

Causes of Dental Trauma: Results of Findings Among Patients in a Secondary Oral Healthcare Center, Jos, Nigeria

Abstract

Background: Dental trauma is a major type of traumatic dental injury (TDI) and a common presentation in many oral health facilities in Nigeria. Despite the high prevalence of TDIs, causes of dental trauma are yet to be fully investigated among Nigerians. **Aim:** The aim of this study is to determine the types of dental trauma, aetiology, and the causes of dental trauma as it relates with sociodemographic characteristics among dental patients. **Materials and Methods:** This was a cross-sectional study among patients attending a secondary oral healthcare facility in the North Central city of Jos between January 2019 and December 2020. The sociodemographic features of the patients include patients' complaints, clinical and social history, result of simple clinical oral examinations, and diagnoses of dental trauma. The classification of Ellis and Davey (1970) was used to classify dental trauma for this study. **Results:** One hundred and seventy-six (6.7%) patients presented with dental trauma involving 281 teeth. The mean age was 37.54 ± 2.16 years. The most common cause of dental trauma in 48 (27.3%) patients was bone cracking, followed by falls in 33 (18.8%), road traffic accidents (RTAs) in 26 (14.8%), and bottle opening with teeth in 26 (14.8%). Bone cracking was the major cause of dental trauma in 18 (31.0%) educated and 2 (28.6%) non-educated patients. Among the patients, 118 (67.1%) presented with single traumatized tooth. Permanent anterior teeth 151 (53.74%) were more involved, and class 2 trauma involving enamel and dentinal structure was the most common presentation. **Conclusion:** Oral health awareness campaign on the damaging effect of bone cracking and use of tooth for opening metal caps of bottled drinks among adult population will reduce the prevalence of dental trauma among many adult Nigerians.

Keywords: Aetiology of dental trauma, bone cracking, bottle opening, dental trauma, tooth fracture, traumatic dental injuries

Introduction

Dental traumas (traumatic dental injury [TDI]) are injuries due to the impact on the orofacial structures including teeth and/or other surrounding hard or soft tissues within and around the vicinity of the oral cavity.^[1] Dental trauma has been reported to be the most common type of injury in the orofacial region and is a common presentation in many oral healthcare facilities in Nigeria and other parts of the world.^[1-5]

Dental trauma has been reported as a serious public oral health challenge worldwide with the consequences seen immediately or later on.^[3,4,6-8] The immediate effects of dental trauma include tooth fracture, tooth displacement, tooth mobility, bleeding from tooth or contiguous tissues, tooth sensitivity, laceration of soft tissues, and tooth avulsion (tooth loss). Later, consequences may include

tooth discoloration, dental/periodontal abscess and loss of periodontal attachment, peri-apical infections, peri-apical cyst, delayed tooth eruption, and ankylosed or complete failure of permanent tooth eruption secondary to traumatized primary predecessors. Others are phonetic and esthetic impairments, low self-esteem, functional impairments, and impaired overall quality of life.^[3,4,6,9-12] The prevalence of dental trauma varies from country to country and also according to the type of study. It has been predicted that in the near future prevalence of dental trauma will likely be as high as dental caries and periodontal diseases, which are currently the most common oral diseases.^[8] Literature review shows the prevalence of TDIs ranges from 4.1% to 58.6%.^[13] The prevalence of dental trauma (TDI) among children population in India was reported to be 10.7%.^[8] In Southern Nigeria, prevalences of 12.8% and 10.9% among 12-year-old schoolchildren have been reported.^[14,15] In Northern Nigeria, the prevalence of dental trauma among children

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was reported to be 15.25%.^[16] However, the report of dental trauma in the Nigerian adult population is scanty. It is important to note that dental trauma can affect both the deciduous and permanent teeth in all age groups and genders.

