

EPIDEMIOLOGY OF MOTORCYCLE-RELATED MAXILLOFACIAL INJURIES PRESENTING TO THE 37 MILITARY HOSPITAL, GHANA

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Abstract

Objective: The study examined the epidemiology of motorcycle-related maxillofacial injuries to provide data to guide the prevention and management of maxillofacial trauma.

Methodology: The research was a one-year prospective cross-sectional study of patients presenting with motorcycle crash-related maxillofacial injuries. The variables recorded include the demographic data, type of motorcycle collision, day and time of motorcycle crash, location of the crash, role of injured patient, maxillofacial and concomitant injuries sustained. Descriptive statistics were used to ascertain the epidemiology of maxillofacial injuries sustained.

Results: A total of 148 patients aged between 15 and 65 years were involved in the study. There was a high male dominance (96%) among patients who sustained maxillofacial injuries secondary to motorcycle-related road traffic crashes (RTC). The median age of the

participants was 30.9 +/- 9.1 years. Most (55.6%) of the motorcycle crashes resulted from collisions with cars. Maxillofacial injuries were mostly soft tissue injuries with the midface sustaining the most. Skeletal injuries often occurred in the mandible with parasymphyseal fractures constituting the majority of the mandibular fractures.

Conclusion: There is a male predominance in patients with motorcycle-related maxillofacial injuries with a peak age of 21-30 years. Victims of motorcycles crashes often sustain soft tissue injuries with aesthetic and functional implications. Motorcycle crashes contribute significantly to the public health burden of RTC, especially in developing countries like Ghana. Healthcare professionals ought to be conversant with the epidemiology of maxillofacial injuries in motorcycle crash victims to ensure prompt and comprehensive management.

Key words: *Epidemiology, Maxillofacial, Motorcycle, Injury*

Introduction

The economic burden of Road Traffic Crashes (RTC) on developing countries is enormous as the estimated costs as a percentage of Gross Domestic Product (GDP) ranges from about 1-5% in most African countries.¹ According to the WHO 93% of the world's fatalities on the roads occur in low and middle-income countries, even though these countries have approximately 60% of the world's vehicles. The number of injuries and deaths from RTC are expected to increase with further motorization.² There have been disproportionately high and rising numbers of motorcycle deaths globally, especially in developing countries.¹ Additionally, motorcycle users stand the greatest risk of death in traffic among vehicle occupants. Contrary to a car crash, victims of motorcycle accidents absorb all the kinetic and compressive energy resulting from the crash.³ Also, motorcyclists are less visible and they share the traffic space with occupants of fast-moving vehicles.

Maxillofacial injuries are associated with various degrees of morbidity requiring extensive treatment at a huge cost to patients. In a study on maxillofacial and concomitant injuries in multiply injured patients, Parkins et al., reported that RTC was the commonest cause of injury accounting for 55% of injuries.⁴ In recent times, there has been the increasing use of motorcycles and tricycles as a means of public transportation in Ghana although this is illegal according to the road traffic regulations.

Motorcycle transportation has been identified as the cause of most oral and maxillofacial injuries with the majority of the victims suffering multiple facial bone fractures.⁵ Motorcycle taxis, also known as "Okada" or "boda boda" in parts of Africa, have become an integral part of the transport sector in several cities in Sub-Saharan Africa. Reasons cited for their continued use include economic gains, fast means of transport, the ability to travel on poor roads, and fun to ride, among others.⁶

Regulations guiding motorcycle transportation in Sub-Saharan Africa vary considerably. While Nigeria has banned the use of motorcycle in the capital city, Lagos, Ghana has been debating the legalization of motorcycles for commercial transportation.⁷ The policies on motorcycle usage needs to consider the public health burden as well as the socioeconomic

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implications. This would be possible if local data is available to inform such policies. Thus, this study sought to describe the epidemiological profile of motorcycle crash victims and the pattern of maxillofacial injuries sustained to inform policy and guide the management of maxillofacial trauma.

