% patients who wear helmet wearers, and 74.1% were not having a helmet during the insult. The size of EDH was greater in non helmet wearers. Most of the helmet wearers have mild traumatic brain injury whereas non helmet wearers had more severe TBI (p= 0.04). Helmet wearing reduces the size of contusion (p=0.001) following TBI. the helmet wearers 25% (n=2) died, and among the non helmet wearers 75%(n=6) died(P = 0.14). **Conclusion:** Majority of motorcycle crash injury victims sustained head injury. Few of the victims used safety helmets at the time of the motorcycle crash. Use of helmets was protective of sustaining mild to severe head injuries among crash injury victims. Medical professionals must educate the public regarding the societal and personal cost of unhelmeted motorcycle riding. Legislation mandating helmet usage for motorcycle riders must be sought.

Keywords: head injury, helmet use, motorcycle crash injury

Introduction

The World Health Organization (WHO) estimates that about 1.2 million die and 50 million are injured yearly [1]. Motorcycle is used purposely for transportation because it is cheap and fast access to areas not pliable by motor vehicles [2]. Helmets usually made of a rigid fiberglass or plastic shell, a foam liner, and a chinstrap, have been the principal countermeasure for preventing or reducing head injuries from motorcycle crashes. **T**raumatic Brain Injury (TBI) is defined as an injury to the head that results from blunt or penetrating trauma or acceleration or deceleration forces that temporarily or permanently disrupts the brain function[3]. In a developing country like India, due to rapidly increasing motorization, the incidence of road traffic accidents and associated traumatic brain injuries are increasing.

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Morbidity rather than mortality is the main concern as TBI dramatically diminishes the quality of life of the survivors. Road traffic accidents are one of the most common causes of head injury in developing India, which puts an enormous strain on our country's health care system and the national economy. Head injury covers a wide range of severity from patients who die before admission to hospital to mild injuries that do not require hospital attendance.

Classification of TBI severity is crucial to understanding and describing the clinical management and burden of TBI. There is no classification system for TBI that meets every need. The corollary of this principle is that different classification systems meet differing needs. Several scoring systems are used for assessing the neurological status of patients with TBI which include the Glasgow Coma Scale (GCS), the trauma score, the trauma score revised, the Head Injury Severity Scale and the Abbreviated injury scale. The GCS despite its limitations is the most commonly used system. GCS is a simple, practical scale used to determine an injured person's level of consciousness to predict outcomes for patients with TBI and classify TBI as mild (GCS 13-15), moderate (GCS 9-12) or severe (GCS 3-8).

Mild TBI (MTBI) is an acute brain injury resulting from mechanical energy to the head from external physical forces. Operational criteria for clinical identification include: (i) one or more of the following: confusion or disorientation, loss of consciousness for 30 minutes or less, post-traumatic amnesia for less than 24 hours, and/or other transient neurological abnormalities such as focal signs, seizure, and intracranial lesion not requiring surgery; (ii) Glasgow Coma Scale score of 13–15 after 30 minutes post-injury or later upon presentation for healthcare. These manifestations of MTBI must not be due to drugs, alcohol, medications, caused by other injuries or treatment for other injuries (e.g. systemic injuries, facial injuries or intubation), caused by other problems (e.g. psychological trauma, language barrier or coexisting medical conditions) or caused by penetrating craniocerebral injury[2,3]. "Mild TBI is considered as a non surgical condition which is frequently confronted by neurosurgeons. The belief that mild TBI is always completely reversible and has no long term consequences has been dismissed because in some cases, long term cognitive sequelae like depression and dementia have been reported

Short term effects include sudden temporary loss of consciousness, traumatic amnesia, post traumatic convulsive movements, post traumatic autonomous disturbances. Long term effects include headache, drowsiness, irritability, sleep disorders, memory problems. It may also increase the risk for Alzheimer's disease and depression. Transient loss of consciousness occurs in most of the patients with MTBI which is explained by five prominent theories of concussion such as the vascular, reticular, centripetal, pontine cholinergic and convulsive hypotheses. Among these, Reticular Hypothesis, is the most accepted one which postulates that concussive force temporarily disturbs activity within the brain stem including the Reticular Activating System.

