

Epidemiology of Maxillofacial Injuries: A Single-Center Prospective Study

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Abstract

Background: Maxillofacial trauma could involve the soft and hard tissues of the face, with a varying pattern, severity, type, and etiology. The global prevalence of these injuries is well documented. This study assesses the pattern and distribution of maxillofacial trauma at the Lagos State University Teaching Hospital, Ikeja, Nigeria.

Objective: To assess the pattern of distribution of maxillofacial injuries.

Method: A prospective cohort study of 140 maxillofacial trauma cases seen and treated at the Oral and Maxillofacial Surgery Department of the Lagos State University Teaching Hospital, Ikeja, from January 2018 to 4th November 2020. Information on age, sex, etiology, nature of the injury, and anatomical site of trauma were collected using a proforma. Descriptive analysis of data collected was done using percentages, frequencies distribution, and chi-square tests. P-value was set at <0.05.

Results: The mean age distribution of 140 patients analyzed was 33.5 years (SD +/- 12.2 years) with a male to female ratio of 3:1. Motorbike accidents and tricycles in 56 (40.0%) cases accounted for the highest cause of trauma and the least was a domestic injury in 20 (14.3%). Incidence was highest between September and December 57 (40.7%) patients while May to August with 38 (27.1%) recorded the least. The mandible was the most affected anatomical site in 67 (48.2%) cases, followed by the Zygomatic bone complex in 32 (23.2%). The mandible and Zygomatic bone complex together were the most injured anatomical sites in both male and female patients 7 (5.0%). There was no statistical difference between sex and etiology (p-value= 0.19), as well as sex and the anatomical site of trauma (p-value 0.096). No statistical significance was also observed between month and etiology and the anatomical site of trauma.

Patients involved in motor accidents present mostly with mandibular and zygomatic complex fractures (43% and 23%) respectively. Motor-bike and tricycle accidents also present mostly with mandibular and zygomatic complex fractures in 40% and 35%. However, mandibular fractures were the main presentation in cases of assault (70%) and domestic accidents (50%). There was a statistically significant relationship between the etiology and anatomical site of trauma (p-value <0.05).

Conclusion: Maxillofacial trauma is predominant among the male population in the 4th decade of life. Trauma from motor-bike accidents seems to be commoner than previously reported, and the mandible was the most common anatomical site affected. Policy efforts should be directed toward the use of safety helmets for motor-bike and tricycle riders, with strict enforcement, particularly in the 4th quarter of the year.

Keywords: maxillofacial, trauma, Nigerians

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I. Introduction

Injuries to the facial region often result in reduced esthetics, loss of function, severe morbidity, and could constitute a financial burden to the patient and the healthcare system¹

These maxillofacial injuries are often associated with varying degrees of physical disabilities and psycho-social effects^{2,3}. This is as a result of the centrality of the face as a key factor in human identity, esthetics, and general well-being⁴

The prevalence and etiology of maxillofacial trauma have been performed globally to characterize patterns, assess preventive protocols, and health policies for research⁵. The epidemiological pattern varies and seems to be related to local prevailing factors of the country under study⁵

The third global status study on road safety showed the third world nations were the most affected with road traffic injuries, with double fatality rates, that is, having 90% of global road traffic deaths⁵

The major aetiological factors worldwide include road traffic crashes (RTCs), interpersonal violence (IPV), assaults, falls, sports, animal attacks, and firearm injuries (FAIs).⁶⁻⁸

All age groups may be affected by maxillofacial trauma. In a systematic review of maxillofacial injuries in Middle East and North Africa, the prevalence varies from country to country. The Male to female ratio in the region is reported to be 4.5:1, the commonest bone involved is the mandible while RTCs are the commonest aetiology⁹. A Rwandan study also reported similar results with RTCs being the commonest cause, age group of highest prevalence was 21-30 years while the most involved bone is mandible and zygomatic bone for the midface¹⁰, this is corroborated by a Ugandan study which also reported motorcycle injury as commonest of the RTCs⁶.

A Nigerian study by Gbolahan et al¹¹ 70 patients reported peak age of incidence as the 3rd decade of life with males to female ratio of 4:1. RTC was commonest cause (70%) while the mandible was the commonest site (57.1%) and zygomatic bone (18.6%) was the commonest in the midface. Isolated mandibular fracture, isolated middle-third fractures, and combined middle third and mandibular fractures accounted for (31.4%), (15.7%) and (12.9%) respectively¹¹. Review of existing literature also reveals mandible as the most affected bones in facial fractures, with a frequency of 36% to 70%.¹²

Periodic evaluation of the pattern of maxillofacial injuries coupled with the injury severity may help to identify emerging trends and by effect implement targeted interventions early. We aim to assess the pattern of maxillofacial injuries and the management of cases seen.

