

The Role Of Helmet Use On Severity Of Maxillofacial Injuries Among Electric- Powered Bikes, Scooters And Motorcycle Accidents Attending Hafr Central Hospital

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Abstract

Background: Maxillofacial injuries are among the most typical forms of body injuries. Facial bone fractures, dentoalveolar injuries and soft tissue injuries are the three categories of maxillofacial injuries. Automobile accidents, attacks, falls, and athletic injuries are all possible causes. This study aimed to determine the role of helmet use on the severity of oral maxillofacial injuries among electric bike and motorcycle accidents attending Hafr Central Hospital, Saudi Arabia.

Materials and methods: This study was a descriptive study of the injured motorcyclist, electric power bikes, and scooters seen with maxillofacial injuries between January 2021 and January 2023 at Emergency Hafr central hospital in Hafr albatin city. The study was a cross-sectional study that included patients reported

within the previous three years. The source population consisted of maxillofacial injury patients who presented to the accident department after being involved in an electric-powered bike, scooter, or motorbike accident, as well as the oral and maxillofacial surgery department at Hafr Cental hospital in Eastern Provence. Data were entered into Microsoft Excel soft Simple descriptive statistical, chi-square test, and Kruskal-Wallis test was applied as appropriate. Statistical significance was inferred at $p < 0.05$.

Results: The study included 154 maxillofacial injury patients in case of motorcycle accidents; all of them (100%) were non-helmeted. The injured patients were in different age categories (less than 5 to more than 20 years old). However, most patients were between 10-14 years old (91). The majority of injured patients in motorcycle accidents were males ($n=108$), while only 46 injured women were reported. Most of the injuries were soft tissues in male patients (106) or females (46). Only 2 males had hard tissue injuries. The most common facial injuries were Lip injury (39), followed by Frontal laceration (21), Cheek abrasion (17), and Frontal bruises (16), then Nasal laceration (14) and Scalp laceration (13). Suturing was carried out on the majority of injured patients (132, 85.71%), while 19 patients (12.3%) had no treatment, and 3 patients (1.95%) had Oculoplastic surgery.

Conclusion: Motorcyclists, electric power bikes, and scooter riders who used helmets had a lower risk of head injury, as well as hard tissue and maxillofacial injuries. These findings might lead to more effective legislation and control of helmet use, as well as better treatment regimens for general and dental physicians.

Keywords: Maxillofacial injuries, Motorcycle, electric bikes, Powered scooters Helmet, Saudi Arabia.

INTRODUCTION

Motorcycle accidents are a serious public health issue worldwide, particularly in poorer nations ¹. These incidents have significantly increased the health expenditures associated with the care and rehabilitation of wounded patients and disrupted the lives of thousands of individuals, particularly those in the economically active age group (adolescents and young adults) ^{1,2}.

Powered stand-up scooters (P-scooters) and electric bicycles (E-bikes) are becoming more popular ways of mobility across the world ³. They are more convenient, less expensive, and easier to use than other powered vehicles ^{2,4}. However, there is rising worry about the hazards of harm ^{5,6}.

Every year, millions of people die or are injured or disabled as a result of traffic accidents across the world ⁴. These statistics are much more concerning in the case of motorbike accidents, which are a major public health concern globally. These accidents have not only fatal repercussions but also motor and psychological implications ^{5,7}. In addition, motorbike accidents significantly raise victim care and rehabilitation expenses ⁶. The large number of injuries caused by motorcycle accidents can be attributed to the vehicle's inherent instability and the poor amount of protection provided ⁸.

Many studies have repeatedly shown that wearing a helmet helps to avoid head injuries and reduces mortality and injury severity among motorcycle riders. However, resistance to obligatory helmet regulations persists in industrialized and developing nations, as does the controversy over the efficiency of helmet wear in protecting motorcyclists ^{9,10}. Although the benefit of helmet use in lowering mortality and head injuries is widely known, its impact on reducing the prevalence and severity of face damage is not ^{11,12}. Furthermore, additional factors, including the type of helmet used and its fixation condition at the time of the accident, might impact the severity of the injuries. Motorcycle helmets (both open-face and full-face) are available ^{8,11}. Because an open-face helmet only covers part of the face, facial injuries appear more common and serious in the motorcycle riders ⁹. However, there is inconsistent evidence on the facial protection given by the various types of current headgear ¹².