Moderate TBI is commonly defined as patients presenting with TBI and a post resuscitation GCS score of 9 – 12. It is an uncommon entity on which little specific research has been conducted. Due to the potential for profound functional impairment after moderate TBI, patients must be aggressively treated with early diagnosis and neurosurgical consultation, serial examinations (physical and radiographic), evacuation of mass lesions, control of intracranial pressure and prevention of secondary insults. There are 53 practically possible GCS scores under moderate TBI. Moreover the initial GCS score may be artificially low because of non CNS pathology such as hypoxia, hypotension and alcohol intoxication. These make the diagnosis of moderate TBI a daunting task in the emergency department.

Severe TBI corresponds to a post resuscitation GCS score of 8 or less. The head injury severity scale described by Stein further subcategorizes severe TBI into two subgroups. A post resuscitation GCS of 5 to 8 corresponds to a "severe brain injury" and a score of 3 to 4 represents "critical brain injury". The proper and timely management of severe TBI is essential to increase survivability and recovery after a head trauma. Moderate and severe head injury is associated with 1.5 times increased risk of depression and a 2.3 and 4.5 times increased risk of Alzheimer's disease[1].

There is need for more literature on these injuries that will inform stakeholders on the magnitude of the problem. Majority of motorcycle injuries are preventable, a clearer understanding of the magnitude, contributing factors and injury patterns is essential for establishment of prevention strategies as well as treatment protocols.

Aim of the study is to compare the patterns of head injury in injured motorcyclists wearing helmets and those not wearing helmets presenting to the emergency department of a tertiary care institute and to identify impact of helmet use on severity of traumatic brain injury.

Materials and methods

An observational cross sectional study was done during the period from March 2014 to March 2015, in the Emergency Department of Government Medical College, Kozhikode. The study subjects were injured motorcyclists attending our department following trauma, during the study period. A total of 200 patients were selected of which 100 wearing helmet and 100 not wearing helmet, in the age group 18-80 years. Patients with polytrauma, having severe maxillofacial injuries, age less than 18 years and more than 80 years, were excluded. Informed written consent was obtained from all patients /his/her relatives to include in the study group. The basic information collected were:

1. Demographic information about the patient.
2. Pre hospital care data if available.
3. Whether helmet used or not.
4. Whether motorcycle rider or pillion rider.
5. Information about injury associated symptoms like loss of consciousness, vomiting, seizure, ENT bleeding, post traumatic amnesia.
6. History of alcohol consumption prior to the accident.

Severity of traumatic brain injury was assessed using Glasgow Coma Scale after initial resuscitation as per Advanced Trauma Life Support (A.T.L.S) Protocol [4] in the Emergency Department. CT head was taken for patients who met either Canadian CT Head Rule or New Orleans Criteria[5,6].

Table 1:New Orleans criteria and Canadian CT head rule

New Orleans Criteria—GCS 15*	Canadian CT Head Rule—GCS 13–15*
Headache	GCS <15 at 2 hours
Vomiting	Suspected open or depressed skull fracture
Age >60 years	Any sign of basal skull fracture
Intoxication	More than one episode of vomiting
Persistent antegrade amnesia	Retrograde amnesia >30 minutes
Evidence of trauma above the clavicles	Dangerous mechanism (fall >3 ft or struck as pedestrian)
Seizure	Age >65 years

Outcome variables measured were severity of traumatic brain injury, scalp laceration, head CT findings like skull fracture, size of hemorrhages and death among the two groups. A cut off point was set for each hemorrhages and contusion for easy comparison between the groups and to know the effect of helmets.

