

Severity of Maxillofacial Trauma in Motor Bike Riders among Helmet Wearers vs. Non-Helmet Wearers

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ABSTRACT

Aim: To evaluate the severity of maxillofacial trauma in motorbike riders among helmet wearers and non-helmet wearers.

Study Design: A cross-sectional study was conducted. The setting was Jinnah Hospital Lahore from April 1, 2021, to October 1, 2021.

Method: The study was conducted at Jinnah Hospital Lahore from April 1, 2021, to October 1, 2021. The sample size of our study was 143 patients. The data were collected from the clinical records of individuals who had suffered maxillofacial trauma. Subjects engaged in motorcycle accidents with thorough case records and radiological studies met the inclusion criteria. The collected data were analyzed using the SPSS 23 version.

Results: In our study, the mean age of patients was 31.10 ± 9.15 , with 129 (90.2%) patients being male and 14 (9.8%) patients being female. 41 (28.5%) patients were helmet users, and 102 (71.3%) patients were non-helmet users. In our study, we also found the severity of maxillofacial trauma: 39.2% of patients had mandible fractures, 35.7% had zygomatic arch fractures, 65.7% had soft-tissue injuries, and 21.0% had dentoalveolar fractures. Observed the greater severity of maxillofacial trauma in non-helmet users with a significant p value ($p < 0.05$). Non-helmet wearers noted more general comminuted fractures, loss of organs like blindness and loss of vision due to orbital fractures, more deep facial lacerations causing lifetime esthetic concerns, a greater hospital stay, and more expenditure at the hospital. Also, more trauma to teeth and injuries lead to a more expensive burden for tooth prostheses afterwards. In helmet wearers, there were fewer fractures, and patients had to stay less or didn't need to stay at the hospital; they could continue with their daily routine work and job.

Practical Implication: Helmet usage requirements must be carefully enforced, and public awareness about motorcycle safety must be encouraged.

Conclusion: In our study, we concluded that there was a significant difference in the severity of maxillofacial trauma in motorbike riders between helmet wearers and non-helmet wearers. These fractures may be avoided by encouraging the use of safety equipment (such as required crash helmet usage), strengthening road infrastructure, and limiting the number of motorbikes registered. Helmet usage requirements must be carefully enforced, and public awareness about motorcycle safety must be encouraged.

Keywords: Severity, maxillofacial trauma, motor bike, helmet wearers, Non-Helmet wearers

INTRODUCTION

The face of a human is anatomically divided into three portions, forming a tripartite structure. From inside to outside, these divisions are: hard tissues ("bones and teeth"), soft tissues ("muscles, fat, and subcutaneous connective tissues"), and skin ("superficial layer"). The face is especially vulnerable to trauma since it is the most exposed part of the body. Trauma to the face produces injuries to the skeleton, dentition, and soft tissues of the face.^{1,2}

Assault is the leading cause of face trauma in Western countries, while road traffic accidents (RTAs) are one of the most prevalent causes of maxillofacial fractures in underdeveloped nations.³ There is a significant disparity between developed and developing nations, which may be due to strict enforcement of the regulations and rules in developed countries. RTA accounts for 39 percent to 54 percent of all maxillofacial injuries in Pakistan.⁴

Maxillofacial injuries are a common reason for visits to the emergency department. Management of such injuries, which may range from minor nose fractures to severe facial communication, can be exceedingly difficult. The existence of an upper airway and proximity to cervical and cranial tissues may be implicated concurrently to aggravate injuries in this highly vascular zone.⁵

The treatment of craniomaxillofacial fractures needs an appropriate diagnosis and treatment plan, which necessitates physical examination and computed tomography (CT) scanning. Injury complications must be identified and handled. Fractures are classified as mandible, maxilla, zygomatic bone, orbital wall, nasoorbital-ethmoid (NOE), skull base, and frontal bone.⁶

In poor and middle-income countries, motorcycles are a general mode of transportation. Their use is linked to a high rate of injuries, which is a main public health problem. Previous research has found a link between the frequency of motorcycle use and

injuries in several countries. Motorcycle crashes cause the most injuries in South Asian countries compared to other countries.⁷

Due to its design, balance concerns, and lack of fixed safety equipment such as airbags, the motorcycle is regarded as the riskiest vehicle ever. Because there is no safety vessel surrounding the driver and passenger, both are liable for collisions or slippage. Many other risk factors exacerbate the situation, including road conditions and nature, poor visibility at night, traffic flow, and human factors such as the attitude of motorcyclists' and behavior on roads, speeding, disregarding safety measures such as wearing protective clothing and crash helmets, and substance abuse prior to the riding.^{8,9}

The wearing of a full-coverage motorcycle helmet may prevent deaths and brain injuries. Nonstandard helmets offer poorer protection against head injuries and increase the severity of injuries in motorcyclists as compared to full-coverage helmets.¹⁰

Because of the significant influence of maxillofacial traumatic injuries on a person's quality of life, thorough information regarding the epidemiological characteristics of this issue is required in Pakistan. Due to the increase in road traffic accidents (RTA) in our population, the need of the hour is to access the importance of safety measures in order to counter the increased ratio of mortality and disability caused by RTA.

