Frequency and severity of Cervical spine injuries in motorcycle riders with and without helmet use

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ABSTRACT

Objective: To determine the frequency and severity of cervical spine injuries in motorcycle riders with and without helmet use.
Methods: This descriptive study was conducted in Accident and Emergency Department, Khyber Teaching Hospital Peshawar from 23rd January 2019 to 23rd December 2019. All patients fulfilling the inclusion criteria were enrolled in the study. The Abbreviated Injury Scale(AIS) was used for documenting the frequency and severity of cervical spine injuries in helmeted and unhelmeted motorcycle riders. The neurological status was evaluated with American Spinal Injury Association(ASIA) impairment scale.
Results: A total of 559 motorcycle riders were included in our study. Helmet users were 123(22%) and non-users were 436(77.9%). The mean age of helmeted group was 39±6SD and unhelmeted group was 28±11SD. The frequency of cervical spine injury was noted in 8(6.5%) patients wearing helmets and in 87(19.9%) patients not wearing helmets.(*P* value <0.05)The cervical spine injuries in helmeted were AIS1 in 6(75%) patients and AIS2 in 2(25%) patients. The types of cervical spine injuries in unhelmeted were AIS2 in 10(11.4),AIS3 in 70(80.4%) and AIS4 in 7(8%) patients. No neurological impairment was noted in helmeted group while unhelmeted group had ASIA C in 7(8%) and ASIA D in 10(11.4%) patients on arrival to hospital.
Conclusion: The frequency and severity of cervical spine injuries in unhelmeted motorcycle riders were more than helmeted riders. Motorcyclists wearing helmets were not prone to increased risk of cervical spine injuries during collisions, rather wearing helmet had some protective advantage.
Key Words: Abbreviated Injury Scale, ASIA Impairment Scale , Cervical spine, Helmet, Motorcycle.

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INTRODUCTION

Deaths due to road traffic accidents are ranked as the third most important health problem in developing countries and majority of these deaths are due to motorbike collisions.[1] Although there is a clear consensus in the literature that helmets are protective in reducing the frequency and severity of traumatic brain injuries among the motorcyclists,[2-5] its impact on cervical spine injury is still controversial.[6]The anti helmet lobby is of the opinion that wearing helmet not only decreases the vision of motorcyclist but predisposes the rider to increased cervical spine injury due to increase weight of the head resulting in accelerated traction forces and torque to the cervical spine during collision.[7-10] However some authors have documented that wearing helmets during motorcycle accidents neither increased or decreased the risk of cervical spine

injuries,[11-13] while other studies were not able to provide any solid evidence of increased frequency or severity of cervical spine injuries in motorcyclists wearing protective helmets.[14-15]

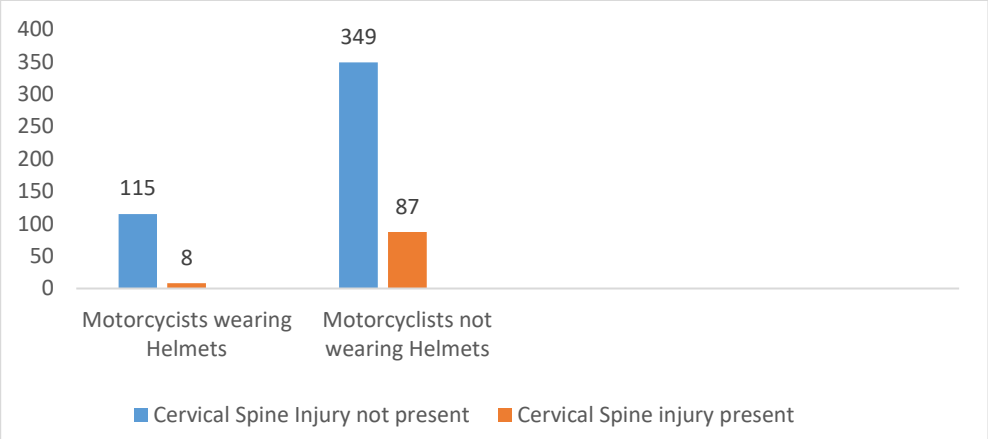
In order to solve this controversy we conducted this study to determine the frequency and severity of cervical spine injuries in motorbike riders with and without helmet use, presenting to Accident and Emergency Department ,Khyber Teaching Hospital Peshawar. We hypothesized that motorcyclists wearing helmets were not prone to increased risk of cervical spine injuries during collisions, rather wearing helmet had some protective advantage. To our knowledge this was the first study in our set up on this topic. The results of this study will help us in formulating standard guidelines for managing such patients in Accidents and Emergency Department. Recommendations for legislature on mandatory helmet use for motorcyclists and strict implementation will be advised accordingly.