While comparing the intraparenchymal hemorrhage and contusion a cut-off point of 5mm was taken and the patients were grouped into three ; size <5mm, size ≥5 mm, absent. While comparing the Subdural hemorrhage and Extradural hemorrhage a cut off value of 10 mm was taken and patients were divided into three groups; size<10 mm, size ≥10 mm, absent.

For Subarachnoid hemorrhage the cut-off point taken was midline shift of 5mm. Three groups were taken for comparison, the first group included patients with Subarachnoid hemorrhage or Subarachnoid hemorrhage with midline shift <5mm, second group included patients with Subarachnoid hemorrhage and midline shift ≥5mm, last group was without Subarachnoid hemorrhage. Death during the first 6 hours of stay in the Emergency Department was taken into account. After data collection, statistical analysis was done using SPSS 18 software for windows.

Results

A total number of 200 patients brought to the emergency department following road traffic accident who were motorcyclists of which 100 were helmet wearers and 100 were non-helmet wearers were included in the study after ensuring they did not fall into exclusion criteria.

The age group included in the study was 18-80 years, of which the age group 18-38. (58.50% ;n=117) was the most common group to sustain a head injury. Of the 200 patients ,predominant group were males 83 % (n=166) . 17 % (n= 34) were females. Riders constituted the major study population n=159 (79.50%). 41 were pillion riders (n=41).

Presenting symptoms

The most common presenting complaint of head injury patients in the emergency department was vomiting (64.5% ;n= 129) followed by loss of consciousness (60.5%; n=121). The least common complaint was post traumatic amnesia (20 %; n=40). 31 % (n= 62) of the patients had ENT bleeding and 22 % (n=44) had seizure.

GCS score

45 % (n=90) of the patients had a GCS score of moderate head injury(9-12).34.5% (n=69) of the patient had a score 13-15 and 20.5% (n=41) had score of 3-8.

Alcohol use

Among the helmet wearers 26% (n=26) had history of alcohol consumption. 22% (n=22) among the non helmet wearers had history of alcohol consumption.

Head injury frequency

The most common CT finding among the head injury patients was contusion (49.50%; n=99) followed by subdural hemorrhage (48.50%;n=97). The least common finding was intraparenchymal hemorrhage(5.50%;n=11). EDH and SAH constituted (40%;n=80) and (33%;n=66) respectively. 20 % (n=40) had skull fracture(Table 1).

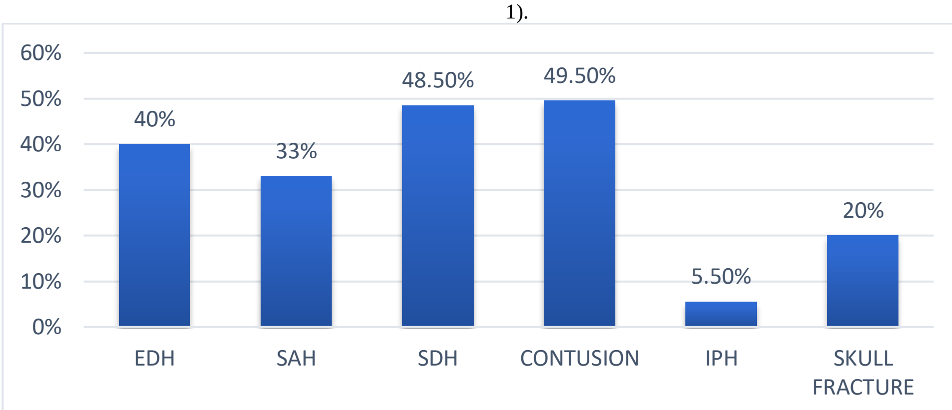

Fig 1:Head injury frequency

EDH frequency: Among the 200 patients, 26 % (n=52) had an EDH size <10mm. A total of 40% (n=80) had EDH.

