

Prevalence and Trend of Oral and Maxillofacial Injuries among Patients Attended at Mbeya Zonal Referral Hospital, Tanzania: A four - years retrospective study

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Abstract

Background: Oral and maxillofacial injuries pose a significant public health burden, but data on their patterns and prevalence is lacking in many developing countries like Tanzania. This study aimed to establish baseline data on these injuries' prevalence, patterns, and associated factors among Mbeya Zonal Referral Hospital (MZRH) patients.

Methods: A retrospective assessment of electronic medical records was conducted for all patients presenting with oral and maxillofacial trauma at MZRH between January 2019 and December 2022. Data on demographics, injury types, and admission status were extracted. Descriptive statistics and logistic regression models were used for analysis.

Results: Of 608 patients, 82.9% were males, and the median age was 28. Fractures of the mandible (53%) were most common, followed by malar/maxillary fractures (34%) and soft tissue injuries (12%). Malar/maxillary fractures had the highest odds of admission. Males had 1.84 times higher odds of malar/maxillary fractures than females. The 0-17 age group had higher odds of soft tissue injuries than older ages. Patients aged 18-34 years had twice the odds of mandibular fractures versus the youngest group.

Conclusion: Oral and maxillofacial injuries predominantly affected young adult males in this region. Mandibular fractures were most common, but malar/maxillary fractures required more admission. Age and gender were associated with anatomical patterns of injuries. The findings highlight the need for preventive strategies and management protocols tailored to regional epidemiology.

Keywords: Oral and maxillofacial injuries, mandibular fractures, malar and maxillary fractures, soft tissue injuries, retrospective study, Tanzania

Introduction

Oral and maxillofacial trauma can be defined as any physical injuries of the orofacial soft tissues, underlying facial bones, and teeth within the oral and maxillofacial region. These injuries can lead to orofacial deformities and malfunctions, which may have economic, health, and emotional implications.

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(Mitchener & Canham-Chervak, 2010). According to WHO, oral and maxillofacial trauma poses a severe public health problem, and reliable data on its frequency and severity are still lacking in most countries, particularly in developing countries (Petersen, 2004). Due to its anatomical location and structure, the craniofacial region is more vulnerable to traumatic injury than other body parts (Obimakinde et al., 2012). Most of the studies that looked at the gender distribution found that males were more likely to sustain orofacial injuries compared to females. Two studies done in Tanzania had similar findings (Obimakinde et al., 2012)(Deogratius et al., 2006)(Majambo et al., 2013)(Owibingire & Sohal, 2018). Orofacial injuries have repeatedly been found to be more common among the younger population compared to the older ones. A study done in Rwanda found that the overall prevalence of oral and maxillofacial injuries was 16%, with most (53.8%) of the patients belonging to the 21-30 age group (Majambo et al., 2013). In another study done in Uganda, the same age group (21-30 years) was the most commonly affected. (Deogratius et al., 2006).

Mandibular fractures are more common than maxillary fractures when assessing the anatomical distribution of these injuries. A study in the United Arab Emirates revealed that mandibular fractures were four times more frequent than maxillary fractures (Ahmed et al., 2004). Also, the same study found that the distribution of maxillary fractures was mostly Le-Fort I (66.7%), followed by Le Fort II (29.4%), Le Fort III (10.7%), and dentoalveolar fractures 49% (Ahmed et al., 2004). Another study done in Tanzania reported that mandibular fractures occurred more frequently (71%) than maxillary fractures (Owibingire & Sohal, 2018). Similarly, in Uganda, it was found that mandibular fractures were the most common injuries, which accounted for 66% of all maxillofacial fractures (Kamulegeya et al., 2009).

The most common causes of oral and maxillofacial injuries include motor traffic accidents, assaults (including gunshots), sports injuries, falls, chemical exposures, thermal burns or animal bites, and interpersonal violence. Studies done in developing countries have indicated that motor traffic accidents are the most common causes of oral and maxillofacial trauma (Alvi et al., 2003)(Majambo et al., 2013)(Ahmed et al., 2004). These etiological factors have been shown to vary in different countries or within the same country depending on factors such as socio-economic, cultural, and environmental conditions (Adeyemo et al., 2005). In a systematic review study, falling was found to be the most important cause of dental trauma in children and adolescents (Azami-Aghdash et al., 2015). This was similar to other studies done elsewhere (Gupta et al., 2011)(Ravishankar et al. N, n.d.)(Zhou et al., 2013). One study done in Tanzania found that the most (88%) victims involved in motorcycle accidents were the riders of motorcycles (Owibingire & Sohal, 2018). Also, another study done in the same country showed that the causes of maxillofacial fractures varied from assault (57.6%), falls (19.7%), motor traffic accidents (13.7%), and sports (8%) (Deogratius et al., 2006). The diverse variability in reported causes and prevalence of oral maxillofacial injuries is due to various contributing factors such as the sex, age, environment, and socio-economic status of the studied individuals.