METHODS

This descriptive study was conducted in Accident and Emergency Department ,Khyber Teaching Hospital Peshawar from 23rd January 2019 to 23rd December 2019.All motorcyclists with accidents presenting to the Accident and Emergency Department for treatment were included in our study. Patients with head injury and passengers of the motorbike accidents were excluded from the study. The Ethical Review Board gave approval of the study. Informed written consent was taken from the patient or responsible attendant for treatment and study publication. All the patients were resuscitated according to the ATLS protocols and appropriate treatment for other injuries were given. In patients with suspected cervical spine injury immobilization of the cervical spine was done with a cervical collar. In the included subjects complete history and physical examination was done. Radiographs and MRI of the cervical spine was done in all patients with cervical spine injury once clinically stabilized. We used the Abbreviated Injury Scale (AIS)[16] for classification of cervical spine injuries. The cervical spine injuries were classified as AIS1 (Minor), AIS2 (Moderate), AIS3 (Serious), AIS4 (Sever), AIS5 (Critical) and AIS6 (Maximum injury-virtually survivable). The frequency and severity of cervical spine injuries were noted in both helmet users and non-users. The neurological status of both groups at presentation was noted using American Spinal Injury Association(ASIA)[17] Impairment Scale. The collected data was analysed with SPSS(version 22) and presented as frequency, percentage and mean±SD. Important variables in helmeted and unhelmeted groups were compared and Chi-square test was applied(*P* value<0.05 was considered as significant) The data represented in graph and tables where necessary.

RESULTS

The total number of motorbike accidents victims enrolled in our study were 559.The mean age of helmeted group was 39±6SD and unhelmetd group was 28±11SD. All patients were males. Majority(77.9%,n=436) of motorcycle riders were without helmet at the time of accidents while only 123(22%) motorcyclists had helmets at the time of collision. Cervical spine injury was noted in 8(6.5%) patients wearing helmets and in 87(19.9%) patients not wearing helmets.(Graph 1) This was statistically significant(*P* value<0.05).The cervical spine injuries in helmet users were AIS1 in 6(75%) patients and AIS2 in 2(25%) patients. The types of cervical spine injuries in unhelmeted were AIS2 in 10(11.4),AIS3 in 70(80.4%) and AIS4 in 7(8%) patients. Unhelmeted motorbike drivers had more sever form of cervical injuries including cervical vertebrae fractures(19.5%,n=17) than helmeted as shown in table I. Associated injuries in helmet users with cervical spine injuries included fracture tibia fibula in 2(25%) patients and radius ulna in 1(12.5%) patient. Non helmet users with cervical spine injuries had tibia fibula fractures in 11(12.6%),radius ulna in 4(4.5%),femur fracture in 4(4.5%),clavicle fracture in 3(3.4%) and humerus fracture in 1(1.1%) patient. All the patients were managed accordingly. All helmeted patients had no neurological impairment as assessed with ASIA scale while 10(11.4%) patients had ASIA score D and 7(8%)C among unhelmeted patients.(table II).No in hospital mortality noted.



Graph I: Graph showing frequency of cervical spine injuries in helmeted and unhelmeted motorcyclists.

Table I: Comparison of cervical spine injuries in helmeted and unhelmeted motorcyclists.