Anatomically, enamel is the hardest structure in the body. However, fracture of enamel and other structures of a tooth due to trauma is still a common reason for dental visits.^[17,18] Tooth fracture was reported as the third primary presenting complaint (3.9%) among other oral health challenges in an oral healthcare facility in Nigeria,^[17] with prevalence of 10.1% among children.^[18] The pattern and time of presentation for treatment among patients depend on the severity of associated symptoms such as pain, esthetics, extent of fracture, among others.^[4]

The common causes of tooth/dental trauma include falls, sports, RTA, collusion with objects, assaults, and fight.^[3,4,14-16] Documented risk factors that predispose to dental trauma are incompetent lip, increased overjet (>6 mm), socio-economic status, and misuse of teeth.^[4,15,16,19] The aim of this study was to determine the types of dental trauma, major aetiological factors responsible for dental trauma, and relationship between dental trauma and sociodemographic characteristics of the patients seen at dental outpatient clinic of a secondary oral healthcare facility in the city of Jos, North Central Nigeria.

Materials and Methods

This was a cross-sectional study conducted at a secondary healthcare centre in the city of Jos, North Central Nigeria. Data for this study were gathered from the clinical records of patients who presented over a 2-year period (between January 1, 2019 and December 30, 2020). Relevant data collected include sociodemographic characteristics such as age, gender, and educational level of each patient. Others were primary complaints of the patients such as those related to dental trauma and sequelae, causes of dental trauma, teeth involved, and the nature of care received by each patient. The classification of Ellis and Davey was adopted for this study.^[20] Each patient who presented with oral health challenges during the period of this study was subjected to routine simple clinical oral examination using the required tools such as mouth

mirrors, examination probe, college tweezers, and gauze. Other necessary investigations with the use of pulp tester for testing the vitality of the traumatized teeth and radiological assessment were done.

Patients with fractured tooth due to gross carious lesions or severed tooth wear lesions as well as those with incomplete information in their hospital files were excluded from this study. Patients of all age groups were included in the study. Ethical clearance was obtained from the Research and Ethics Committee of Our Lady of Apostle Hospital. Analysis of data was done using the Statistical Package for the Social Sciences (SPSS), version 23.0. The χ^2 test was employed to test the associations between categorical variables. A *P*-value of ≤ 0.05 was considered statistically significant.

Results

A total of 176 (11.7%) out of 1501 patients presented with dental trauma during the period of this study with involvement of 281 teeth. The male patients were 104 representing 59.1%, whereas the females were 72 representing 40.9%. The mean age of the patients was 37.3 ± 2.2 years.

Bone cracking accounted for 27.3% of dental trauma in 48 patients ($P = 0.001$). This was followed by a fall in 33 (18.8%) patients, RTAs in 26 (14.8%) patients, and opening of metal corked bottle with teeth in 26 (14.8%) patients. Other factors such as seizures, collusion with objects, and use of teeth to mend metal object like earrings were also notable causes of dental trauma in 12 patients (6.8%). Fight, biting of stone in food, sports, and assaults were among causes of dental trauma, as shown in Table 1.

There was no statistically significant association between gender and causes of dental trauma. Bone cracking was the commonest cause of dental trauma among both male and female patients, 26 (25.0%) and 22 (30.6%), respectively, and this was followed by a fall [18 (17.3%) and 15 (20.8%)] in males and females, respectively. Dental trauma due to RTA was recorded more among males [17 (16.3%)] when compared with females [9 (12.5%)], whereas dental trauma due to bottle opening with tooth was more common among the females [Table 1].

