

Pattern and treatment needs of traumatized anterior permanent teeth in a sub-urban area in Lagos State

Piponsuhu R.A., Agbaje M.O., Osisanya M.O., Oyapero A.

ABSTRACT

Aims: The main goal of this study was to determine the prevalence, pattern and treatment needs of traumatized permanent anterior teeth of secondary school children aged 11–15 years in Ojokoro Local Council Development Area, Lagos (South West Nigeria). **Methods:** This cross-sectional survey was carried out among 1265 secondary school children from both private and public secondary schools in Ojokoro Local Council Development Area, Lagos State. A multistage sampling technique was adopted to select study participants. A self-administered structured questionnaire was used for data collection and school children with positive history of traumatic dental injuries (TDI) had intra-oral examination to determine the type of fracture sustained, tooth involved, number of tooth/teeth affected and type of treatment received. **Results:** The prevalence of TDI was 16.7%. Private school children had a higher prevalence (24.3%) compared with those in public schools (15.1%) [$p = 0.001$]. More males were affected with a male to female ratio of 1.5:1 ($p = 0.003$). The maxillary arch was more involved (95.7%) and majority of the respondents (93.8%)

had a single tooth injury. The maxillary central incisors were mostly affected (86.3%); the most common type of fracture was enamel fracture (56.4%) and most of these injuries occurred at home. **Conclusion:** Traumatic dental injuries require prompt attention to prevent the ensuing complications of delayed treatment. School and community based oral health education should be carried out in order to create the necessary awareness about traumatic dental injuries and to encourage prompt management.

Keywords: Anterior permanent teeth, School children, Traumatic dental injuries (TDI), Treatment needs

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INTRODUCTION

Trauma to the oral region occurs frequently and makes up 5% of all injuries for which people seek treatment in all dental clinics and hospitals [1]. Secondly, traumatic dental injuries (TDI) tend to occur at a young age during which growth and development take place [2]. The prevalence of TDI's vary in different countries, even within the same country possibly because of the

different methods of data collection, age group studied, type of classification adopted, type of dentition studied with prevalence values ranging from 4–35% [3–5]. About 75% of traumatic dental injuries occur during childhood and adolescence [1]. The Majority of TDI results from fall, collision with moving objects, motor vehicle, bicycle and motorcycle accidents. Increased participation of children in sport activities is also associated with TDI [6–8]. During the early childhood years, most of the trauma results from falls and impacts that happen during playing and running, while non-accidental injury or child abuse has also been implicated. The incidence peaks during school years where accidents in the school play area are common. Injures related to road traffic accidents, sports and assaults are more common in the late teenage years and adulthood, and may be associated with alcohol or drug use.

Trauma from sports, violence and road traffic accidents can result in multiple tooth injuries. Trauma to the anterior teeth can result in injury, loss of vitality and infection of the dental pulp. Dental trauma apart from the direct effect on the afflicted child, also has additional consequences such as interruption of daily activities and considerable financial burden due to the cost of treatment. The importance of the anterior teeth in terms of aesthetics, mastication, speech, occlusion cannot be overemphasized because any form of defect can lead to aesthetic flaws in the child. This may further lead to social awkwardness and psychological embarrassment, self-consciousness, irritability, inability to chew properly and difficulty in maintaining oral hygiene [9]. This can affect the child's quality of life and result in a lowered self-esteem.

Traumatic dental injuries often require multiple follow-up visits and may have long-term consequences for the developing dentition. A lot of traumatized anterior teeth with uncomplicated injuries such as contusion, infraction, simple enamel and dentine fracture go untreated due to lack of immediate symptoms [10, 11] and eventually present with post traumatic complications such as tooth discoloration, dental abscesses and fistula and complete tooth loss. A high percentage of children and adolescents attended to in Lagos state Hospitals report for treatment of traumatized anterior teeth after months or several years of sustaining injury to the affected tooth/teeth with complications from the long standing neglect of the injured teeth. Researchers found out that the average management time for complicated TDI teeth was 1.2 higher than for uncomplicated TDI in primary dentition while it was 1.4 times higher in permanent dentition [12]. This delay in treatment may eventually result in early loss of potentially restorable teeth [13].

Traumatic dental injuries are preventable, but such measures can only be applied if causal factors are properly recognized [14]. There is thus need a need for adequate understanding of the risk factors associated with dental trauma so that appropriate preventive actions can be instituted. The aim of this study was to investigate

and describe the prevalence and risk factors related to traumatic injuries to permanent anterior teeth in a local government area of Lagos state.