So, such a study is well needed in order to evaluate the severity of maxillofacial trauma that has occurred in patients wearing helmets compared to non-helmeted patients. So that emphasis can be placed on the legislation regarding the use of helmets.

METHODOLOGY

The cross sectional study was conducted. After approval from the hospital ethical committee, the study was conducted at Jinnah Hospital in Lahore from April 1, 2021, to October 1, 2021. The

study design was cross-sectional. The sample size of our study was 143 patients, which was calculated using the WHO sample size calculator OpenEpi.

The data were collected from the clinical records of individuals who had suffered maxillofacial trauma. Subjects engaged in motorcycle accidents with thorough case records and radiological studies met the inclusion criteria.

Demographic and maxillofacial trauma information were collected. The collected information was analyzed using SPSS version 23. In descriptive statistics, the mean with standard deviation and frequency with percentages were calculated. The Chi square test was also used for the analysis of data among helmet users and non-helmet users.

RESULTS

We enrolled 143 patients in our study. The mean age of patients was 31.10±9.15 years, with a range of 12-62 years. Out of 143 patients, 13 (9.1%) were from the <20 year age group, 119 (83.2%) were from the 20–40 year age group, 9 (6.3%) were from the 41–60 year age group, and 2 (1.4%) were from the >60 year age group.

In our study, 129 (90.2%) patients were male and 14 (9.8%) patients were female. In education, 30 (21.0%) patients were illiterate, 34 (23.8%) patients were undermatriculated, 24 (16.8%) patients were matriculated, and 55 (38.5%) patients were abovematriculated.

In the locality, 61 (42.7%) patients were from urban areas and 82 (57.3%) were from rural areas. The results of helmet usage showed that in our study, 41 (28.5%) patients were helmet users and 102 (71.3%) patients were non-helmet users. In victim status, 112 (78.3%) patients were drivers and 31 (21.7%) patients were passengers.

Table-1: Results of demographic variables

Demographic Variables	Frequency	Percent
Age Groups		
< 20 years	13	9.1
20-40 years	119	83.2
41-60 years	9	6.3
> 60 years	2	1.4
Gender		
Male	129	90.2
Female	14	9.8
Education		
Illiterate	30	21.0
Under matric	34	23.8
Matric	24	16.8
Above matric	55	38.5
Locality		
Urban	61	42.7
Rural	82	57.3
Helmet usage		
Helmet wearers	41	28.7
Non-Helmet wearers	102	71.3
Victim Status		
Driver	112	78.3
Passenger	31	21.7

The results of severity of maxillofacial trauma showed that in our study 56(39.2%) patients had mandible fractures, 51(35.7%) patients had zygomatic arch fractures, 94(65.7%) patients had soft-tissue injuries and 30(21.0%) had dentoalveolar fractures.

Table-2: Results of Severity of Maxillofacial trauma

Severity of Maxillofacial trauma	Frequency	Percent
Mandible fractures	56	39.2
Zygomatic arch fractures	51	35.7
Soft-tissue injuries	94	65.7
Dentoalveolar fractures	30	21.0

The severity of maxillofacial trauma among helmet and non-helmet users showed that mandible fractures were observed in helmet and non-helmet users as (22.0% vs. 46.1%, p = 0.008),

zygomatic arch fractures were observed as (4.9% vs. 48.0%, p = 0.0001), soft-tissue injuries were observed as (46.3% vs. 73.5%, p = 0.002), and dentoalveolar fractures were observed as (16.7% vs. 31.7%, p = 0.046). In non-helmet users, the severity of maxillofacial trauma was observed more than in helmet users, with a significant p value.

Table-3: Comparison of severity of maxillofacial trauma among helmet and non-helmet users

Variables	Helmet usage		p value
	Helmet wearers	Non-Helmet wearers	
Mandible fractures	Yes	9 22.0%	0.008*
	No	47 78.0%	
Zygomatic arch fractures	Yes	2 4.9%	0.0001*
	No	49 95.1%	
Soft-tissue injuries	Yes	19 46.3%	0.002*
	No	75 53.7%	
Dentoalveolar fractures	Yes	17 16.7%	0.046*
	No	13 83.3%	

Significant (p<0.05)

Non-helmet wearers noted more general comminuted fractures, loss of organs like blindness and loss of vision due to orbital fractures, more deep facial lacerations causing lifetime esthetic concerns, a greater hospital stay, and more expenditure at the hospital. Also, more trauma to teeth and injuries lead to a more expensive burden for tooth prostheses afterwards.

In helmet wearers, there were fewer fractures, and patients had to stay less or didn't need to stay at the hospital; they could continue with their daily routine work and job.