In Tanzania, few studies have been conducted, mainly in Dar es Salaam, to determine the patterns of oral and maxillofacial injuries. So far, there is no established data on the prevalence and patterns of oral and maxillofacial injuries at Mbeya Zonal Referral Hospital (MZRH), which is a tertiary-level hospital that receives patients from more than seven regions of the Southern highlands zone and neighbouring countries. Recent observations at MZRH showed an increasing trend of oral and maxillofacial trauma related to motorcycle accidents, similar to reports from several studies done worldwide (Agbor et al., 2014)(Gabriella Pacheco da Silva et al., 2015)(Khanbhai & Lutomia, 2012)(Yamamoto et al., 2014). This study aimed to establish baseline data on the prevalence, patterns, and factors associated with oral and maxillofacial injuries among MZRH patients. This information will equip hospital management and healthcare providers with an understanding of the burden of these injuries and help them plan to manage these patients appropriately. These may subsequently translate into reduced morbidities and mortalities, improving the victim's quality of life.

Methods

Study design

We conducted a retrospective cross-sectional analysis of electronic records for patients who presented at the dental department of Mbeya Zonal Referral Hospital between January 1st, 2019, and December 31st, 2022.

Data source, definition, and variables

To estimate the burden of oral and maxillofacial injuries during the study period, we calculated the proportion of patients that presented with these injuries among all patients that presented for management of any conditions at the dental department. Details on the types of oral and maxillofacial injuries were extracted from electronic medical records (EMR) according to the ICD 10 diagnostic codes system. Demographic information collected included age, sex, admission status, and health care payment scheme. The patients' ages were stratified into one of the following subgroups: less or equal to 17 years, 18-34 years, 35-59 years, and more than 60 years old.

Data Analysis

Data was analyzed using STATA statistical software (StataCorp, College Station, TX). Descriptive statistics were calculated; for continuous data, we reported the mean, SD, median, and interquartile range, while for categorical data, we reported the frequency and percentages of all patients. Pearson's chi-squared tests were used to compare the association between categorical variables. Two binary logistic regression models were conducted to estimate the relationship and effect of different predictors of maxillofacial fractures and admission status. The odds ratio was reported at a 95% confidence interval, and a two-sided $P < 0.05$ was considered statistically significant.

Ethical consideration

The study was approved by the Mbeya Medical Research and Ethics Committee (Ref No: SZEC-2439/R.A/V.1/157a). Permission to conduct the study was obtained from the Mbeya Zonal Referral Hospital administration. Confidentiality and privacy of participants' information were observed. Names and other identifying information were not included.

Results

608 patients with all diagnoses of oral and maxillofacial injuries were attended at the Mbeya Zonal Referral Hospital in 4 years. These injuries comprised 3.8% of all diagnoses in the dental department. The majority 504 (82.9%) of the patients were males, and the median age was 28 years IQR (20-37.5). More than half (53.4%) of the patients were aged between 18 and 34. Most, 444 (73%) attended as outpatients, and about three-quarters (453) of all the patients paid out of their pockets rather than through insurance schemes.

Table 1: Demographic characteristics of the patients with oral and maxillofacial injuries attended at Mbeya zonal referral hospital (n=608)

Characteristic		Frequency (%)
Gender	Male	504 (82.9)
	Female	104 (17.1)
Age in years	Median (IQR)	28 (20 -37.5)
Age group	0 – 17	91 (15.0)
	18 – 34	325 (53.4)
	35 – 59	177 (29.1)
	≥ 60	15 (2.5)
Admission status	Admitted	164 (27.0)
	Outpatient	444 (73.0)
Payment scheme	Cash	453 (74.5)
	Health insurance	148 (24.3)
	Other	7 (1.2)