SAH frequency: SAH was seen among 33 % (n=66) of patients among which 19.5% (n=39) had an SAH with or without midline shift of less than 5mm.

SDH frequency: Among the patients with SDH, SDH size <10 mm was 24% (n= 48) and SDH size ≥ 10 mm was 24.5% (n=49).

Contusion frequency: Most of the contusions were <5mm, which constituted 39% (n=78). 50.5% (n=101) had no contusions.

Intraparenchymal hemorrhage frequency: The patients with Intraparenchymal hemorrhage was only 9.5% (n=19). Among which 5.5% (n=11) had a size greater than 5 mm.

Scalp injury and intracranial injury frequency: Scalp injury was present in 57.5 % (n=115) of the total patients. 73.5 % (n= 147) had sustained an intracranial injury. 44%(n=88) had both scalp injury and intracranial injury.

Table 2:Frequency of head injury

Classification	Percentage	Frequency
MILD	34.5 %	69
MODERATE	45%	90
SEVERE	41%	41

Mortality: A total of 8 deaths were reported among the whole study group, during the initial period of 6 hours stay in the emergency department due to head injury.

Association of helmet usage and scalp injury: There is a significant relation between helmet wearing and having a scalp injury (p =0.000). Among the 100 patients who were wearing helmet 33.9 % (n=39) had a scalp injury where as among nonwearers it was 66.1% (n= 76). This shows that helmet wearing have protective effect from scalp injury (Figure 2).

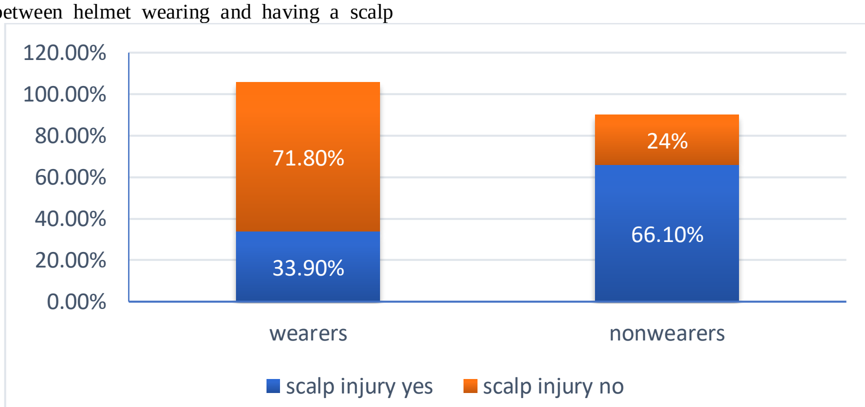

Fig 2:Association of helmet usage and scalp injury

Association of intracranial injury and helmet use: There is no significant relationship between having a helmet and sustaining a head injury(p=0.168). But among the helmet wearers 47.6%(n=70) had a head injury whereas it was 52.4% (n=77) among the nonwearers. Though there is no significant association between helmet wearing and head injury there is a increased incidence of head injury in non-helmet wearers.

Association of helmet status and having both scalp and head injury: There is a significant association between helmet usage and having both scalp and head injury simultaneously. 33% (n=29) had a helmet and sustained both injuries, whereas 67% (n=59) was not wearing a helmet, but had injuries.

Association of helmet use and skull fracture: Among the patients with skull fracture 27.5% (n=11) had a helmet and 72.5% (n=29) not had a helmet. There is a significant association skull fracture and helmet (p value=0.002). From the data it is clear that helmet has a protective effect from skull fractures(Figure 3).