Table 1: Association between gender and causes of dental trauma

Causes	Male	Female	Total*	χ^2	p-value
RTA	17(16.3)	9(12.5)	26(14.8)	13.530	0.095
Sport	7(6.7)	0(0.0)	7(4.0)		
Fall	18(17.3)	15(20.8)	33(18.8)		
Fight	6(5.8)	3(4.2)	9(5.1)		
Bone cracking	26(25.0)	22(30.6)	48(27.3)		
Bottle opening	13(12.5)	13(18.1)	26(14.8)		
Stone in food	3(2.9)	5(6.9)	8(4.5)		
Assault	7(6.7)	0(0.0)	7(4.0)		
Others	7(6.7)	5(6.9)	12(6.8)		
Total	104(100.0)	72(100.0)	176(100.0)		

* $\chi^2 = 86.432$, p-value = 0.001

Table 2 shows that among patients 18 years and below, the commonest cause of dental trauma was falls (84.4%), whereas bone cracking (33.0%) was the major cause of dental trauma among patients above 18 years ($P=0.001$). Bottle opening with teeth, RTA, and sports were also recorded as causes of dental trauma and more noticeable among patients above 18 years when compared with those below 18 years. Other causes of dental trauma include ear-rings biting, chewing of popcorn, and collusion with human and other objects, which were recorded more among the older age group.

Among the non-educated patients (i.e., both with informal education and those who were not educated at all) and patients who had primary, secondary, and tertiary educational level as shown in Table 3, there were no significant differences in the causes of dental trauma statistically. Although bone cracking, falls, and bottle opening were seen more among the educated, they were also recorded as causes of dental trauma among the non-educated.

More than half of the patients, i.e., 118 (67.1%), presented with a single traumatic tooth, and this was statistically significant with $P=0.004$, as shown in Table 4. Bone cracking

was discovered as the most responsible cause in both single and multiple traumatic tooth presentations. Factors such as bottle opening among 23 (9.5%) and sports in 4.2% presented more with single traumatic tooth injury. Falls were responsible for 15.3% of single tooth involvement, whereas it was responsible for 25.9% of multiple teeth involvement. Consequently, patients who had falls presented more with multiple teeth than with single traumatic tooth. Multiple traumatic teeth were also more common with factors such as RTA 15.5%, falls 25.9%, bone cracking 31.0%, and assaults 10.3%.

Out of the 281 teeth that were involved in dental trauma, 7.4% were deciduous teeth, 38.7% were posterior permanent teeth, and 53.74% were anterior permanent teeth. The anterior permanent teeth were more involved in dental trauma than posterior permanent and deciduous teeth. The findings were statistically significant with $P=0.001$, as depicted in Figure 1.

Table 5 shows the classification of the tooth trauma observed in this study. While class 2 involving both enamel and

Table 2: Association between age group and causes of dental trauma

Causes	≤ 18	>18	χ^2	p-value
Fall	27(81.8)	6(18.2)	110.564	0.001
Others	5(3.5)	138(96.5)		
Bone cracking	0(0.0)	48(100.0)	13.034	0.001*
Others	32(25.0)	96(75.0)		
Bottle opening	1(3.8)	25(96.2)	3.159	0.075*
Others	31(20.7)	119(79.3)		

*Fisher's exact test

Table 3: Association between educational level and causes of trauma

Causes	Educational level		χ^2	p-value
	Non educated	Educated		
Fall	2(5.9)	32(94.1)	0.003	0.955*
Others	8(5.6)	134(94.4)		
Bone cracking	2(4.2)	46(95.8)	0.027	0.868*
Others	8(6.3)	120(93.7)		
Bottle opening	2(7.7)	24(92.3)	4.349	0.983*
Others	8(5.3)	142(94.6)		

*Fisher's exact test

Table 4: Single/multiple tooth involvement vs causes of trauma

Causes	Single teeth	Multiple teeth	χ^2	p-value
RTA	17(14.4)	9(15.5)	21.900	0.005
Sport	5(4.2)	2(3.4)		
Fall	18(15.3)	15(25.9)		
Fight	6(5.1)	3(5.2)		
Bone cracking	30(25.4)	18(31.0)		
Bottle opening	23(19.5)	3(5.2)		
Stone in food	7(5.9)	1(1.7)		
Assault	1(0.8)	6(10.3)		
Others	11(9.3)	1(1.7)		
Total	118(100.0)	58(100.0)		

dentinal structures was the most common type of trauma accounting for 24.6% and followed by class 7 (18.1%), the least presentation was class 1 involving only the enamel structure.