Materials and Methods

The study prospectively analysed data from patients presenting to the 37 Military Hospital with maxillofacial injuries resulting from motorcycle crashes from 1st October 2020 to 30th September 2021. The 37 Military Hospital is the National Emergency Response Center of Ghana and attends to both military and civilian patients. Maxillofacial trauma patients either report directly or are referred to the Maxillofacial Unit of the Dental Division for management. Motorcycle riders and pillion passengers who presented to the Hospital within the study period were included in the study. Patients who were referred to other health facilities by the Trauma and Surgical Emergency Unit or died before being referred to the Maxillofacial Unit were excluded from the study. A standard maxillofacial trauma form was used for data collection. The data was entered in Microsoft Excel 2010 and analysed using Stata 14 software (StataCorp. College Station, TX). The variables recorded were the demographic data, type of motorcycle collision, day and time of motorcycle crash, location of the crash, role of injured patient, maxillofacial and concomitant injuries sustained, as well as clinical signs elicited. The age category was classified as minor (less than 18 years), young adult (18 to 35 years), middle-aged adult (36-55 years), and older adults (above 55 years).⁸ The determination of the pattern of maxillofacial injuries sustained by victims of motorcycle accidents was done by dividing the face into three broad regions as the upper, middle, and lower third. This was done using two imaginary horizontal lines through the pupillary plane and the commissures of the mouth.

Descriptive statistics were done for the background variables and categories, with report of proportions. The central tendency for age was reported with its corresponding standard deviation. The pattern of motorcycle-related injuries was also ascertained by the use of descriptive statistics. The prevalence of motorcycle-related maxillofacial injuries was determined as a fraction of the number of motorcycle-related cases over the total number of RTC and trauma cases presenting to the OMFS department of the hospital within the study period. Informed consent was obtained from all patients. Ethical approval was sought from the Institutional Review Board of the 37 Military Hospital.

Results

The study participants comprised of 142 males and 6 females between the ages of 15 and 65 years. The proportion of various age groups as well as the education and employment status of the participants are as shown in Table 1.

Table 1 Background Characteristics of Participants

Variable	Number (N)	Percent (%)
Sex		
Male	142	95.9
Female	6	4.1
Age category		
Minor (<18yrs)	5	3.4
Young adults (18-35yrs)	114	77.0
Middle-aged adults (35-55yrs)	26	17.6
Older adults (>55yrs)	3	2.0
Occupation		
Formally employed	39	26.4
Informal employment	89	60.1
Unemployed	20	13.5
Education		
No education	5	3.4
Primary	9	6.1
Junior High School	38	25.7
Senior High School	67	45.3
Tertiary	29	19.6
Post-graduate	0	0.0

The majority of the participants were within the 21-40 years age bracket (Figure 1).

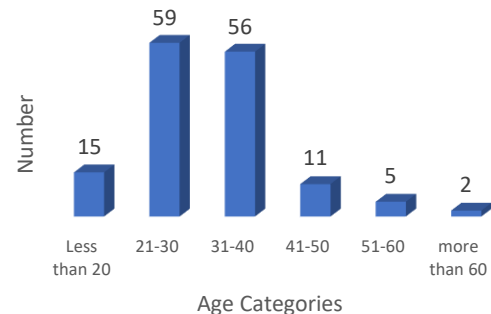


Figure 1 Age Distribution Of Participants

The prevalence of motorcycle-related cases among all trauma cases at the Oral and Maxillofacial Unit of the 37 Military Hospital was determined to be 31% while accounting for 46% of RTC. Most of the motorcycle crashes occurred on Saturdays (18.8%) with the afternoons recording the highest incidence (32%) followed by morning (24%). In terms of motorcycle usage, 23% of the riders used the motorcycles for commercial purposes, mostly as motorcycle taxis and for delivery services. Many motorcycle-related injuries occurred in urban areas (85%), with rural areas accounting for the remaining 15%. Regarding the role of the injured patients, 86% of the participants were riders while 14% were pillion passengers. Most (55.6%) of the motorcycle crashes resulted from collision with cars (Figure 2).