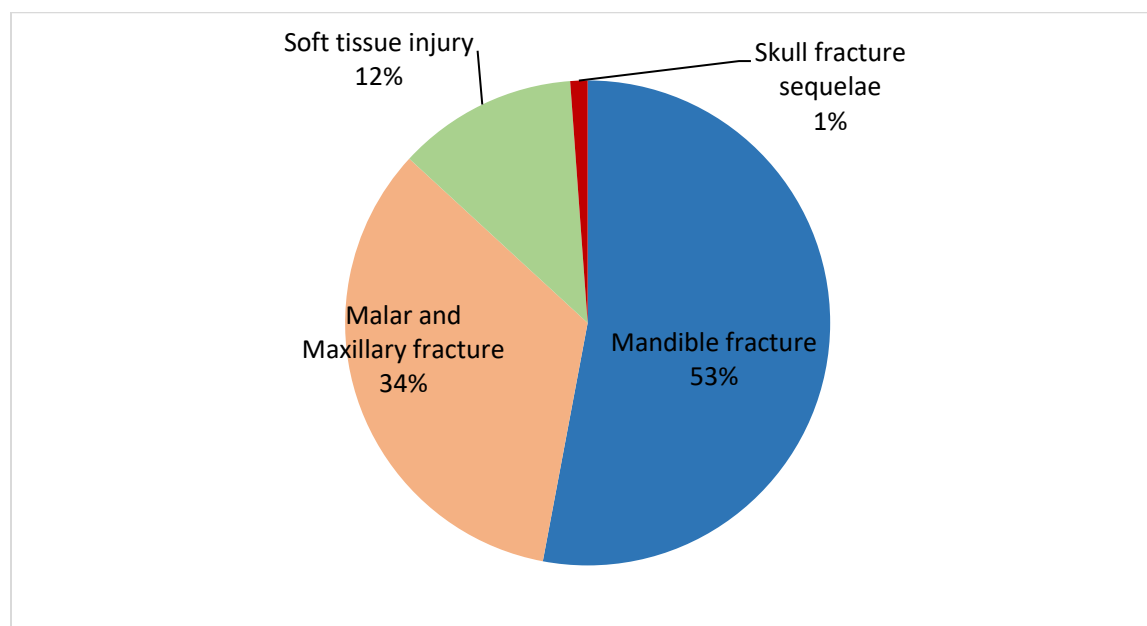


Figure 1: Distribution of the types of oral and maxillofacial injuries sustained by patients who sought treatment at MZRH between 2019 - 2022

The most commonly encountered oral and maxillofacial injuries were fractures of the mandible 322 (53%), followed by 207(34%) that had malar and maxillary bone fractures and twelve percent (73) that had a soft tissue injury (Figure 1).

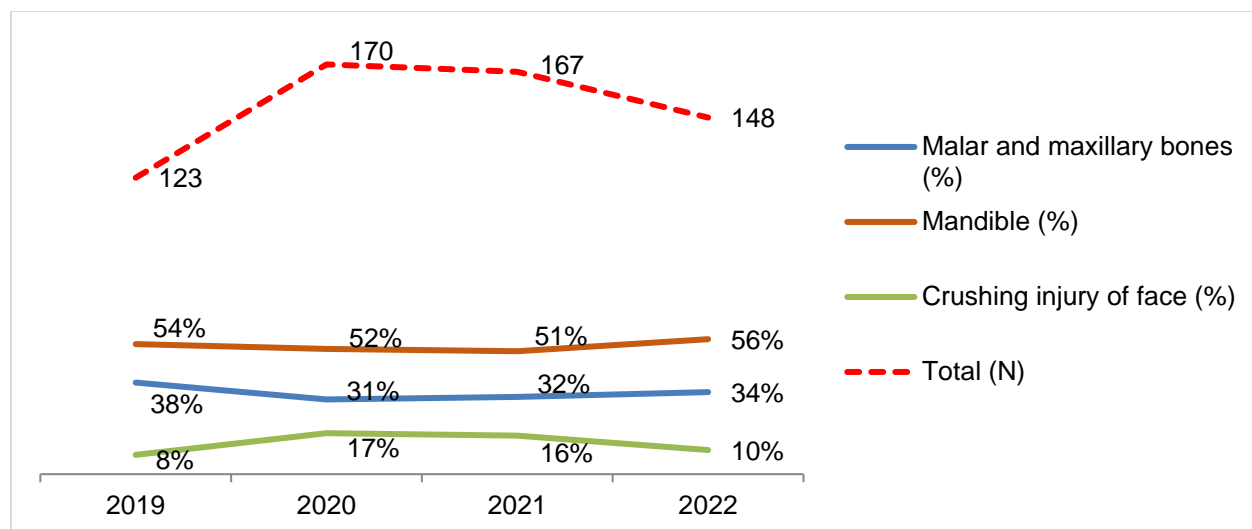


Figure 2: Trends of oral and maxillofacial injuries over the years at MZRH hospital