As a result, this retrospective study aimed to investigate whether wearing a helmet reduced the prevalence and severity of facial fractures in hospitalized victims of the electric-powered bike, scooter, and motorcycle accidents.

MATERIALS AND METHODS

This 2-year retrospective study was undertaken Oral and Maxillofacial Surgery Department, Hafr Central Hospitals, Saudi Arabia. For each patient, data was collected from clinical notes and surgical records using a standardized data collecting form designed

expressly to explore the epidemiologic aspects of maxillofacial trauma. The data recorded only patients sustaining maxillofacial injuries after motorcycle or electronic bike accidents. It included patient age, gender, diagnosis, helmet use, soft tissue lesions, associated facial and general trauma, and type of treatment. The exclusion criteria were incomplete information on the trauma in the medical chart.

The injury sites were classified into three-thirds of the face: upper (frontal bone), middle (maxilla, zygoma, zygomatic arch naso-orbit-ethmoidal, nasal), and inferior (mandible). Mandible fractures were divided into sites: condyle, ramus, angle, body, parasynthesis, symphysis, and dentoalveolar. Abrasion and laceration were classified as soft tissue injuries. Data were entered into Microsoft Excel software. Simple descriptive statistical, chi-square and Kruskal-Wallis tests were applied as appropriate. Statistical significance was inferred at $p < 0.05$.

Patients who were victims of accidents with vehicles other than motorcycles and patients without head trauma (no reports of facial trauma) were excluded.

RESULTS

Of the total 154 subjects, 108 (70.1 %) were males and 46 (29.9%) were females (Table 3). the majority were Saudi nationals. The study included 154 maxillofacial injury patients in case of motorcycle accidents; all of them (100%) were non-helmeted. The injured patients were in different age categories (less than 5 to more than 20 years old). However, most patients were between 10-14 years old ($n=91$). The majority of injured patients in motorcycle accidents were males ($n=108$), while only 46 injured women were reported. Most of the injuries were soft tissues in male patients (106), while females patients was ($n=46$). Only 2 males had hard tissue injuries.

Table 1: The frequency distribution of participants according to the pattern of maxillofacial injuries and helmet use

Helmet use	The injured part of the maxillofacial region	Percentage %
Non-Helmted	154	100
Helmted	0	0

Table 1 shows that, the study included 154 maxillofacial injury patients as case of motorcycle accidents, all of them (100%) were non-helmeted.

Table 2: The frequency distribution of participants according to helmet usage by age groups

Age group	Helmet Usage	
	Helmted	Non-Helmet
Less than 5 year	0	3
5 – 9 year	0	22
10 – 14 year	0	91
15 – 20 year	0	26
More than 20	0	12
Total (n)	0	154

Table 2 shows that the study included 154 maxillofacial injury patients in case of motorcycle accidents; all of them (100%) were non-helmeted. The injured patients were in different age categories (less than 5 years old to more than 20 years old). However, the majority of patients were between 10-14 years old (91 patients).

Table 3: Association between types of injury with gender and clinical factors.

Gender	Type of injury		Percentage
	Soft tissues	Hard tissues	%
Male	106	2	70.1
Female	46	0	29.9

Table 3 shows that the majority of injured patients in motorcycle accidents were males (n=108), while only 46 injured women were reported. Most of the injuries were soft tissues in male patients (106) or females (46). Only 2 males had hard tissue injuries. (chart 1).