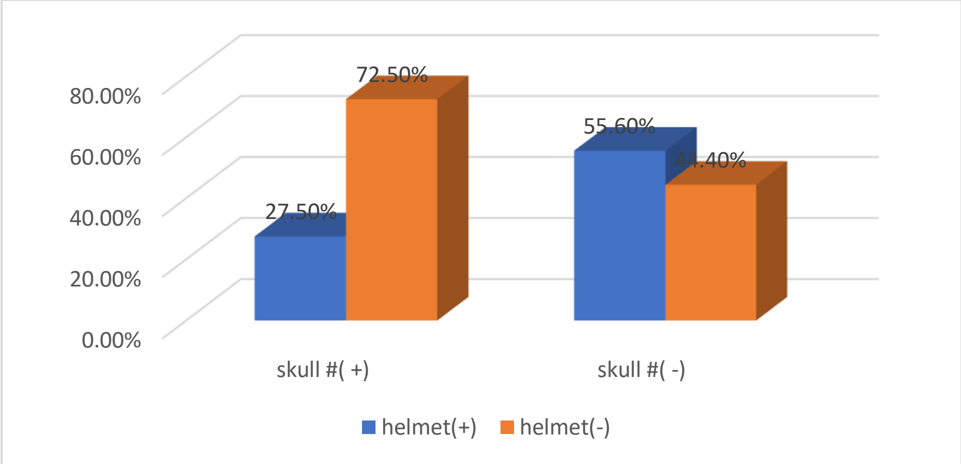

Fig 3:Association of helmet use and skull fracture

Association of EDH size and helmet use: While comparing the EDH size among the patients, the non-helmet wearers had a higher chance of having larger EDH. 82.1% (n= 23) of non-helmet wearers had an EDH greater than 10 mm size. But while comparing EDH size <10 mm size both helmet wearers and non-helmet wearers had equal incidence 50% (n=26). Statistical analysis shown that there is a significant association between helmet wearing and EDH size (p value=0.001).

Association of SAH and helmet use: Since SAH size calculation was difficult, presence of SAH and associated midline shift was used for comparison. Among the patients with SAH with a midline shift ≥ 5mm was seen in 25.9% (n=7) patients who wear helmet wearers , and 74.1% (n=20) were not having a helmet during the insult. In the group with SAH or SAH and midline shift of less than 5 mm 43.6% (n=17) had a helmet and 56.4%(n=22)did not wear helmet.

Association of SDH size and helmet use: SDH size and helmet wearing had a significant association (p =0.007). Among patients with SDH size< 10 mm, 58.3% (n=28) had a helmet whereas 41.7%(n=20) did not have helmet. Among SDH ≥10 mm size, patients 30.6% (n=15) had helmet whereas 69.4% (n=34)did not wear a helmet. The size of EDH was greater in non helmet wearers

Association of helmet usage and contusion: Contusion was another important head injury seen. Contusion less than 5mm was almost same in helmet wearers (48.7%;n=38) and non helmet wearers(51.3%;n=40). Size of contusion was more in non helmet wearers(85.7%;n=18). Helmet wearing reduces the size of contusion(p=0.001) following TBI.

Association of intraparenchymal hemorrhage & helmet use: Wearing a helmet doesn't have much effect on IPH size. IPH size depends on multiple factors whether the patient is on anticoagulants, old age, antiplatelets. Statistical analysis showed that there is no association between helmet wearing and size of IPH (p= 0.483)(Figure 4).