II. Methodology

Study design: This was a prospective cohort study. Ethical approval was obtained from the Health Research and Ethics Committee of the study institution.

Study Setting: The study was conducted at the Department of Oral and Maxillofacial Surgery and the Surgical Emergency Room at the Lagos State University Teaching Hospital, between December 2019 and September 2021. The Lagos State University Teaching Hospital has 750 beds, receiving a monthly average of over 1,100 trauma and non-trauma emergencies.¹⁴ This is due to the large population of the State, central location, and State Governmental policy of relatively free health care.

Patients and data collection: The inclusion criteria for this study were patients who presented at the OMS (Oral and Maxillofacial Surgery) department or the Surgical Emergency Room (SER) with evidence of maxillofacial injury (hard tissue), as determined by trained emergency medical officers at the SER triage. While patients who refused consent and those with incomplete clinical data were excluded. Data obtained included, demographic characteristics (age and sex); etiology of injury: motorbike accidents, vehicle accidents, assault, interpersonal violence, and falls; the month of injury (January to December); and the anatomical site of trauma (mandible, dentoalveolar, maxilla, zygoma, nasal bones, orbit, frontal bone).

Statistical analysis: Data were analyzed using STATA (version 13, College Station TX, StataCorp LP; 2013). Demographic factors, cause of injury, the month of injury, and anatomic site of injury were tabulated with summary statistics using percentages and frequencies in tables and charts. Chi² tests were used to determine significance at a p-value less than 0.05.

III. Results

A total of 140 participants were enrolled in the study, with a male to female ratio of 3:1. The age range was from 2 years to 83 years with a mean of 33.7 years (SD +/- 12.2).

Etiology and Month of injury

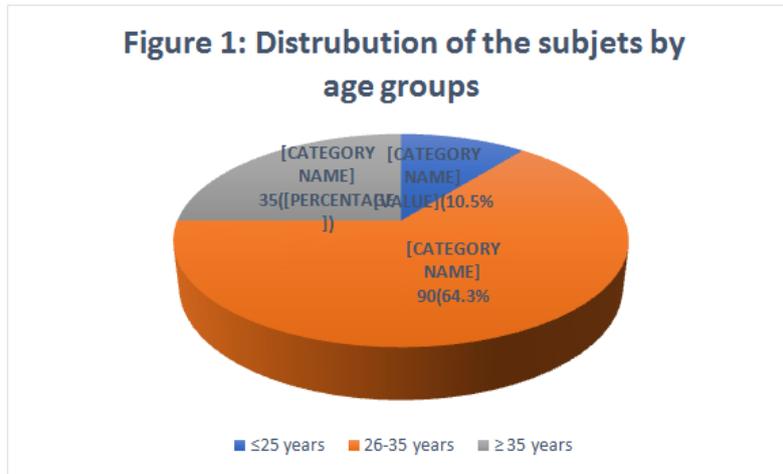
The commonest cause of injury was motorbike accidents, which accounted for 41% of injuries. The least etiologic factor was domestic violence, which occurred in one percent of cases. [Table 1]. The peak incidence of injury monthly in the 3 years of study was June (14.3%); while the peak season of injury was observed in October, November, December (10.7%, 10.7%, 12.9% respectively) [Table 1].

Pattern of injury

The mandible, with 48.2% isolated fractures, was the most common anatomical site of injury, while the maxilla (1.4%) and nasal fractures (1%) had the least isolated injury. Pan facial fractures affecting 2 or more of the 3 facial segments were recorded in 11.5% of patients [Table 1].

Further sub-analysis by sex detailed the mandible (male, female; 53.3%, 32.4% respectively) and zygomatic complex (male, female; 21.9%, 26.5% respectively) as the most common anatomical sites of injury for both sexes [Table 2].

In addition, analysis of the cause of injury by sex, detailed motorbike accidents (40.6%) as the most common cause in males, while motorbike and vehicular accidents equally accounted for injury in females (38.2% and 38.2% respectively) [Table 2]. Regardless of the cause of injury, the mandible was the most affected anatomical site ($\chi^2= 81.2$, p-value= 0.00) [Table 3].