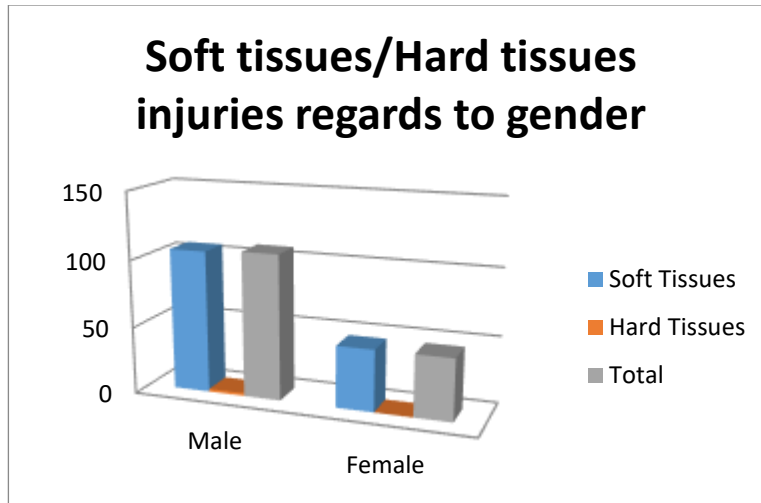
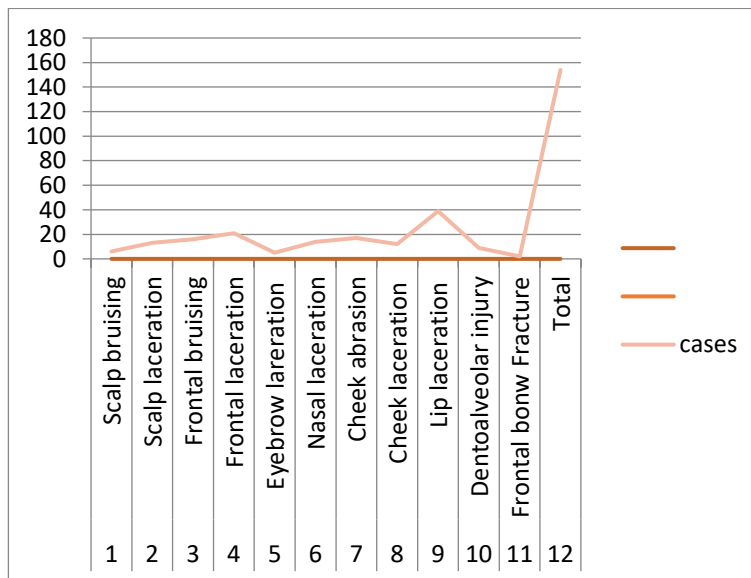
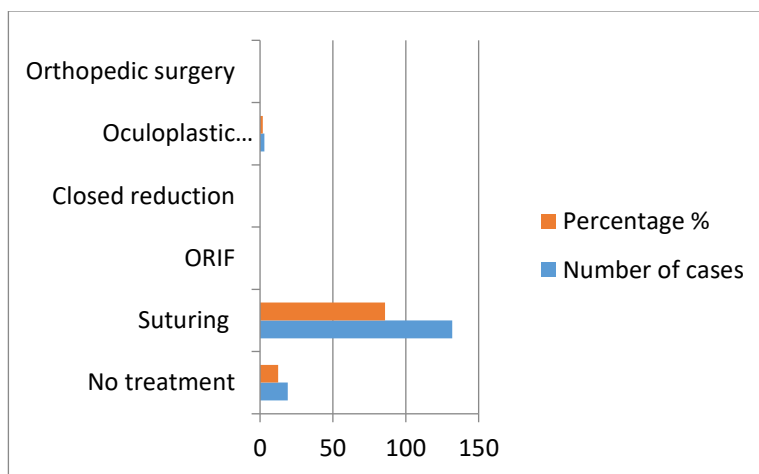


Chart 1: The majority of motorcycle accident in male patients more than female



Graph 2: Location of facial injuries according to patient's riding status.

Graph 2 shows that 154 maxillofacial injury patients were reported as a case of motorcycle accidents, all of them (100%) were non-helmeted, and most of them had soft tissue injuries in different locations. The most common facial injuries were Lip injury (39), followed by Frontal laceration (21), Cheek abrasion (17), and Frontal bruises (16), then Nasal laceration (14) and Scalp laceration (13).



Graph 3: Distribution of treatment modalities for oral and maxillofacial injuries

Graph 3 shows that Suturing was carried out on the majority of injured patients (132, 85.71%), while 19 patients (12.3%) had no treatment, and 3 patients (1.95%) had Oculoplastic surgery.

DISCUSSION

Electric bicycles (E-bikes) and powered stand-up scooters (P-scooters) are rapidly gaining popularity as ways of mobility across the world¹³. They are more convenient, less expensive, and easier to use than other types of motorised vehicles¹⁴. However, there is rising worry about the dangers of harm¹⁵. Riders of e-bikes and P-scooters are more likely to be injured in a high-speed accident with a motorised vehicle than pedestrians and traditional bikers. As a result, the formers are more likely to be engaged in high-energy accidents, suffer more serious injuries, and require significant and lengthy medical care¹⁶. From 2000 to 2017, 133,872 injuries linked with E-bikes and P-scooters were reported to the United States National Electronic Injury Surveillance System¹⁷, with E-bikes being more likely to be involved in an accident than P-scooters¹⁸.