MATERIALS AND METHODS

Study design/ setting and location

A descriptive cross-sectional survey was carried out on 1265 school children comprising of boys and girls, aged 11–15 years from both private and public secondary schools in Ojokoro Local Council Development Area, Lagos State.

Ethical aspects

The protocol for the study was presented to Health Research and Ethics Committee of the Lagos State University Teaching Hospital and written approval was obtained. Permission, information regarding the lists of schools and population of students was obtained from Lagos State educational district 1. The information was used to determine the proportion of the students that participated in the study. Consent letter explaining the aim and purpose of the study was sent to the parent of each student.

Sample selection

A multistage sampling technique was adopted to select study participants. The first stage involved the selection of the participating schools through simple random sampling using the list of schools as the sampling frame while the second stage involved a stratified sampling method to select two hundred students from each of the selected public junior secondary schools and 121 students from each of the selected senior secondary schools using the nominal roll as the sampling frame. Seventy-four students were selected from each of the selected private secondary schools using the same method.

Sample size determination

From a reference study, using a prevalence of dental injury of 27.56% in a study conducted in a similar study population, [5] the estimated sample size 1200 was calculated using an equation for descriptive studies. This was determined using a standard error of 5% or less and a 95% confidence interval level. A total of 1265 were recruited during the study period.

Eligibility criteria

Participants included in the study were those that gave their assent and whose parents gave informed consent.

Data collection

Data collection was done in two phases. The first phase was done using a self-administered structured

questionnaire after obtaining an informed consent from the parents of each participant and the participants as well. School children with positive history of TDI were taken through the next stage which was intra-oral examination to determine the type of fracture sustained, tooth involved, number of tooth/teeth affected and type of treatment received. Dental examination was carried out by the author and recorded by a trained dental assistant. The assistants were trained in order to achieve uniformity in recording and observation. The school children were examined in the school in a separate classroom that was created for that purpose under natural light and artificial illumination.

The instruments and material used (plane mouth mirror, periodontal probe, gloves, and gauze pads) were packed and sterilized in adequate numbers for each working day. Periodontal probes were used to remove debris, identify the presence and extent of restorations and to measure the overjet. Teeth were examined for the type of fracture, tooth involved, number of tooth/teeth fractured. The following types of fracture were recorded: fractures involving enamel and dentine, subluxation, luxation injuries and tooth discoloration (with clinical signs and symptoms) with or without fracture visible to the naked eye or by trans-illumination. This classification based on WHO, Andreasen's criteria [2]. Enamel-dentine-cementum and root fracture were excluded because intra-oral radiographs were not taken. Overjet was recorded using graduated probes and was considered normal if it ranged between 0-3 mm lips competence was examined and determined using Jackson's classification by the relative contact of the upper lip with the cervical part of the upper incisors with the patient in a relaxed position.

Data analysis

The data entry, validation and statistical analysis was carried out using the Epi-info statistical software 3.5.1 version. The statistical association was evaluated with the chi-square test association and was considered statistically significant when p-value was equal to or less than 0.05. Data entry quality control checks was developed using check codes.

RESULTS

A total of 1265 secondary school children aged 11-15 years (mean age was 13.3 ±1.3 years) participated in this study. There were more females (55.8%) than males (44.2%) and 82.5% were from public schools. About 60.4% of the respondents' fathers had tertiary education while 48.7% of the mothers had tertiary education (Table 1).

The prevalence of traumatic dental injury in this study population was 16.7% (Figure 1). There was a high prevalence in 11-year-old respondents (18.9%), there was

a decline in prevalence (13.8%) in children aged 12 years and a gradual rise to 19.4% in 15-year-old respondents. There were more males (20.2%) with traumatized permanent anterior teeth than females (13.9%) with a male to female ratio of 1.5:1 and a statistically significant association between gender and traumatic dental injury experience (p = 0.003). Likewise, the prevalence of dental injuries was higher in respondents attending private schools (24.3%) than in those attending public schools (15.1%) p = 0.001 (Table 2). The injuries were mostly sustained between 10–13 years of age with majority of the respondents (25.4%) having the traumatic dental injury at 13 years of age. (Figure 2)

The majority of the respondents (81.0%) sustained injuries less than two years prior to the oral examination whilst the maxillary arch was more involved (95.7%)