For the past four years, MZRH has attended more patients with mandibular fractures than other maxillofacial fractures. The majority of 337 (55.4%) patients with oral and maxillofacial injuries were attended at MZRH during the years 2020-2021, and almost an equal number of patients with oral and maxillofacial injuries were attended at this period (Figure 2). After adjusting for gender, age was associated with the odds of malar and maxillary fractures. Those aged 18-34, 35-59, and above 60 years had 2.12, 2.65, and 3.87 times the odds for malar and maxillary fractures compared to those aged 0-17. Males had 1.84 times the odds of malar and maxillary fractures compared to females CI (1.00-3.38). Those aged 18-34, 35-59, and above 60 years had 75%, 41%, and 85% lower odds for soft tissue injury, respectively. Male patients had 40% lower odds for soft tissue injuries than female patients (CI 0.38-0.95). Patients aged 18-34 years had twice the odds of mandibular fractures compared to those aged 0-17 years. There was no evidence of an association between gender and the odds of sustaining mandibular fractures.

Table 2: Multivariable logistic regression showing an association between demographic factors and anatomical types of maxillofacial fractures

Characteristics	Total N (%)	Type of fracture AOR (95% CI)		
		Malar and maxillary	Mandible	Soft tissue injury
Age group				
0-17	92(15.1)	Ref	Ref	Ref
18-34	326(53.6)	2.12(1.04 – 4.34)	2.24(1.38– 3.63)	0.25(0.15 – 0.42)
35-59	175(28.8)	2.65(1.26 – 5.58)	0.97(0.58 – 1.65)	0.59(0.35 – 0.99)
60 and above	15(2.5)	3.87(1.09 – 13.7)	1.84(0.61 – 5.53)	0.15(0.3 – 0.72)
Gender				
Female	104(17.1)	Ref	Ref	Ref
Male	504(82.9)	1.84(1.00 – 3.38)	1.08(0.70 – 1.68)	0.60(0.38 – 0.95)

After adjusting for the patient's health insurance status, age, and gender, there was strong evidence of an association between admission status and oral and maxillofacial injuries. Patients who sustained mandibular fractures and soft tissue injuries had 48% and 79% lower odds, respectively, of being admitted compared to those with malar and maxillary fractures.

Table 3: Multivariable logistic regression showing the association between oral and maxillofacial injuries and admission status

	Admission status			
	Admitted	Not Admitted	AOR (95% of CI)	P-value
Type of fracture				
Malar and maxillary bones fractures	51(38.4)	82(61.6)	Ref	
Fracture of mandible	74(24.7)	225(75.3)	0.52(0.33 – 0.82)	0.004
Soft tissue injury	21(11.9)	155(88.1)	0.21(0.12 – 0.39)	<0.001

Adjusted for health insurance status, age and sex

Discussion

Of all the dental diagnoses made at Mbeya Zonal Referral Hospital, oral and maxillofacial injuries accounted for 3.8%, higher than the (2%) national proportion. *Ministry of Health (MoH), 2023, Tanzania “District Health Information System (DHIS 2)” (Unpublished data)*. This could be explained by the fact that Mbeya Zonal Referral Hospital is a zonal tertiary referral hospital where almost all oral and maxillofacial trauma patients are referred from all facilities in the Southern Highland regions. The fact that males (82.9%) were more affected than women in this study could be explained by the difference in socio-economic activities, which make men more mobile and thus vulnerable to such injuries since men use motorcycles and motor vehicles more commonly than women. Also, more men are involved in physical activities such as building, road works, and mining than women, which increases their exposure to accidents leading to physical injuries. Similar findings have been reported in other studies (Azami-Aghdash et al., 2015)(Kamulegeya et al., 2009)(Majambo et al., 2013)(Owibingire & Sohal, 2018)(Park et al., 2015). In line with this, the male patients in this study showed higher odds of malar and maxillary fractures than were females, which was similar to the study done in Romania (Juncar et al., 2021).

