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CIVILIAN GUNSHOT OROFACIAL INJURY IN A NIGERIAN TERTIARY HOSPITAL: A 10-YEAR RETROSPECTIVE REVIEW

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ABSTRACT

Background: **Gunshot related injuries to the face are relatively rare in peacetime. This study reported the pattern of presentation and management of orofacial civilian gunshot injuries at a Nigerian tertiary hospital.**

Methodology: **Medical records of 25 patients who sustained gunshot injuries to the face and were managed at the Obafemi Awolowo University Teaching Hospitals Complex, Ile Ife between 2010 and 2019 were reviewed. Patients' demographics, wounding mechanisms, clinical presentations and treatment administered were retrieved from the patients' case record. Patient records with incomplete information were excluded. Data generated were inputed into IBM-SPSS version 26 and analysed.**

Results: **A total of 2,847 patients were admitted through our department over the study period and 28 of them sustained orofacial gunshot injuries, giving a prevalence of 0.98%. Twenty-five out of the 28 retrieved case files met the inclusion criteria. There were 22 males and 3 females; with a male to female ratio of 7.3:1. The mean age was 37.60 ±11.86 years with highest prevalence at fourth decade of life. About two-thirds of these injuries were intentionally inflicted by others with the use of Dane guns on highways. Majority (64%) of these injuries involved the middle third of the face. Definitive treatments ranged from simple to complex reconstructive procedures to restore pre-injury form and functions.**

Conclusion: **Gunshot injury involving the maxillofacial region is uncommon during peace time. The male gender was predominantly affected and the middle third facial skeleton was the most involved anatomic site. Most of the injuries were intentionally inflicted by others using Dane gun.**

Keywords: Civilian, Gunshot, Orofacial, Injury, Nigeria.

INTRODUCTION

The orofacial region is one of the vulnerable regions of the body following gunshot injuries. It is one of the body parts that is poorly protected against gunshot related injuries[1]. In 2001, the World Health Organization (WHO) declared gunshot injury as a public health problem because of its significant short and long term consequences on the victims[1]. Injuries resulting from gunshots to the face may present with functional impairment and disfigurement.[2]

Gunshot wounds include wound arising from bullets, pellets, shrapnel and other projectiles. The epidemiology of gunshot injuries varies from one geographical location to another, even within the same country, different nations and between peacetime and wartime or civil unrest.[3] Peacetime gunshot injuries are experienced in the following situations – attempted suicides, criminal attacks (armed robbery), terrorist attacks, accidental discharge of gunshots by law enforcement agents, political thuggery and other social unrest and disturbances. Wartime injuries on the other hand occur in region of the world where there is tribal or ethnic or religious conflicts, banditry and insurgency. In wartime, gunshot injuries occur in addition to blast injuries because of the use of bomb, shell, grenades, land mines and improvised explosive devices (IED). The previous studies done by Ugboko *et al.*[4] in Ile-Ife, and Obeichena and Fasola[5] in Ibadan were conducted well over two decades ago. Due to increasing population, changes in sociopolitical, security and economic situations of the country at large with implications on our local community, there is need to reappraise the prevalence and presentation pattern of civilian orofacial gunshot injuries in the presence of

the heightened economic difficulties and insecurity with the aim of evaluating present preventive strategy and formulating a new policy to tackle the menace of gunshot injuries. Therefore, the purpose of this article was to report the pattern of presentations and management of orofacial civilian gunshot injuries at a suburban Nigerian tertiary hospital.

PATIENTS AND METHODS

The study was a 10-year (2010-2019) retrospective study of civilian gunshot orofacial injuries at the OAUTHC, Ile-Ife. The total number of inpatients management by the oral and maxillofacial surgery department during the study period was retrieved from the Statistic Unit of the Medical Record Department of OAUTHC. Patients with orofacial gunshot injuries were identified from the patients' medical records domiciled at the Accident and Emergency Department, operating theatre and the oral and maxillofacial outpatient clinic. Only medical records of patients who were alive at the time of presentation were reviewed. Patients with gunshot injuries to other body parts without the orofacial region were excluded. Sociodemographic variables, rescuer, time of injury to hospital presentation, range of gunshot injury, mechanism of injury, type of gunshots, injury profiles (affected anatomic sites, side of the face and description of injury) and definitive treatments were retrieved from the medical records of eligible patients. Data analysis was performed using IBM-SPSS version 26. Approval for this study was received from the Ethics and Research Committee of Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife with Protocol number: ERC/2022/03/07.