Table 1: Socio-demographic characteristics of the study respondents

	Frequency(n)	Percentage (%)
Age		
11	148	11.7
12	240	19.0
13	240	19.0
14	329	26.0
15	308	24.3
Total	1265	100
*Mean Age (SD) = 13.3±1.3		
Sex		
Male	559	44.2
Female	706	55.8
Type of school		
Private	222	17.5
Public	1043	82.5
Total	1265	100
Fathers Educational level		
Tertiary	764	60.4
Secondary	329	26.0
Primary	37	2.9
None	60	4.7
Don't Know	75	6.0
Mothers' Educational level		
Tertiary	609	48.1
Secondary	430	34.0
Primary	76	6.0
None	68	5.4
Don't Know	82	6.5
Total 1265		100%

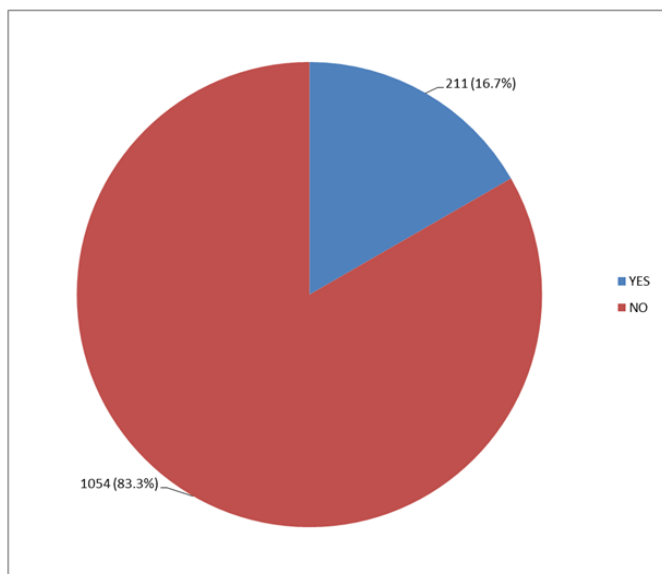


Figure 1: History of Tooth injury among the respondents.

Table 2: Association between respondent's socio demographic characteristics and traumatic dental fracture

Variable	Traumatized Teeth			X ²	p-value
Age (years)	Yes (n) (%)	No (n) (%)	Total (n) (%)		
11	28 (18.9)	120 (81.1)	148 (100)	6.4	0.170
12	33 (13.8)	207 (86.3)	240 (100)		
13	31 (13.0)	208 (87.0)	239 (100)		
14	59 (17.9)	270 (82.1)	329 (100)		
15	60 (19.4)	249 (80.6)	309 (100)		
Sex					
Male	116 (20.7)	444 (79.3)	560 (100)	8.9	0.003
Female	95 (13.5)	610 (86.5)	705 (100)		
Type of school					
Private	54 (24.3)	168 (75.7)	222 (100)	11.5	0.001
Public	157 (15.1)	886 (84.9)	1043 (100)		
Total	211 (16.7)	1054 (83.3)	1265 (100)		

* Statistically Significant with p value < 0.05

than the mandibular arch (4.3%). Trauma to a single tooth was the most common type of injury (93.8%). The maxillary central right and left incisors were equally affected (43.1%) and were the most commonly injured teeth (86.3%) (Table 3).

The most commonly experienced type of dental trauma was enamel fracture (56.4%) which occurred more in males (58.8%) than females (41.2%). This was followed by enamel infraction (18.4%) involving more females (56.4%) than males (43.6%). Enamel–dentine fracture affected 13.2% of the respondents which involved more