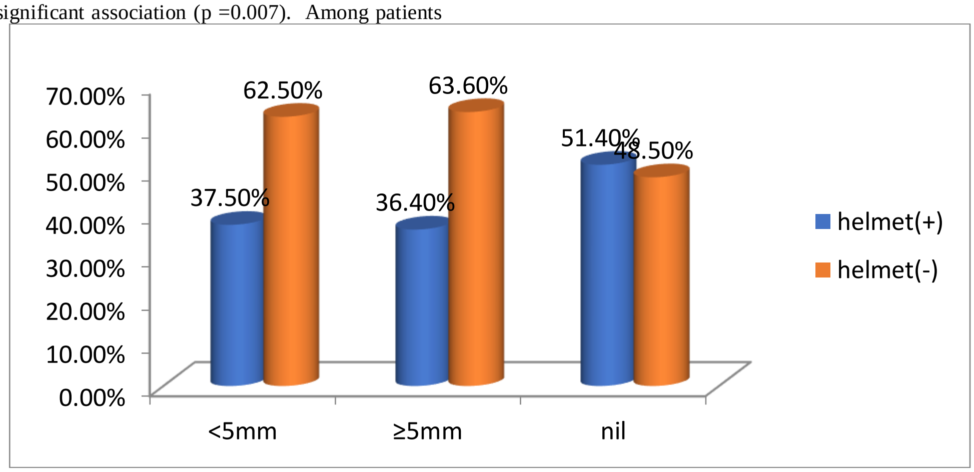

Fig 4:Association of intraparenchymal hemorrhage & helmet use

Association of helmet status and death: Mortality and helmet status do not have a significant relation (P = 0.14). Death was not modifiable by helmet use. But among the helmet wearers 25% (n=2) died, and among the non helmet wearers 75%(n=6) died.

Association of helmet use and severity of brain injury: Usage of helmet helps in reducing the severity of head injury than having a head injury. Most of the helmet wearers have mild traumatic brain injury whereas non helmet wearers had more severe TBI. A significant association was seen between helmet wearing and severity of head injury.(p= 0.04)(figure 5)

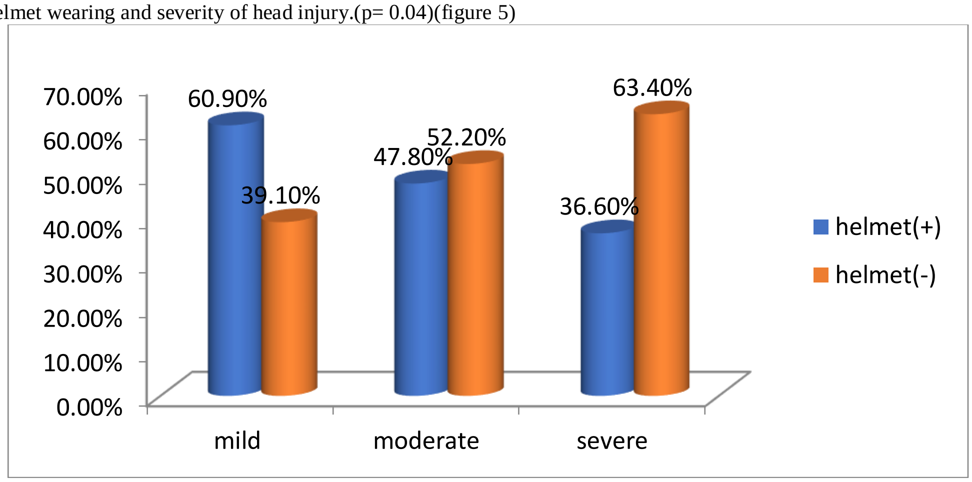

Fig 5:Association of helmet use and severity of brain injury

Discussion

Among the 200 patients, 117(58.5%) patients were under the age group of 18-38 years. Most common affected group was age group 18-38 years. Among the 200 patients, 83% (n=166) were males and 17 % (n=34) were males. Results were comparable with other studies. *Das Chattopadhyay et al.* reported in their series of 3861 patients 2421 (62.6%) patients were of age in between 21-40 years[7]. *Michael Fitzharris , et al'* s study [8],378 MTV users were enrolled to the study of whom 333 (88.1%) were male, and median age was 31.3 years. *Galwankar et al's* study population median age of the study population was 31 years (range <1 year to 98 years)[9]. The majority of TBI cases occurred in persons aged 21 - 30 years (535 or 27.7%), and in males (1,363 or 70.76%).