This study examined the role of helmet use on the severity of oral maxillofacial injuries among electric-powered bikes, scooters, and motorcycle accidents. The increasing incidence of injuries and the rather severe cases that came to emergency departments and were hospitalized should serve as a warning sign and prompt action to prevent future escalation of these trauma cases. The fact that not only the occupants of those cars are hurt but also innocent pedestrians should serve as an additional justification for the action¹⁹.

Accidents using electric bikes and scooters highlight a major public health concern. The fast adoption of those cars might explain their increasing prevalence in recent years and the government's delay in implementing necessary safety rules²⁰. Annual E-bike sales are expected to increase from 31 million units sold in 2012 to 47.6 million by 2018²⁰. The kinematics and injury implications of two-wheeler riders result from a complex interaction of elements ranging from rider statures to two-wheeler and vehicle types to accident situations²¹. As a result, particularly tailored preventative strategies for using motorized motorcycles and scooters should be studied and implemented.

In the present study, 154 maxillofacial injury patients in case of motorcycle accidents were included. All of them (100%) were non-helmeted. The injured patients were in different age categories (less than 5 to more than 20 years old). However, most patients were between 10-14 years old (91). The majority of injured patients in motorcycle accidents were males (n=108), while only 46 injured women were reported^{19,20}. Similarly, Hamzani et al. (2021) reported that the average age of all patients injured in E-bike/P-scooter incidents was 31.6 ± 15.8 years, with the majority of those with oral and maxillofacial injuries being between the ages of 21 years old and 30 years old²². As a result, we believe that more restrictive standards for the limited age of motorbike riders should be considered^{20,21}.

E-bikes and P-scooters can also cause soft-tissue injuries. Our results indicated that most injuries were soft tissues in male patients (106) or females (46). Only 2 males had hard tissue injuries. The most common facial injuries were Lip injury (39), followed by Frontal laceration (n=21), Cheek abrasion (n=17), and Frontal bruises (n=16), then Nasal laceration (n=14) and Scalp laceration (n=13). Suturing was carried out on the majority of injured patients (132, 85.71%), while 19 patients (12.3%) had no treatment, and 3 patients (1.95%) had Oculoplastic surgery. In a study of general ED visits for E-scooter-related injuries, Badeau et al. (2016) found different outcomes. Surprisingly, motorcyclists who wore helmets had a considerably greater likelihood of soft-tissue lacerations than those who did not²³. This data may be connected to a previous prospective cross-sectional research examining the connection of soft-tissue injuries with helmet use in motorcycle accidents, which found that riders wearing full-face helmets were more likely to have mid-face injuries. The authors hypothesized that these injuries were caused by the plastic helmet

visor breaking on impact²⁴. In another study, Lin et al. (2020) found the maxilla to be the most often broken facial bone and documented zygomatic bone damage in 48.28% of pedestrians with oral and maxillofacial injuries. Thus, bone injuries may be detected largely in the zygomatic maxillary complex in individuals with E-bike and P-scooter-related trauma²⁵.

The main limitation of the research is that data were collected retrospectively, and information on the type of helmet used (full face, half face, modular, half shell, etc.) was absent. Future studies should plan ahead of time and collect as much data as possible, including helmet type, which has a significant influence on the kind and severity of E-bike and P-scooter-related injuries. Furthermore, integrating a greater number of patients with oral and maxillofacial injuries might boost the relevance of the results. This can be accomplished by integrating various medical centers within the nation or across many countries for comprehensive longitudinal investigations.

CONCLUSION

In summary, we investigated the role of helmet use on the severity of oral maxillofacial injuries among electric-powered bikes, scooters, and motorcycle accidents. The fast growth and widespread usage of E-bikes and P-scooters, along with a lack of understanding of the need for protective equipment to reduce injury severity, can be ascribed to the increased prevalence of maxillofacial injuries. This study found that wearing a helmet reduces the probability of head injury and the number of hard tissue and dentoalveolar injuries. These findings may help to guide the development of appropriate safety regulations and treatment initiatives.

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