RESULTS

Out of 2,847 patients who were managed by the maxillofacial surgeons as inpatients during the study period at our facility, 28 sustained orofacial gunshot injuries. Twenty-five out of the 28 retrieved case files met the inclusion criteria; giving a prevalence of 0.98%. The three that do not meet the inclusion criteria were excluded from further analysis. Twenty-two (88.0%) were male patients while 3 (12.0%) were females, with

Table 1: Sociodemographic and clinical profiles of civilian orofacial gunshot patients

	Variable	Frequency(N)	Percentage(%)
Gender	Male	22	88.0
	Female	3	12.0
	Total	**25**	**100.0**
Age range	1-10	1	4.0
	11-20	2	8.0
	21-30	6	24.0
	31-40	11	44.0
	41-50	3	12.0
	51-60	1	4.0
	61-70	1	4.0
	Total	**25**	**100.0**
Occupation	Trade	13	52.0
	Farming	4	16.0
	Driver	3	12.0
	Schooling	3	12.0
	Police officer	2	8.0
	Total	**25**	**100.0**
Mechanism of injury	Intentionally inflicted by others	15	60.0
	Accidentally self-inflicted	6	24.0
	Accidentally inflicted by others	2	8.0
	Intentionally self-inflicted	2	8.0
	Total	**25**	**100.0**
Type of gun	Dane gun	16	64.0
	Pistol	5	20.0
	Unknown	4	16.0
	Total	**25**	**100.0**
Location of attack	Highway	17	68.0
	Home/Hostel	6	24.0
	Street	2	8.0
	Total	**25**	**100.0**

Table 2: Age and gender distribution of patients with gunshot orofacial injuries according to year.

		Age groups (years)							
Year	Sex	1-10	11-20	21-30	31-40	41-50	51-60	61-70	Total
2010	M			1		1	1		3
	F								
2011	M				2				2
	F								
2012	M			2					2
	F								
2013	M		1			1			3
	F				1				
2014	M			1					1
	F								
2015	M	1		1	2				4
	F								
2016	M				3				3
	F								
2017	M				1			1	2
	F								
2018	M			1	1	1			3
	F								
2019	M		1		1				2
	F								
Total		1	2	6	11	3	1	1	25

male to female ratio of 7.3:1. Mean age was 37.60 (±11.86) years with age range of 10 – 63 years. Most patients were in fourth decade of life (Table 1) while combined third and fourth decades contributed to two third of the total patients recorded (Table 2).

Most of the patients 17 (68.0%) were shot on the highway following armed robbery attacks. Six (24.0%) were shot with pistols, 16 (64.0%) were shot with locally made Dane gun while 3 (12.0%) could not recognise the type of gun used for the attack. The earliest presentation to the hospital was within one hour of injury while the latest was 3 months after injury. Most injuries (15; 60.0%) were intentionally inflicted by others, followed by accidentally self-inflicted injuries (6; 24.0%). The other mechanisms of gunshot injuries were those accidentally inflicted (2; 8%) and intentionally self-inflicted (2; 8%). Fifteen (60.0%) of the patients were shot at close range, while two (8.00%) patients were shot at long range distance from their assailants. Nineteen (76.0%) of the patients were rescued by law enforcement agents (officers of the Nigeria Police Force, Federal Road Safety Corps and, Nigeria Security and Civil Defense Corps) while 6 (24.0%) were rescued by good Samaritans (neighbours and friends).

The combined middle and lower third of the face were more affected (17; 68.0%) than isolated middle or isolated lower third of the face in our study. In the middle third, maxillary, nasal, zygomatic bones and floor of the orbit were frequently affected either in isolation or in combination with adjacent bones. The body and angle regions were the commonest fracture sites in the mandible. The left side of the face was mostly affected (10; 40.0%), followed by the central (9; 36.0%) and the right side of the face in (6; 24.0%) patients (Table 3).