Rider status and helmet use

Among the 200 patients studied , 159 (79.5%) patients were riders and 41 (17%) were pillion riders. Since the study was a comparative one, 100 helmet wearers and 100 non helmet wearers were included. In the study none of the pillion riders wore a helmet. These findings were comparable to the study by *Ravikumar*,[10] which showed 187(76.33%) motorcycle riders and58(23.67%)pillion riders out of 245 cases .67(35.82%) Riders, among 187 riders had not been wearing a helmet at the time of accident. None of the pillion riders had been wearing Helmet.In *Michael Fitzharris , et al'* s study there were 378 Motor Traffic Vehicle(MTV) users out of which 252 (66.7%) being riders. The median age for riders was significantly older than thatof the pillions. There were significantly fewer riders < 20 years of age (11.1%) than pillions(26.2%) and more riders (29%) > 40 years of age than pillions(18%). There were few children aged 1–9 years (3, 0.8%) and 10–14 years of age (9,2.4%), with all but one child aged 10 – 14 years being pillions.

*Murdock et al'*s study shown that patients wearing helmets averaged 26 years of age, and those not wearing them averaged 25 years[11]. Of 474 patients, 236 patients(50%) were not wearing a helmet, 111 (23%) were wearing ahelmet, and for 127 patients (27%) helmet usage was not documented. Most of the patients (449, or 95%) were male. Of the helmet users, 97% were male, and92% of non helmeted users were male.

Patterns of head injury and ct findings: The most common CT finding in the present study was contusion (49.5%) followed by SDH(48.5%), EDH(40%), SAH(33%), SKULL FRACTURE(20%), IPH(5.5%). The laceration was present in57.5% (n=115) of the total patients and intra cranial injury was present in 73.5%(n=147) patients. In the IMPACT[12] study, which included 9 randomised clinical trials in TBI patients, the range of frequency for EDH and SDH was 7.20% and 20.36%respectively. Payman Asadi et al's study showed subdural hemorrhage (45.9%) ,epidural hemorrhage (23.7%) and intracranial hemorrhage accompanied by brain contusion (17.1%) as the most common findings of brain CT scans[13].

In the study conducted by *Ravikumar*,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. Sub duralhaemorrahage (SDH) in 92.80% followed by sub arachnoid haemorrahage (SAH) in 76.80%, Intra cranial haemorrahage (ICH) in 17.60% and least is extra duralhaemorrahage (EDH) in 4.83% in riders. In our study Subdural hemorrhage and contusions were the most common findings which was comparible with other studies (Table 2).

Table 3: Comparison of various studies

STUDY	PATTERNS OF HEAD INJURY					
	Laceration	Contusion	SDH	SAH	EDH	IPH
Michael Fitzharris et al.	35%	30 %	23 %	21 %	5%	-
Perel et al	-	-	30%	22%	22%	22%
CRASH TRIAL	-	-	27%	-	-	-
IMPACT STUDY	-	-	20.36%	-	7.2%	-
Payman Asadi et al	-	17.1%	45.9%	-	23.7%	-
Ravikumar (riders)	-	-	92.8%	76.8%	4.83%	17.6%
Lalitkumar et al.[14]	50.2%	-	-	12.2%	7.2%	-
Current Study	**73.5%**	**49.5%**	**48.5%**	**33%**	**40%**	**5.5%**