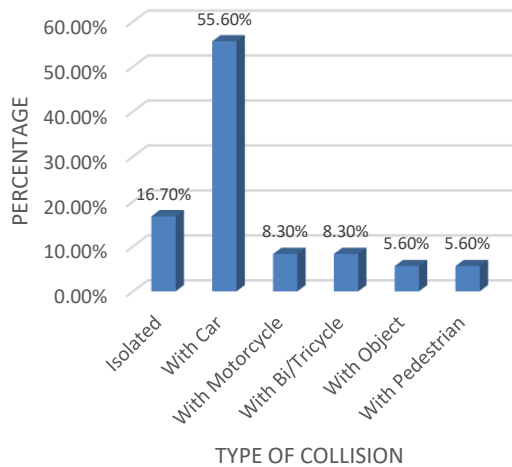


Table 2: Pattern of Maxillofacial Injuries

Injury description	Number	Proportion %
Tissue type		
Soft tissue	125	84.5
Hard tissue	50	33.8
Region		
Upper face	80	54.1
Mid-face	94	63.5
Lower face	86	58.1
Symmetry		
Unilateral	52	35.1
Bilateral	96	64.9
Unilateral injuries (N=52)		
Right	24	46.0
Left	28	54.0

Table 3: Distribution of Maxillofacial Clinical Signs

Clinical Signs	Number (N)	Proportion (%)
Eye Signs		
Edema	12	10.0
Ecchymosis	5	4.2
Subconjunctival haemorrhage	13	10.8
Malocclusion	10	8.3
Dentoalveolar involvement	39	32.5
Others		
Epistaxis	16	13.3
Bloody otorrhea	1	0.8
CSF Otorrhea	1	0.8
Trismus	19	15.8
Paraesthesia	1	0.8
Telecanthus	3	2.5

Most (84.5%) patients sustained soft tissue injuries with injuries to the middle third of the face dominating. The injuries sustained were bilateral in most instances (64.9%). The left side of the face was often injured in

patients who sustained unilateral facial injuries (Table 2).

Although the middle third of the face was mostly injured, skeletal injuries mostly occurred in the mandible with parasymphseal fractures constituting the majority of mandibular fractures. Besides dentoalveolar manifestations, trismus, epistaxis and ocular anomalies were the predominantly elicited clinical signs (Table 3). Concomitant injuries were mostly observed in the limbs.

Discussion

The study participants were made up of 96% (142) males and 4% (6) females. The finding agrees with most studies among victims of motorcycle-related road traffic injuries.^{9,10} Reasons cited for the sex differences in RTC, and motorcycle accidents, in particular, include the involvement of men in risky driving practices, driving under the influence of alcohol, and speeding.¹¹ The participants in this study were mostly young adults (77%) with an average age of 30.9 +/- 9.1 years and the peak age group being 21-30 years. This finding agrees with global and local figures.^{5,12,13} The presence of a lot of young male riders should be of concern since they are reportedly more likely to engage in risky behaviours like not wearing a helmet while riding a motorcycle.¹⁴ Over half (60%) of the victims of motorcycle crashes reported being employed in the informal sector with 45% having secondary school education while 3% had no formal education. This is expected as 80% of Ghana's workforce is employed in the informal sector.¹⁵

Motorcycle collisions accounted for 31% of all maxillofacial trauma cases and 46% of road traffic-related injuries reporting to the Maxillofacial unit of the 37 Military Hospital within the study period. This emphasizes the significant contribution of motorcycle crashes to the increasing burden of RTC. The percentage of RTC involving motorcycles was however lower than a study in Nigeria where motorcycle-related crashes constituted 69.4% of RTC.¹⁶ In Pakistan, the proportion of RTC contributed by motorcyclists is much higher at 84.2%.¹⁷ The highest number (28) of motorcycle crashes occurred on Saturdays. This may be because most social activities in Ghana are scheduled on Saturdays and there is a high likelihood of riders riding under the influence of alcohol. Concerning the time of day, the majority (32%) of the motorcycle crashes happened in the afternoon, with an additional 24% happening in the morning. This reinforces the fact that motorcycles are increasingly being employed as a means to circumvent the traffic congestion in urban centres, especially during peak periods.