This study has shown that 325 (53.4%) individuals who presented with oral and maxillofacial injuries were aged 18 – 34 years. These results concurred with studies done in Rwanda (Kamulegeya et al., 2009) and Uganda (Deogratus et al., 2006), where individuals aged 21-30 were mainly affected, and also in Korea, where the 10 to 39 years age group was mostly affected (Park et al., 2015). Such findings may be explained by the more common involvement in physical and social activities in this age group, which increases their chances of being exposed to oral and maxillofacial trauma. The mandible (53%) was the most commonly affected anatomical part, which echoes findings from studies done elsewhere. A study done at Muhimbili National Hospital showed that mandibular fractures were four times more frequent than maxillary fractures (Owibingire & Sohal, 2018). Another study done in Uganda also showed the predominance of mandibular fractures compared to other parts of the oral and maxillofacial region (Deogratus et al., 2006). This could be explained by the anatomical protrusion of the mandible compared to other parts of the face. However, our findings differed from a study done

in Korea, which found that the malar and maxillary bones (41.9%) were the most commonly affected regions. In comparison, the mandible fractures accounted for 33% (Singaram et al., 2016).

Surprisingly, this study revealed a decreased occurrence of oral and maxillofacial trauma in 2022 compared to 2020 and 2021. Studies done elsewhere have shown increasing trends of oral and maxillofacial trauma over the years (Park et al., 2015)(Plawecki et al., 2017). This decreased trend in this study could be due to the government's decision to employ many dentists and equip most of the dental clinics in Regional Referral Hospitals in the country. This has probably enabled facilities to manage most trauma patients who would otherwise be referred to the Mbeya zonal referral hospital.

However less in number, patients with malar and maxillary fractures had the highest admission than those with mandibular fractures. This probably could be due to the anatomical structures and proximity of fractures to the vital aerodigestive organs. The current study also demonstrated that the youngest age group (0-17 years) and female patients had higher odds for soft tissue injury compared to older ones and males respectively, which was similar to what was observed in the studies done in Iraq (Awlla et al., 2013) and Nigeria (Osaghae IP, Eriamiator CO, 2019). This could be explained by the fact that females and young individuals are usually not exposed to outdoor environments much during their daily activities; hence, they are less likely to come across higher-impact accidents, which could lead them to sustain skeletal fractures. Most of the low-impact accidents result in soft tissue injuries. However, this finding (12%) by the current study differed from other studies done in Tanzania (Sohal et al., 2022) and Columbia (Contreras Ochoa et al., 2019).

This study involved a retrospective assessment of routine patient records related to oral and maxillofacial trauma, and thus, establishing the causal inferences, clinical characteristics, and management was complex. This calls for and necessitates conducting another prospective study to establish the common causes of oral and maxillofacial trauma in our locality. Also, the electronic medical record with the ICD 10 version could not classify the oral and maxillofacial fractures further according to the patterns of fractures. The information from this study portrays the snap-shot of oral and maxillofacial trauma among patients at MZRH and may thus be an excellent basis for improvement in both planning and management of oral and maxillofacial trauma patients

Conclusion

This retrospective study provides important insights into the epidemiological patterns and risk factors associated with oral and maxillofacial injuries among patients attending a major referral hospital in the Southern Highlands of Tanzania. The findings highlight that these injuries predominantly affect the younger population, with a striking male preponderance. Mandibular fractures emerged as the most common type of injury. However, malar and maxillary fractures were associated with higher odds of hospital admission, likely due to their proximity to vital anatomical structures and the complexity involved in their management. The observed associations between age, gender, and specific injury patterns underscore the role of demographic and behavioural risk factors in influencing trauma mechanisms and injury severity. Young adults, particularly males, may be more prone to high-risk activities or occupations that increase their vulnerability to maxillofacial trauma. Preventive strategies tailored to these at-risk populations could be crucial in mitigating the burden of such injuries. Furthermore, the insights gained from this study can inform the development of comprehensive management protocols and resource allocation for oral and maxillofacial trauma care within the region. Prospective studies are warranted to elucidate further the etiological factors and clinical characteristics of these injuries to optimize preventive and therapeutic interventions.

Acknowledgements

The authors thank the management of Mbeya Zonal Referral Hospital for granting us access to the data used in this study.