Mortality

The study has got a significant relation between helmet wearing and having a scalp injury(p value =0.000). Among the 100 patients who were wearing helmet 33.9 % (n=39) had a scalp injury whereas among nonwearers it was 66.1% (n= 76). This shows that helmet wearing have protective effect from scalp injury. There is no significant relationship between having a helmet and sustaining a head injury (p =0.168). But among the helmet wearers 47.6% (n=70) had a head injury whereas it was 52.4% (n=77) among the nonwearers.Though there is no significant association between helmet wearing and head injury there is a increased incidence of head injury in nonhelmet wearers. There is a significant association between helmet usage and having both scalp and head injury simultaneously. 33% (n=29) had a helmet and sustained both injuries, whereas 67% (n=59) was not wearing a helmet, but had injuries.Among the study group with skull fracture 27.5% (n=11) had a helmet and 72.5% (n=29) not had a helmet. There is a significant association between skull fracture and helmet (p value=0.002). From the data it is clear that helmet has a protective effect from skull fractures. While comparing the EDH size among the patients, the non helmet wearers had a higher chance of having larger EDH. 82.1% (n= 23) of non helmet wearers had an EDH greater than 10 mm size. But while comparing EDH size <10 mm size both helmet wearers and non helmet wearers had equal incidence 50% (n=26). Statistical analysis shown that there is a significant association between helmet wearing and EDH size (p value=0.001).Among the studied population, SAH with a midline shift ≥ 5mm was seen in 25.9% (n=7) patients who wear helmet wearers ,and 74.1% (n=20) were not having a helmet during the insult. In the group with SAH or SAH and midline shift of less than 5 mm 43.6% (n=17) had a helmet and 56.4%(n= 22) didnot wear a helmet. SDH size and helmet wearing had a significant association (p value=0.007). Among patients with SDH size< 10 mm 58.3% (n=28) had a helmet whereas 41.7%(n=20) did not have helmet. Among SDH ≥10 mm size patients 30.6% (n=15) had helmet whereas 69.4% (n=34)did not wear a helmet. The size of EDH was greater in non helmet wearers . Giannoudis e's study shown that the mean GCS of patients at the time of arrival in the emergency department was 13.7 (range, 3–15). The mean GCS in the group not wearing protective headgear was 6 compared to 13 in the group that did. Summer et al done a prospective study and shown head injurywas sustained by 4/114 (4%) of helmet wearers compared with 100/928 (11%) of nonwearers.The study conducted in Colorado showed that proper motorcycle helmet wearing could prevent head injuries 2.4 times better than those not wearing a motorcycle helmet (Gabella et al, 1995). Chiu et al. (2000) reported that un-helmeted motorcyclists were two times more likely to sustain a head injury in the event of a crash compared to helmeted motorcyclists. Liu et al (2008) demonstrated that the helmet may reduce head injuries and death by 72%.All studies have shown that helmets have a protective effect in head injury. Severity of head injury has a definite association with helmet usage. Mortality rate was not comparable with other studies because only the death during the initial 6 hours of stay in the Emergency Department was taken into consideration[14]

Limitations

1. Potential confounders like mechanism of injury, age, alcohol , type of helmet used, proper fastening of helmet , standard of helmet used, use of anticoagulants and antiplatelets , brain edema, diffuse axonal injury were not taken into consideration.
2. Another important limitation of the study is the unmeasured factors not taken into account which may have placed the patient at lesser risk from the accident.
3. Timing of CT is another limitation because most of the CT reports used for data analysis was the CT taken during initial 4 hours. So SAH may have been missed because usually CT scans performed 6 to 8 hours after injury are more sensitive for detecting traumatic SAH.
4. Outcome of the patients has not compared.

Conclusion

In the current study, there is no significant association between usage of helmets and presence of intracranial injury, but association is seen with the size and severity of head injury. Most of the helmet wearers had intracranial bleeding less than the cut off the point. Non helmet wearers had more of moderate and severe head injury and the intracranial bleeding size was large. These findings are consistent in suggesting a protective effect of motor cycle helmets on severe head injuries. The preventive measures must be implemented to reverse the trend of accident related brain injuries for which the first step is to document the problem. Besides the authorised and strict implementation of universal laws, health education programmes focused on children, adolescents and young adolescents and young adults will most likely improve the helmet use. Initial aggressive management to prevent all the known causes of secondary systemic insults like hypotension, hypoxia, hyperpyrexia, hyperglycemia, seizures, hypothermia should be initiated in the Emergency Department. Medical professionals must educate the public regarding the societal and personal cost of unhelmeted motorcycle riding. Legislation mandating helmet usage for motorcycle riders must be sought.

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