Etiology of injury	Female (%)	Male (%)	N (%)
Vehicle accidents	13(38.2)	22(20.8)	35 (25.0)
Motorbike accidents	13(38.2)	43 (40.6)	57 (41.0)
Assaults	6(17.7)	23 (21.7)	28 (20.0)
Domestic injuries	2(5.9)	18 (16.9)	20 (14.0)
Total	34(100.0)	106 (100.0)	

Table1: Distributions of etiologic variables by Sex

Anatomical site of injury	N (%)
Mandible	67 (48.0)
Maxilla	2 (1.4)
Zygomatic bone and complex	39 (28.1)
Orbit	6 (4.3)
Nasal complex	1 (0.7)
Zygomatic bone and Nasal complex	4 (2.9)
Pan facial fracture	16 (11.5)

Table 3: Distribution by anatomic sites of injuries

Pearson $X^2 = 6.10$. p-value = 0.19

Figure 2. Distribution of maxillofacial trauma cases by month of presentation

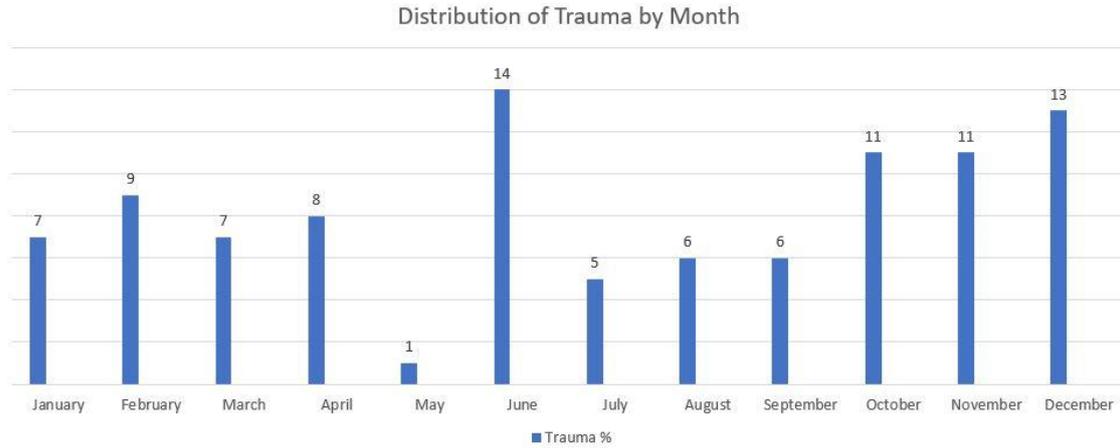


Table 4: Distribution of Anatomical sites of Injuries by Gender

Anatomical site of injury	Female (%)	Male (%)
Mandible	12 (35.3)	59 (56.2)
Maxilla	0 (0.0)	2 (1.9)
Zygomatic bone and complex	12 (35.3)	27 (25.7)
Orbit	1 (2.9)	5 (4.8)
Nasal complex	1 (2.9)	0 (0.00)
Zygomatic bone and Nasal complex	3 (8.8)	1 (0.9)
Pan facial fracture	5 (14.7)	11 (10.5)
Total (%)	34 (100.0)	105 (100.0)

Pearson $X^2 = 16.13$. p-value = 0.09

Table 5. Distribution of maxillofacial injuries by anatomical site.

Anatomical site of injury	Vehicle accidents (%)	Motor-bike accidents (%)	Assault (%)	Domestic violence (%)
Mandible	15 (43.0)	25 (45.5)	21 (72.4)	10 (50.0)
Maxilla	1 (3.0)	0 (0.0)	1 (3.5)	0 (0.0)
Zygomatic bone and complex	10 (28)	23 (41.8)	3 (10.3)	3 (15.0)
Orbit	3 (9)	2 (3.6)	0 (0.0)	1 (5.0)
Nasal complex	1 (3.0)	0 (0.0)	0 (0.0)	0 (0.0)
Zygomatic bone and Nasal complex	1 (3.0)	1 (1.8)	2 (7.4)	0 (0.0)
Panfacial fracture	4 (11.0)	4 (7.3)	2 (7.4)	6 (30.0)
Total	35 (100.0)	55 (100.0)	29 (100.0)	20 (100.0)

Pearson $X^2 = 81.23$. p value = 0.00

IV. Discussion

Maxillofacial injuries are not uncommon presentation and prompt management is important to prevent negative outcomes in functional activities and or psychosocial status of the patients¹³