Discussion

A total of 1501 patients with different oral health challenges were attended to during the period of this study. Of the patients seen, 176 (6.7%) presented with dental trauma. This is similar to a report from the southern part of Nigeria where 6.96% of the patients seen at an oral health facility presented with TDIs.^[3] Our result in Table 6 showed more males patients presented with dental trauma compared with female patients, and this is similar to reports from several other studies.^[4,21-23] The involvements of males more than females in activities that predispose to dental trauma may be responsible for these findings. It however contradicts some other reports in which female preponderance to dental trauma was reported.^[3,24]

From this study, investigations on the aetiological causes of dental trauma revealed bone cracking as the most common cause (26.7%) of dental trauma among the patients. This was

in contrast to reports from other similar studies in which falls were identified as the leading cause of TDI from 26.4%^[3] to 57.71%.^[25] Although bone cracking, especially among adults, has been reported among the causes of TDI in previous studies in Nigeria,^[3,14,25] it was not the most common aetiological factor. Bone cracking is a common practice among Nigerians, and many people may be ignorant of the damaging effect of this practice on oral health. Our result in Table 1 showed bone cracking as the leading cause of dental trauma in both male and female patients.

Although the relationship between causes of dental trauma and gender was not statistically significant in our study as shown in Table 1, factors such as RTA, sports, fights, and assaults were seen more common among male than among female patients, whereas falls and stone in food were associated more with females. The reason for this may be due to differences in lifestyle in male and female patients. It may also be due to the fact that more males participate in sporting activities than females and possibly more males involve in fight and assaults compared with females. However, bone cracking and metal corked bottle opening with teeth as leading causes of dental trauma identified in this study are a wrong practice and could be termed as tooth misuse.^[3,26] This avoidable and wrong practice was observed in both male and female patients. This can be attributed to poor oral health awareness, knowledge, and practices among the patients.

As in previous reports, falls were the most common cause of TDIs among those below 18 years of age.^[16,19,26,27] A person below 18 years is regarded as a child (defendant) in Nigerian context, and many of them are either in primary or in secondary schools. They engage in running as a major activity, which may make them to be more prone to falls than the adults. However, RTA, bone cracking, sports, fight, assaults, bottle opening, and stone in food were major causes of dental trauma among those patients above 18 years in this study and this is in keeping with previous reports.^[3,26] The reason may be attributed to less involvement of children in RTA, fight, assaults, and misuse of teeth when compared with the adults.

Education attainments appeared not to have played a significant role in the causes of dental trauma among patients in this study. Both educated and non-educated patients were involved in practices such as bone cracking and opening of metal corked

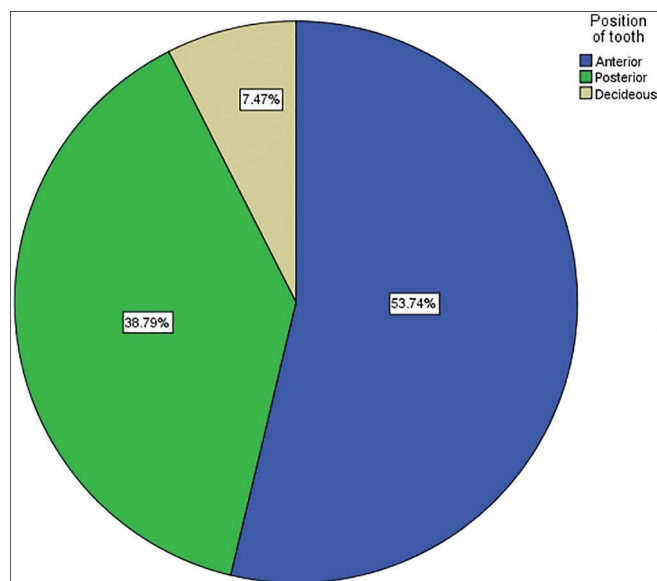


Figure 1: Positioning of teeth affected by trauma ($\chi^2 = 93.979$; P-value = 0.001)