The most common soft tissue injury was avulsion (21; 88.0%) while the commonest hard tissue injury was communited fracture of the mandible mostly in the body and angle region. The soft tissue injuries were managed by debridement with removal of foreign bodies and delayed repair of affected tissues (mucosa, submucosa, muscle and skin), exenteration, or enucleation of the unsalvageable globe. Two of the patients that presented with residual soft tissue facial deformities had secondary procedures which included commisuroplasty, sulcoplasty, scar revisions, skin graft and use of local flaps. The bone injuries were managed by open reduction and internal fixation using conventional fracture plates and screws, midface

microplates and appropriate screw sizes, mandibular bridging/reconstruction plates and screws. The hard tissue (bone and cartilage) residual deformities were managed with the use of autogenous bone grafts from the rib and iliac crest, and auricular cartilage.

The reason for the similar age bracket could be explained by the high level of outdoor activities to meet up with the daily financial needs which is characteristics of this age group.

Table 3: Injury patterns and range of fire of civilian orofacial gunshot patients

Variable		Frequency(N)	Percentage(%)
Range of Fire	Close range (<5m)	15	60.0
	Intermediate range (5-10m)	8	32.0
	Long range (>12m)	2	8.0
	Total	25	100.0
Side Affected	Right	6	24.0
	Left	10	40.0
	Central	9	36.0
	Total	25	100.0
Region of the face affected	Lower third only	4	16.0
	Middle third only	4	16.0
	Lower and middle third	17	68.0
	Total	25	100.0
Affected bones	Maxilla	3	12.0
	Zygoma	4	16.0
	Maxilla and zygoma	7	28.0
	Maxilla and nasal bone	4	16.0
	Maxilla, Nasal and Lacrimal bones	4	16.0
	Mandible	3	13.0
	Total	25	100.0

DISCUSSION

Peace time gunshot injuries are on the increase as a result of injudicious use of firearms following unrest in several parts of the country.[6] The current study reported a low prevalence of gunshot injury among the oral and maxillofacial surgery inpatients. This is contrary to the findings of Amole *et al.*[7] that reported a prevalence of 2.1% among the oral and maxillofacial surgery admission in Kano. The reasons for the lower prevalence in the current study compared to the study by Amole *et al.*[7] could be due to high rate of banditry and terrorist attacks in addition to armed robbery cases in the northern Nigeria.

The current study reported high cases of gunshot injuries among male compared to female. This is similar to previous studies in other parts of the world.[2, 6-10] The high prevalence of male gender in gunshot injuries could be because more males are engaged in outdoor activities primarily for economic reasons and are more vulnerable to violent attacks. The fourth decade of life recorded the highest number of gunshot injury in this study. This is similar to the third to fourth decade reported by Ugboko *et al.*[4] from the same center more than two decades ago and Bassey *et al.*[8] in Calabar. The current study reported an increase in the presentation of civilian gunshots orofacial injuries within the last five year of the study period (2015-2019) compared with the early years (2010-2014). The recent rise in gunshot related injuries could be due to increased incidence of armed robbery attacks, attempted or successful abductions and high level of insecurity on the highways. This is in line with Wahid *et al.*[11], that reported an increase in the incidence of firearm injury in Pakistan.[11]

In our study, locally made Dane gun (long-barreled gun with similar design like shotgun) was the commonest firearm responsible for orofacial injuries. This is in keeping with the report by Ugboko *et al.*[4] but contrary to the finding of Odai *et al.*[6] that reported pistol as the commonest type of gun used in Benin City. The difference in the type of gun used could be attributed to the occupational differences of people residing in different parts of the countries where the studies were conducted. For instance, locally made Dane guns are mostly used for hunting, farming and other community services in southwest Nigeria. Also, it is easy to fabricate, cheap and fairly accessible.[12] These

may be some of the reasons for proliferation and availability of locally made Dane gun in the southwest region of the country. Majority of the participants were victims of intentionally inflicted injuries mostly from armed robbery attack. This is at variance with Ugboko *et al.*[4] from the same study location 22 years ago that reported accidental discharge as the commonest mechanism of injury. The variation in findings may be attributed to the increased spate of armed robbery attacks occasioned by high level of insecurity on the highways as opposed to accidental discharged from poorly trained security personnel who manned our highways and in communities in the past as reported by Ugboko *et al.*[4].