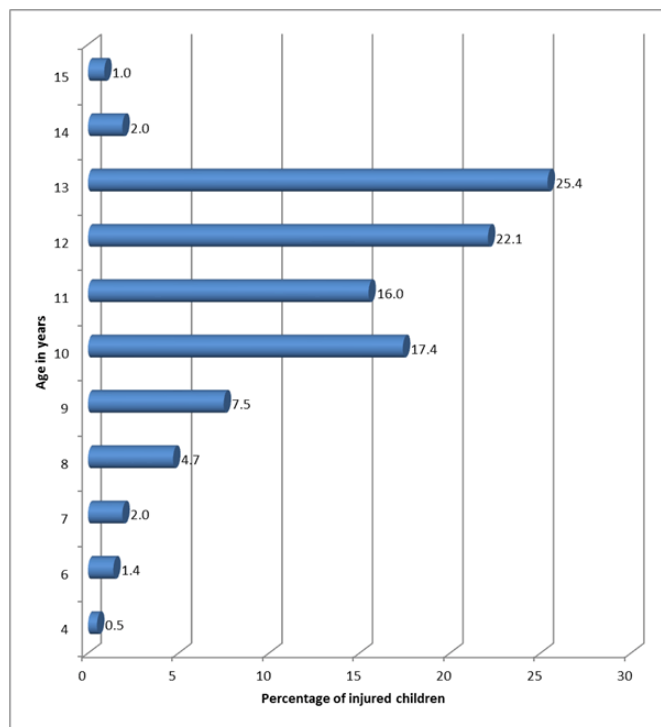


Figure 2: Age at which traumatic dental injury occurred in Respondents.

Table 3: Presentation and pattern of distribution of traumatic dental injuries in the study respondents

No. injured teeth	Frequency (n)	Percentage (%)
1	198	93.8
2	11	5.2
3	2	1.0
Total	211	100
Time elapsed (years) from trauma to dental examination		
0–2	171	81.0
2–4	23	10.9
4–6	7	3.3
>6	8	3.8
Not sure	2	1.0
Total	211	100
Maxilla		
Right central incisor	91	43.1
Right lateral incisor	5	2.4
Right canine	4	1.9
Left central incisor	91	43.1
Left lateral incisor	8	3.8
Left canine	3	1.4
Total	202	95.7

Table 3: (Continued)

No. injured teeth	Frequency (n)	Percentage (%)
Mandible		
Right central incisor	3	1.4
Right lateral incisor	2	0.9
Right canine	1	0.5
Left central incisor	1	0.5
Left lateral incisor	1	0.5
Left canine	1	0.5
Total	9	4.3

Table 4: Association between respondents' gender and their type of tooth fracture

Variable	Sex		Total (n) (%)	χ ²	p-value
	Female (n) (%)	Male (n) (%)			
Pattern of fracture					
Incomplete # of enamel	22(56.4)	17(43.6)	39(100)	0.0	0.988
# limited to enamel	49(41.2)	70(58.8)	119(100)	16.8	0.0001
Enamel-dentine #	13(46.4)	15(53.6)	28(100)	0.7	0.411
Enamel and dentine with pulp exposure	1(25.0)	3(75.0)	4(100)	1.3	0.339*
Injury without abnormal loosening but with reaction to percussion	1(50.0)	1(50.0)	2(100)	0.0	1.000*
Injury with abnormal loosening without tooth displacement	2(33.3)	4(66.7)	6(100)	1.0	0.420*
Extrusive luxation	1(50.0)	1(50.0)	2(100)	0.0	1.000*
Lateral luxation	6(75.0)	2(25.0)	8(100)	0.9	0.389*
Intrusive luxation	0(0.0)	2(100)	2(100)	2.3	0.215*
Exarticulation	0(0.0)	1(100)	1(100)	0.9	1.000*

*Fisher's exact test

males (53.6%) than females (46.4%). The type of fracture and gender association was only statistically significant (p-value = 0.0001) for enamel fracture (Table 4).

Most of the injuries occurred at home (36.0%) while falls (65.4%) was the major cause of traumatic injuries.

Table 5: Aetiology/Location of injury and overjet/lip competence among the study participants

	Frequency (n = 211)	Percentage (%)
Where tooth injury occurred		
Home	76	36.0
School	52	24.6
Street	49	23.2
Sport ground	30	14.2
Swimming pool	2	0.9
Others	2	1.0
How injury occurred		
Fall	138	65.4
RTA	21	10.0
Collision	20	9.5
Others	17	8.0
Fight	15	7.1
Incisor Overjet		
Normal	99	46.9
High	112	53.1
Total	211	100.0
Lip Competence		
Competent	158	74.9
Incompetent	53	25.1
Total	211	100.0
Treatment received and needed		
Untreated	198	93.8
Treated	4	2.0
Cannot remember treatment given	9	4.2
Need treatment	170	80.6
Do not need treatment	41	19.4

Only 17.3% claimed to have knowledge of mouth guard while 82.7% had never heard of or seen the mouth guard before. There appeared to be a relationship between increased overjet and increased susceptibility of injury in respondents with overjet >3.0 mm (53.1%) compared to those with normal overjet, while lip incompetence did not appear to have any effect. Among the respondents with traumatic dental injuries 93.8% were untreated. (Table 5).