Table 5: Ellis and Davey’s classifications of traumatic teeth among the subjects

Classification	Frequency	Percentage	χ^2	p-value
1- Enamel little or no dentine	8	2.8	109.972	0.001
2- Enamel plus dentine	69	24.6		
3- Enamel, dentine and pulp	35	12.5		
4- Non vital with or without loss of crown	28	10.0		
5- Tooth loss secondary to trauma	9	3.2		
6- Root fracture with or without loss of crown structure	15	5.3		
7- Displacement of tooth without crown or root fracture	51	18.1		
8- Fracture of crown enamel plus displacement	45	16.0		
9- Trauma to deciduous tooth	21	7.5		
Total	281	100.0		

Table 6: Demographic characteristic of study participants

Demographic characteristics	Frequency(n=176)	Percentage
Gender		
Male	104	59.1
Female	72	40.9
Age group		
≤18	32	18.2
>18	144	81.8
Educational level		
None	7	4.0
Informal	3	1.7
Primary	23	13.1
Secondary	58	33.0
Tertiary	85	48.3

bottle with teeth. It is our opinion that this practice may be due to a general belief among both the highly educated and less educated Nigerian adults that teeth are strong and can be used for breaking bones and open metal corked bottles. Another reason which may be attributed to bone cracking among Nigerians is the belief that calcium from bone is needed for body development and can best be obtained through cracking bone.

The majority of the patients presented with single tooth compared with multiple teeth involvement in dental trauma. This finding is contrary to another finding in which most patients presented with dental trauma involving more than one tooth,^[25] but agrees with other reports.^[6,28] Our finding may be attributed to the leading cause of dental trauma in this study. Not many teeth may necessarily be engaged when opening bottle or cracking bones unlike a fall. Consequently, apart from falls, multiple teeth involvement was also associated more with RTA. Therefore, the number of teeth involved in dental trauma may be related to the causes of the trauma. Majority of the traumatized teeth 151 (53.74%) in this study were anterior permanent teeth. This support previous reports in which maxillary incisors and canines were mostly involved in dental trauma.^[3,25] Anterior teeth were mostly used among adults for bottle opening and may equally be more prone to falls, assaults, sports, and RTA when compared with the posterior permanent teeth.

Adopting the classification of Ellis and Davey in our study, Table 6 showed class 2 trauma involving the enamel and dentine as the most common among the patients, whereas class 1 involving only enamel structure was the least which supports previous reports.^[3,4,25] Other reports had class 4^[23] and class 1 as the most common.^[14,16,19,29] The type of dental trauma may depend on the study design and the population involved in the study. Although this study was a cross-sectional study conducted within an oral health facility (clinic), others were descriptive cross-sectional studies conducted outside the clinic environment.^[14,16,19] However, another clinical study also reported preponderance of enamel fracture.^[29] The causes of

trauma may also influence the severity of trauma. The forces exerted on a tooth as a result of misuse may fracture not only hard enamel but also the softer dentinal structure with or without the involvement of the pulp and avulsion of a tooth.

Conclusion

From this study, dental trauma is a common presentation among patients attending the oral health care facility. The use of teeth for bone cracking and opening of metal cap of bottles plays significant roles in the etiological causes of dental trauma among adults irrespective of gender and educational status. Awareness campaign against teeth misuse for bone cracking and bottle opening will reduce the incidence of dental trauma among adult Nigerians. Among the children, school and home environment must be arranged in such a way to minimize the incidence of falls and consequently dental trauma.

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Conflicts of interest

There are no conflicts of interest.

Authors' contribution

Concept and design of the study by Dr. Idowu Enoch Abiodun and Dr. Taiwo Olaniyi.

Drafting of the article and revising for critical and important intellectual content by Dr. Idowu Enoch Abiodun, Dr. Akhiwu Benjamin I, and Dr. Agbara Rowland.

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