Author contributions

MLB conceived the study. MLB, AFL, WO, and BK were involved in designing, analyzing, and interpreting the data and developing the first draft of the manuscript. ZM assisted in data analysis. All co-authors contributed to subsequent revisions. All authors read and approved the final manuscript.

Funding

None

Conflict of interest

The authors declare that they have no competing financial and non-financial interests.

Availability of data and material

All data generated or analysed during this study is included in this published article.

References

- Adeyemo, W. L., Ladeinde, A. L., Ogunlewe, M. O., & James, O. (2005). Trends and characteristics of oral and maxillofacial injuries in Nigeria: a review of the literature. *Head & Face Medicine*, 1, 7. <https://doi.org/10.1186/1746-160X-1-7>
- Agbor, A. M., Azodo, C. C., Ebot, E. B., & Naidoo, S. (2014). Dentofacial injuries in commercial motorcycle accidents in Cameroon: pattern and cost implication of care. *African Health Sciences*, 14(1), 77–82. <https://doi.org/10.4314/ahs.v14i1.12>
- Ahmed, H. E. Al, Jaber, M. A., Abu Fanas, S. H., & Karas, M. (2004). The pattern of maxillofacial fractures in Sharjah, United Arab Emirates: A review of 230 cases. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology and Endodontology*, 98(2), 166–170. <https://doi.org/10.1016/j.tripleo.2004.01.020>
- Alvi, A., Doherty, T., & Lewen, G. (2003). Facial Fractures and Concomitant Injuries in Trauma Patients. *The Laryngoscope*, 113(1), 102–106. <https://doi.org/10.1097/00005537-200301000-00019>
- Awlla, R., Fattah, jalal, & Shihab, O. (2013). Incidence of facial soft tissue injuries among patients attending surgical casualty reception in Rojh-halat emergency hospital. *Zanco Journal of Medical Sciences*, 17(1), 300–304. <https://doi.org/10.15218/zjms.2013.0006>
- Azami-Aghdash, S., Ebadifard Azar, F., Pournaghi Azar, F., Rezapour, A., Moradi-Joo, M., Moosavi, A., & Ghertasi Oskouei, S. (2015). Prevalence, etiology, and types of dental trauma in children and adolescents: systematic review and meta-analysis. *Medical Journal of the Islamic Republic of Iran*, 29(4), 234.
- Contreras Ochoa, I. J., Portillo Vilardy, E. M., & Rodríguez, M. J. (2019). Prevalence of Maxillofacial Injuries in Women Who Have Experienced Physical Violence Reported At a House of Justice in the Metropolitan Area of Bucaramanga (Colombia). *Revista Facultad de Odontología*, 31(1–2), 102–111. <https://doi.org/10.17533/udea.rfo.v31n1-2a9>
- Deogratius, B. K., Isaac, M. M., & Farrid, S. (2006). Epidemiology and management of maxillofacial fractures treated at Muhimbili National Hospital in Dar es Salaam, Tanzania, 1998–2003. *International Dental Journal*, 56(3), 131–134. <https://doi.org/10.1111/J.1875-595X.2006.TB00084.X>
- Gabriella Pacheco da Silva, M., de Lima Silva, V., & Luiza Lopes Timóteo de Lima, M. (2015). *Set-Out*. 17(5), 1689–1697.
- Gupta, S., Kumar-Jindal, S., Bansal, M., & Singla, A. (2011). Prevalence of traumatic dental injuries and role of incisal overjet and inadequate lip coverage as risk factors among 4-15 years old government school children in Baddi-Barotiwala area, Himachal Pradesh, India. *Medicina Oral, Patología Oral y Cirugía Bucal*, 16(7). <https://doi.org/10.4317/MEDORAL.17265>
- Juncar, M., Tent, P. A., Juncar, R. I., Harangus, A., & Mircea, R. (2021). An epidemiological analysis of maxillofacial fractures: a 10-year cross-sectional cohort retrospective study of 1007 patients.