The socio-economic, cultural, legislative, and environmental influences on the etiology of maxillofacial injuries were widely documented by several studies^{14,15}, global epidemiological surveys have revealed that some aspects of the facial fracture patterns remain similar among nations.¹¹

Literature from different areas shows varying ratios of male: female, but the males are consistently seen to be more affected by maxillofacial injuries in most of the studies^{6,8,11,16}

This study also concurred with the stated studies. Young men in the second and third decades of life like in this study are the most afflicted since they are frequently involved in activities that can predispose them to trauma among many like commercial driving of vehicles, tricycles, and motorbikes. A gradual rise in the female ratio involved in road traffic crashes was also observed between earlier and later studies in most centres across the country. This can be attributed to a changing workforce. Women, who are used to staying at home, now work in outdoor and high-risk occupations, thus becoming exposed to RTC and other causes of maxillofacial injuries¹¹

Road traffic crashes like in many studies locally and internationally^{1,4,6,11,17} is responsible for the leading cause of maxillofacial injuries. Both vehicular and motorbikes in the study with similar frequencies

accounted for the main cause of road traffic crashes. The causes of road accidents in Nigeria have been categorized into human, mechanical, and environmental factors¹⁸. The human factor accounts for up to 90% of accidents, while the mechanical and environmental factors contribute the other 10%¹⁸. Human factors include visual acute problems, driver fatigue, poor knowledge of road signs and regulations, illiteracy, excessive speeding, and failure to use protective helmet^{17,19,20}. Among the mechanical factors that lead to road accidents are poor vehicle maintenance and tire blowouts among many others¹⁸. The environmental factors include heavy rainfall, Harmattan winds, and poor road networks. These factors have independently and/or collectively contributed to the high rate of road accidents within the country¹⁸.

The month of June recorded the highest period of road traffic crashes in the study. This may be since it's around the peak of the rainy season and, therefore, the wet condition of the roads with poor visibility intensifies the rate of road traffic crashes^{9,18}. In addition, the months from October to December in the study were noted to also record an increase in road traffic crashes. Ember" months were characterized by a lot of Group travels, festivities, Drinking, excess speeding, reckless driving resulting in increased road traffic crashes.

The mandible is the most common site of injury^{7,11,21} followed by zygomatic complex fractures (ZMC)³. While there is debate as to what part of the facial skeleton is most commonly injured, ZMC fractures comprise up to 40% of facial fractures.³ The high rate of mandibular fractures can be explained by the unique characteristics of the mandible such as mobility and limited bone support when compared to other facial bones.¹² Also, failure to comply with safety precaution rules may be part of what makes the mandible to be the leading maxillofacial trauma in this study. Motor bike being the leading etiologic factor, most of the riders and the passengers do not use helmet for protection.^{11,21} Helmets prevent cranial trauma in about 85% of cases and have proven effective in reducing severe facial trauma. Design features of helmets (open or closed helmets are allowed by Nigerian law),

V. Conclusion

Efforts to enforce traffic regulations have been tightened in recent years by the government, road traffic accidents still remained the greatest cause of facial fractures in the studied region. There is an urgent need for strict enforcement of adherence to speed limits, the use of the seatbelt and the wearing of safety helmets by motorcyclists.

Limitations

Study is a single centre study, there is need for inclusion of other centres in the southwest and other region of the country in other to have a better sample representation.