The small sample size seen during the period under study could be due to the fatality of some of the victims of gunshot injuries which resulted in reduced hospital presentation and also increase number of tertiary heathcare facilities in the state as opposed to when Ugboko *et al.*[4] conducted their study. In the current study, 24% of self-inflicted backward discharge of pellets from locally made Dane gun was observed. Ugboko *et al.*[4] reported 40.9% case of self-inflicted accidental discharge in their study from 1990-1997 in the same study location. This could be due to either faulty design of the locally made Dane gun or inferior quality of metal used for fabrication of Dane gun which resulted to easy metal breakage and eventual accidental discharge. From the present and previous studies conducted in the same location at two different periods (2010-2019 and 1990-1997), it is obvious that locally made Dane gun is associated with the unfortunate mishap of accidental self-inflicted injuries.

In the present study, the left side of the face was the side with more tissue destruction compare to the right side which was commonly the exit point. This is in line with studies by Ugboko *et al.*[4] and Bassey and colleagues.[8] The high number of individuals with right hand dominance could be responsible for this high involvement of the left side in our study participants. The caliber of the gunshot could be a factor responsible for the extent of tissue destruction.[7,13] The extensive destruction at the entry sites in our study was because of low velocity of the locally made Dane guns (being the commonest weapon recorded) and mostly shot at close range. This however was in contrast to the report of Wahid and colleagues[11] who observed less severe injuries at the entry points because pistol, a weapon with high velocity and energy transfer was the predominant wounding firearm recorded in their study. Majority of our patients were rescued from the site of the attack to the hospital by law enforcement agents (police, civil defense corps and federal road safety corps). This is in accordance with Oludara *et al.*[14] that reported police and road safety corpse as the major rescuer in their study. This could be due to the increase number of security personnel at various check points on the highway and they are easily contacted when gunshot injuries occurred.

Treatment of victims of gunshot injuries were instituted promptly at presentation without violating the 2017 law guiding the treatment of gunshot victim.[15] The choice of treatment depends on the degree of injury and the type of tissue involved.[13] Soft tissue injuries were managed by wound exploration, and debridement to remove the dead tissues and foreign bodies before delayed final layered closure was done. Patients with soft tissue loss were managed with local flap transfer with or without the use of skin graft. This is in agreement with Amole *et al.*[7] that utilized local flap in reconstruction of orofacial soft tissue defects following gunshot injuries.

The hard tissues were managed with open reduction and internal fixation using titanium reconstruction plates and screws. This is in agreement with study by Al-Anee *et al.*[16] and Volk *et al.*[2]. The substantial amount of kinetic energy absorbed by the mandible due to its cortical nature could be responsible for the multiple fragmentation of the mandible in gunshot injury.

Management of residual deformities is based on the type of tissue involved and demand of the patient. In this study, avulsed right zygomatic arch was reconstructed with titanium reconstruction bridging plate to restore the flattened right side of the face. Titanium bridging plate adapted to simulate the contour of the contralateral zygomatic arch. This alloplastic reconstructive approach is similar to the report of Buck and colleagues who used mandibular adaptation plate to reconstruct avulsed zygomatic arch.[17] The orbital floor was reconstructed with autogenous cartilage graft because of patient's financial constraint to procure the alloplast. This is in accordance with Vaamugil *et al.*[18] that utilized auricular cartilage in the reconstruction of the floor of the orbit following road traffic crashes. Orofacial soft tissue deformities were managed by facial scar revision, excision of fibrous bands, sulcoplasty, and commisuroplasty.

CONCLUSION

Gunshot injury involving the maxillofacial region is uncommon. The male gender was predominantly affected and the middle third facial skeleton was the most involved anatomic site. About two-thirds of these injuries were intentionally inflicted by others with the use of Dane guns on highways. Majority (64%) of these injuries involved the middle third of the face. Definitive treatments ranged from simple to complex

orofacial reconstructive procedures to restore pre-injury appearance and functions.

Conflict of Interest

The authors declare no conflict of interests.

Ethical Approval

The study protocol was approved by the Ethics Committee of the Obafemi Awolowo University Teaching Hospitals Complex, Ile Ife with protocol number ERC/2022/03/07.

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