Collision with another vehicle, mostly cars, was the predominant mechanism (55.6%) of the motorcycle crashes. In the commercial towns, this is often due to the parking of vehicles on the shoulders of roads without the requisite warning signs.¹⁸ It can also be attributed to the small size of the motorcycle relative to other vehicles and the tendency for motorcyclists to share a lane space

with a car. In terms of motorcycle usage, 23% of participants used motorcycles for commercial purposes, including courier services and public transportation. A study in South China reported that motorcycle taxi riders were more likely to indulge in risky behaviours such as speeding late at night or early morning, not insisting on helmet wearing by pillion passengers, and running a red light.¹⁹ Future studies could examine the differences between the road safety habits of the private and commercial motorcyclists to help with the debate on the legalisation of motorcycle use for commercial transport in Ghana.

Most (85%) of the victims of motorcycle crashes sustained soft tissue injuries, predominantly facial abrasions, and lacerations. Similar findings were reported by Oginni et al., among intracity road users involved in motorcycle-related maxillofacial injuries where the injuries sustained were mostly soft tissue or in combination with a bone injury.²⁰ The middle third of the face was commonly involved with 64% of injuries occurring in that region. This could be due to the fact that motorcyclists often prefer to have the midface exposed for better vision and hearing. The finding agrees with previously published data^{20,21} but differs from other studies in which the lower third of the face was observed to be commonly involved.^{12,22,23} Although most injuries occurred in the middle third of the face, the mandible was the most frequently (55.4%) fractured bone with the parasymphiseal region dominating (30.4%). Several studies have also reported the mandible as the most frequently involved facial bone in RTC and motorcycle crashes in particular.^{13,20,24,25} Lee et al., observed that fractures to the posterior mandible (body, angle) were more common with interpersonal violence while mandibular fractures resulting from RTC commonly occur in the anterior mandible.²¹ A higher frequency of anterior mandibular fractures occur in the absence of a shock-absorbing system like airbags and helmets.²¹ The low use of helmet by motorcyclists in Ghana(5) could be a contributory factor to the high incidence of parasymphiseal fractures observed in this study.

The most common clinical sign was a limitation in mouth opening (15.8%). This can be attributed to the high number of mandibular fractures observed in the study. Mandibular fractures can lead to spasm of the muscles of mastication. The trismus could also result from impingement on the coronoid process by an inferiorly displaced zygomatic arch, trauma to the masticatory muscles resulting in spasm, and inferior displacement of the maxilla in Le Fort fractures. Other common signs were epistaxis (13.3%), subconjunctival haemorrhage (10.8%), and periorbital oedema (10%). This is commensurate with the finding of predominant midface injuries. Fractures of the bones of the middle third of the face are often accompanied by orbital signs such as was observed in this study. This highlights the need for a comprehensive head and neck examination in

motorcycle crash victims and prompt ophthalmology consult when necessary.

Conclusion

There is a male predominance in patients with motorcycle-related maxillofacial injuries with a peak age of 21-30 years. Most motorcycle-related maxillofacial injuries occur in the middle third of the face while skeletal fractures often involve the mandible. Majority of the participants sustained soft tissue injuries with aesthetic and functional implications. Motorcycle crashes contribute significantly to the public health burden of RTC, especially in developing countries like Ghana. Healthcare professionals ought to be conversant with the epidemiology of maxillofacial injuries in motorcycle crash victims to ensure prompt and comprehensive management.

Declaration

Conflict Of Interest

The authors declare no conflict of interest.

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