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Conflict of interest

The authors declare no conflict of interest

References

- [1]. Stier R, Jehn P, Johannsen H, Müller CW, Gellrich NC, Spalthoff S. Reality or wishful thinking: do bicycle helmets prevent facial injuries? *International Journal of Oral and Maxillofacial Surgery*. 2019;48(9):1235-1240. doi:10.1016/j.ijom.2019.02.018
- [2]. Lalloo R, Lucchesi LR, Bisignano C, et al. Epidemiology of facial fractures: Incidence, prevalence and years lived with disability estimates from the Global Burden of Disease 2017 study. *Injury Prevention*. Published online 2019. doi:10.1136/injuryprev-2019-043297
- [3]. Pillay L, Mabongo M, Buch B. Prevalence and aetiological factors of maxillofacial trauma in a rural district hospital in the Eastern Cape. *South African Dental Journal*. 2018;73(5):348-353. doi:10.17159/2519-0105/2018/v73no5a4
- [4]. Udeabor SE, Akinbami BO, Yarhere KS, Obiechina AE. Maxillofacial Fractures: Etiology, Pattern of Presentation, and Treatment in University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria. *Journal of Dental Surgery*. 2014;2014:1-5. doi:10.1155/2014/850814
- [5]. Nyameino S, Butt F, Guthua SW, Macigo F, Akama M. Occurrence and Pattern of Maxillofacial Injuries Caused by Motorcycle Crashes Presenting at Two Major Referral Hospitals in Nairobi, Kenya. *Craniofacial Trauma Reconstruction Open*. 2018;2:9-14. doi:10.1055/s-0038-1660434
- [6]. Tugainyo EI, Odhiambo WA, Akama MK, Guthua SW, Dimba EAO. Aetiology, pattern and management of oral and maxillofacial injuries at mulago national referral hospital. *East African Medical Journal*. 2012;89(11):351-358.
- [7]. Adeyemo WL, Ladeinde AL, Ogunlewe MO, James O. Trends and characteristics of oral and maxillofacial injuries in Nigeria: a review of the literature. *Head Face Med*. 2005;1:7. doi:10.1186/1746-160X-1-7
- [8]. Obuekwe ON, Ojo MA, Akpata O, Etetafia M. Maxillofacial trauma due to road traffic accidents in Benin City, Nigeria: a prospective study. *Annals of African Medicine*. 2004;2(2):58-63. <https://www.ajol.info/index.php/aam/article/view/8279>
- [9]. Owolabi AA. Seasonal Climatic Variations and Road Accidents in Lagos, Nigeria. *Climate change and variability*. Published online 2012. <https://www.researchgate.net/publication/261705347>
- [10]. Majambo M, Sasi R, Mumena C, et al. Prevalence of Oral and Maxillofacial Injuries among Patients Managed at a Teaching

- Hospital in Rwanda. Rwanda Journal of Health Sciences. 2013;2(2):20. doi:10.4314/RJHS.V2I2.3
- [11]. Gbolahan O, Ayantunde A, Odewabi A, Ogunmuyiwa S. Patterns, severity, and management of maxillofacial injuries in a suburban south western Nigeria tertiary center. Nigerian Journal of Surgery. 2015;21(1):38. doi:10.4103/1117-6806.152732
- [12]. Munante-Cardenas JL, Nunes PHF, Passeri LA. Etiology, treatment, and complications of mandibular fractures. Journal of Craniofacial Surgery. 2015;26(3):611-615. doi:10.1097/SCS.0000000000001273
- [13]. Adebayo ET, Ajike OS, Adekeye EO. Analysis of the pattern of maxillofacial fractures in Kaduna, Nigeria. British Journal of Oral and Maxillofacial Surgery. 2003;41(6):396-400. doi:10.1016/S0266-4356(03)00165-7
- [14]. Lee KH, Snape L, Steenberg LJ, Worthington J. Comparison between interpersonal violence and motor vehicle accidents in the aetiology of maxillofacial fractures. ANZ Journal of Surgery. 2007;77(8):695-698. doi:10.1111/J.1445-2197.2007.04189.X
- [15]. Kuye OF, Olawunmi •, Fatusi A, et al. Clinical Signs and Intraocular Pressure Changes in Patients with Orbitozygomatic Complex Fractures. Journal of Maxillofacial and Oral Surgery. 19. doi:10.1007/s12663-019-01299-6
- [16]. Ibrahim NA, Ajani AWO, Mustafa IA, et al. Road Traffic Injury in Lagos, Nigeria: Assessing Prehospital Care. Prehospital and Disaster Medicine. 2017;32(4):424-430. doi:10.1017/S1049023X17006410
- [17]. Olayemi AB, Adeniyi AO, Samuel U, Emeka OA. Pattern, severity, and management of cranio-maxillofacial soft-tissue injuries in Port Harcourt, Nigeria. Journal of Emergencies, Trauma and Shock. 2013;6(4):235-240. doi:10.4103/0974-2700.120362
- [18]. Ukoji VN. Trends and patterns of fatal road accidents in Nigeria (2006-2014). Violence in Nigeria. Published online July 23, 2016:13-40. doi:10.4000/BOOKS.IFRA.1908
- [19]. Udeabor SE, Akinbami BO, Yarhere KS, Obiechina AE. (No Title). Published online 2014. doi:10.1155/2014/850814
- [20]. Lee K. Global Trends in Maxillofacial Fractures. Published online 2012. doi:10.1055/s-0032-1322535
- [21]. Jaber MA, AlQahtani F, Bishawi K, Kuriadom ST. Patterns of Maxillofacial Injuries in the Middle East and North Africa: A Systematic Review. International Dental Journal. 2021;71(4):292-299. doi:10.1111/idj.12587

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