Type of Cervical Spine Injury	Helmeted (n= 8)	Unhelmeted (n= 87)
Cervical Spine Fractures	-	17(19.5%)
• C5 fracture	-	3(17.6%)
• C6 fracture	-	5(29.4%)
• C7 fracture	-	9(52.2%)
Ligamentous Injury	4(50%)	10(11.4%)
Cervical Contusion	2(25%)	48(55.1%)
Cervical Strain	2(25%)	12(13.7%)

Table II: The neurological status of both groups at presentation using American Spinal Injury Association(ASIA) impairment scale.

ASIA Score	Helmeted(n=8)	Unhelmeted (n=87)
A	--	--
B	--	--
C	--	7(8%)
D	--	10(11.4%)
E	8(100%)	70(80.4%)

DISCUSSION

In our study majority(77.9%) of motorcyclists were not wearing helmet at the time of collision while only few(22%) motorbike riders were reported to had helmets on at the time of accident.We noted that the frequency of cervical spine injuries were higher in unhelmeted than helmeted motorcyclists(19.9% versus 6.5%).Page and Wei[12] conducted a study on 1061 motorcycle accidents and found that 30.4% were helmeted and 69.6% were unhelmeted at the time of collision. The frequency of cervical spine injury was 7.4% in helmeted group and 15.4% in unhelmeted group. Fractures of the cervical vertebrae were found in 4.6% of patients wearing helmets and 10.8% patients not wearing helmets. This was in contrast to our study as we did not document any cervical spine fracture in helmeted group. Their study concluded that cervical spine injury was more frequent and more sever in motor cycle riders driving without helmets than those driving with helmets. They advocated that use of helmet should be strictly implemented for all motor cycle riders. Park *et al*[18] conducted a case control study on 2600 motorcycle accidents. Helmet users were 44% and unhelmeted were 56%.Cervical spine injury was noted in 33.5% in helmeted versus 66.5% in unhelmeted motorcyclist. Mortality was high in unhelmeted than helmeted(7.1% versus 2.4%)The authors concluded that helmets were protective against cervical spine injury in motorbike accidents. Similarly another study on 40,890 motor cycle riders

reported that 77% riders had helmets at the time of accidents while 23% had not. Helmeted riders were reported to had 22% reduced chances of cervical spine and 37% decreased odds of mortality than unhelmeted.[19]

Some interesting findings were noted by Ooi and his colleagues [6] after studding the injury model of 76 motorbike accidents in detail. They proposed that helmets were somewhat protective against cervical spine injuries in frontal collisions only. Whereas non frontal collisions like side-impact, rear-end impact and skidded collisions increased the chances of cervical spine injuries in helmeted motor cycle riders than unhelmeted. They suggested that weight of the helmet should be reduced to decrease cervical spine injuries among the helmeted motorcyclists.

Sarkar[20] reviewed records of 173 motorcycle accidents and noted that helmeted drivers are 9 times more prone to had cervical spine injuries than unhelmeted. Sarker,s findings are rejected by Moskal[21] who reviewed the records of 17631 motorcycle collisions and documented that helmets protected the drivers against head and face injuries without increasing the risk of cervical spine injuries. Similarly in a retrospective analysis of 270,525 motorcycle accidents by Khor and Inaba[11] at American College of Surgeons National Trauma Data Bank(NTDB) concluded that although helmet users had reduced risk of head injury and death, no association was found between helmet users and cervical spine injuries.

Unfortunately we were not able to assess the protective effect of type(full coverage, partial coverage) of helmet at the time of motorbike collisions. Lam and Lin[22] evaluated 5225 motor cyclist accidents between 2000 to 2009 in Taiwan and documented that the frequency of cervical spine injuries were 28(16.2%) in motorbike riders wearing full coverage helmets in contrast to 104(60.1%) motorbike riders who used partial coverage helmets.

Our study had some limitations. The design of our study was descriptive. Our sample size was small. We were not able to analyse injury mechanism, helmet type and proper use. Further studies are recommended to address all such limitations.

CONCLUSION

The frequency and severity of cervical spine injuries in unhelmeted motorcycle riders were more than helmeted riders. Motorcyclists wearing helmets were not prone to increased risk of cervical spine injuries during collisions, rather wearing helmet had some protective advantage.

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