- BMC Oral Health*, 21(1), 1–10. <https://doi.org/10.1186/s12903-021-01503-5>
- Kamulegeya, A., Lakor, F., & Kabenge, K. (2009). Oral maxillofacial fractures seen at a Ugandan tertiary hospital: a six-month prospective study. *Clinics (Sao Paulo, Brazil)*, 64(9), 843–848. <https://doi.org/10.1590/S1807-59322009000900004>
- Khanbhai, M., & Lutomia, M. (2012). Motorcycle Accident injuries seen at Kakamega Provincial Hospital in Kenya. *East and Central African Journal of Surgery*, 17(1), 43–46. <https://doi.org/10.4314/ecajs.v17i1>.
- Majambo, M., Sasi, R., Mumena, C., Museminari, G., Nzamukosha, J., Nzeyimana, A., & Rutaganda, E. (2013). Prevalence of Oral and Maxillofacial Injuries among Patients Managed at a Teaching Hospital in Rwanda. *Rwanda Journal of Health Sciences*, 2(2), 20–24. <https://doi.org/10.4314/rjhs.v2i2.3>
- Mitchener, T. A., & Canham-Chervak, M. (2010). Oral-maxillofacial injury surveillance in the department of defense, 1996-2005. *American Journal of Preventive Medicine*, 38(1 SUPPL.), S86–S93. <https://doi.org/10.1016/j.amepre.2009.10.016>
- Obimakinde, O. S., Okoje, V. N., & Fasola, A. O. (2012). Pattern of Assault-induced Oral and Maxillofacial Injuries in Ado-Ekiti, Nigeria. *Nigerian Journal of Surgery: Official Publication of the Nigerian Surgical Research Society*, 18(2), 88. <https://doi.org/10.4103/1117-6806.103114>
- Osaghae IP, Eriamiator CO, I. L. (2019). Pattern of orofacial injuries between the genders following interpersonal conflicts in Benin-City , Edo State , Nigeria. *Nigerian Journal of Dental and Maxillofacial Traumatology*, 2(1&2), 43–50.
- Owibingire, S. S. B. M. K., & Sohal, K. S. (2018). *The Pattern of dental injury, incidence of dental caries and dental treatment need among motorcycle crash victims in Tanzania.*
- Park, K.-P., Lim, S.-U., Kim, J.-H., Chun, W.-B., Shin, D.-W., Kim, J.-Y., & Lee, H. (2015). Fracture patterns in the maxillofacial region: a four-year retrospective study. *Journal of the Korean Association of Oral and Maxillofacial Surgeons*, 41(6), 306. <https://doi.org/10.5125/jkaoms.2015.41.6.306>
- Petersen, P. E. (2004). Challenges to improvement of oral health in the 21st century--the approach of the WHO Global Oral Health Programme. *International Dental Journal*, 54(6 Suppl 1), 329–343. <https://doi.org/10.1111/J.1875-595X.2004.TB00009.X>
- Plawecki, A., Bobian, M., Kandinov, A., Svider, P. F., Folbe, A. J., Eloy, J. A., & Carron, M. (2017). Recreational activity and facial trauma among older adults. *JAMA Facial Plastic Surgery*, 19(6), 453–458. <https://doi.org/10.1001/jamafacial.2017.0332>
- Ravishankar TL, Kumar MA, Ramesh N, C. T. (n.d.). *Prevalence of Traumatic Dental Injuries to Permanent Incisors Among 12-year-old School Children in Davangere, South India | Quintessenz Verlags-GmbH.*
- Singaram, M., G, S. V., & Udhayakumar, R. K. (2016). Prevalence, pattern, etiology, and management of maxillofacial trauma in a developing country: a retrospective study. *Journal of the Korean Association of Oral and Maxillofacial Surgeons*, 42(4), 174. <https://doi.org/10.5125/jkaoms.2016.42.4.174>
- Sohal, K. S., Owibingire, S. S., Kalyanyama, B., & Simon, E. N. (2022). Association between oro-facial soft tissue injuries And oral And MAXillofacial fractures. *Journal of Stomatology*, 75(3), 176–181. <https://doi.org/10.5114/jos.2022.119175>
- Yamamoto, K., Matsusue, Y., Horita, S., Murakami, K., Sugiura, T., & Kirita, T. (2014). Clinical Analysis of Midfacial Fractures. *Materia Socio-Medica*, 26(1), 21. <https://doi.org/10.5455/MSM.2014.26.21-25>
- Zhou, H. H., Ongodia, D., Liu, Q., Yang, R. T., & Li, Z. B. (2013). Dental trauma in patients with maxillofacial fractures. *Dental Traumatology*, 29(4), 285–290. <https://doi.org/10.1111/J.1600-9657.2012.01169.X>