DISCUSSION

The hard and soft tissues that make up the face stretch from the frontal bone superiorly to the jaw inferiorly in the maxillofacial area. The face, being the most exposed portion of the body, is most vulnerable to injury. Hard and soft tissues, such as jaw bones, the alveolus, teeth, and specialized structures like the nose, ears, and eyes, are all affected by facial traumatic injuries.^{11, 12}

In Pakistan, the incidence of maxillofacial trauma is rising in both severity and frequency.⁴ RTAs, falls, interpersonal violence, and sports injuries are some of the causes of maxillofacial trauma. RTAs are the leading cause of maxillofacial injuries.¹³

In addition to the low-level infrastructure and shortcomings in the urban transportation network, third-world nations have difficulties properly enforcing traffic restrictions. As a handy and inexpensive mode of transportation for products and pillion passengers, this results in a rise in the number of motorcycle injuries.^{1, 14}

If not covered by a helmet, the face is a conspicuous area of the body that is exposed when riding a motorcycle. Without a helmet, both the driver and the passenger are at risk of a craniofacial injury.¹⁵

In our study, we found that 39.2% of patients had mandible fractures, 35.7% had zygomatic arch fractures, 65.7% had soft-tissue injuries, and 21.0% had dentoalveolar fractures. Observed the greater severity of maxillofacial trauma in non-helmet users with a significant p value.

The majority of victims of the motorcycle collisions were young people with an average age of 31 years, which was practically similar to the findings reported in numerous studies elsewhere. Pride of the riding motorbikes and competitiveness for passengers often lead the teenage motorcyclists to travel at

competitive speeds that expose them to the dangers of colliding amongst congested traffic congestion.^{16, 17}

Hameed et al. conducted a study in Karachi, Pakistan, to check the pattern and frequency of maxillo-facial traumatic injuries regarding motorcycle accidents. They also checked the association between helmet use and traumatic injuries to the maxillo-facial area. They found 61.4% soft tissue injuries, 8.2% dentoalveolar fractures, 56% mandibular fractures, 47.78% mid-face fractures, and 29% ZMC fractures. They also find significant ($p < 0.05$) positive relation between helmet usage and traumatic injuries of the maxillo-facial. These results matched our study results.

In Tanzania, motorcycles have become a popular mode of transportation, resulting in a rise in motorcycle accidents. Given the high occurrence of motorcycle accidents, Sohail et al. performed research and discovered a total of 116 MCV "motorcycle crash victims," of whom the majority (113, 97.4%) were male. The accident victims ranged in age from 14 to 66 years old (mean of 29.43 ± 8.88), with the 20- to 39-year-olds being most impacted. More than half of the victims (53.4%) were not wearing helmets. MCV had maxillofacial fractures in the majority (89.7%), with 71.2 percent having mandibular fractures, 66.3 percent having midface fractures, and 9.6 percent having frontal bone fractures. The severity of injuries was linked to the speed of motorcycles during collisions and the use of helmets. These results also matched the results of our study.¹⁷

Khan et al. investigated the various patterns of injuries and their frequency in motorcycle accidents. They discovered that the average age was 29.6 years. Males made up 79.4 percent, while females made up 20.6 percent. 34.2 percent of patients were between the ages of 16 and 30, and 25.6 percent were between the ages of 31 and 40. Lower-limb injuries accounted for 56.8%, while upper-limb injuries accounted for 27.2 percent. 93.7 percent had abrasions, 68.1 percent had lacerations, and 52 percent had bruises. Lower limb fractures were 22.5 percent, while upper limb fractures were 13.6 percent.¹⁸ Motorbike injuries were more common among younger boys. The most frequent injuries were abrasions and fractures to the lower limbs.

The patterns and prevalence of maxillofacial fractures change by nation, depending on environmental, cultural, socioeconomic, and demographic variables. Wearing a helmet is an effective type of head protection for motorcycle drivers and is now mandated in the majority of nations. Mandible fractures were the most prevalent injury in both groups, followed by zygomatic arch fractures and dentoalveolar fractures. There was a substantial difference in pattern and degree of maxillofacial damage between non-helmet and helmet users.¹⁹

Maxillofacial injuries caused by commercial motorcycle accidents needed hospitalization and a protracted treatment period at a significant expense. Preventing these injuries can help alleviate poverty since money that would otherwise be spent to improve the victim's life will instead be used to fix abnormalities or treat injuries.²⁰

Accidents involving motorcycle riders who do not wear helmets may result in death, irrevocable damage, serious face bone injuries, prolonged hospitalization, treatment complications, and significant financial losses.²¹

P-scooter and E-bike riders who used helmets had a lower risk of head damage as well as hard tissue and dentoalveolar injuries. These findings might lead to more effective helmet legislation and regulation, as well as better treatment methods for general and dental doctors.²²

CONCLUSION

In our study, we concluded that there was a significant difference in the severity of maxillofacial trauma in motorbike riders between helmet wearers and non-helmet wearers.

In developing nations, road traffic accidents are on the rise. Low usage of safety equipment, bad infrastructure, and an increase in the number of cars on the road are all contributing factors. According to our study, the majority of the people involved

in these accidents are young males in their 20s and 40s. This kind of damage has a profound and devastating effect on the young patients' quality of life. These fractures may be avoided by encouraging the use of safety equipment (such as required crash helmet usage), strengthening road infrastructure, and limiting the number of motorbikes registered.

Ethical Approval: Permission from the ethical committee/ board of the hospital was obtained.

Conflict of Interest: There is no conflict of interest between the authors.

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