Among those that needed treatments, 57.3% needed acid-etch composite restoration, 4.3% required full crown while 3.3% required root canal treatment (Figure 3).

Most of the respondents with dental injuries did not go for dental treatment for different reasons; 46.9% gave no particular reason, 24.2% felt it was not necessary,

15.6% did not feel pain hence did not receive treatment, 7.6% had financial constraints while 5.7% complained of distance to the dental clinic (Figure 4).

DISCUSSION

Several studies have shown that the prevalence of traumatized permanent anterior teeth differ among different study population and groups from 4–59% [2]. The prevalence of TDI in this study was found to be higher when compared with previous Nigerian studies [15–18] amongst various age groups, although Naqvi and Ogidan reported a higher prevalence in their Benin study [19]. However, when compared with hospital based studies [20, 21] the prevalence of TDI in this study was

lower. This is not surprising considering that hospital based studies usually appear to have a higher prevalence which is not a true representation of the society. Majority of the traumatic dental injuries were estimated to have been sustained between the ages of 10–13 years. Ajayi et al. [22] also reported a similar finding in their study. It is estimated that 71–92% of all TDIs sustained occur before the age of 19 years [23]; A lot of children are more energetic, restless and get involved in risk taking activities. Treatment of traumatic dental injuries in children and adolescents are one of the most common procedures in dental practice.

There were more males with traumatized permanent anterior teeth than females with a male to female ratio of 1.5:1 and a statistically significant association between gender and traumatic dental injury experience. Behavioural and cultural factors that predispose boys to aggressive leisure activities and sports have been observed to result in a higher prevalence of TDIs among males [24]. This result is in agreement with reports from previous studies [25–27] but was in contrast to the observation by some other recent studies which observed a reduction in this gender difference, possibly reflecting an increased interest in sports and outdoor activities among girls. [28, 29].

The children attending private schools were observed to have experienced more TDI when compared with those attending public secondary schools. This finding is similar to what was observed by Garcia-Godoy et al. [30] but in contrast to the findings of Soriano et al. [27]. The variation in findings may be attributed to the behavioral differences of the children in the different locations. Marcenes et al. [31] reported a higher prevalence among adolescents from higher socio-economic groups who had access to modern sporting facilities but Malikaew et al. [32] however observed an inverse relationship between TDIs and educational and socio-economic status of the child's parents.

In this study, the maxillary arches were more involved in traumatic dental injuries than mandibular arches. This finding is in accordance with previously reported studies [33, 34]. The maxillary central incisors were the most common teeth traumatized, with the right and left incisors being equally affected. The susceptibility of the maxillary central incisors to dental traumas is probably due to their prominent location in the dental arch. The positioning of the upper anterior teeth in front of the lower anterior teeth could also be a factor. Single tooth injury was the most common in this study which is in agreement with reports from other studies [35].

The most common type of trauma found in this study was enamel fracture and this was followed by infraction and enamel-dentine fracture. Most of the dental trauma occurred at home, as similarly reported by previous reports [36, 37] followed by school and on the street associated with motorcycle accident. Falls and motorcycle accidents accounted for the majority of TDIs. The variation in the sequence of causes of dental injuries

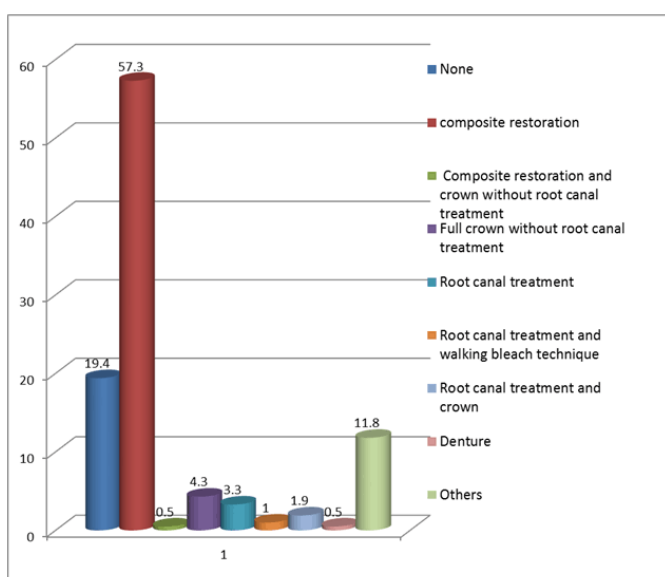


Figure 3: Type of treatment needed.

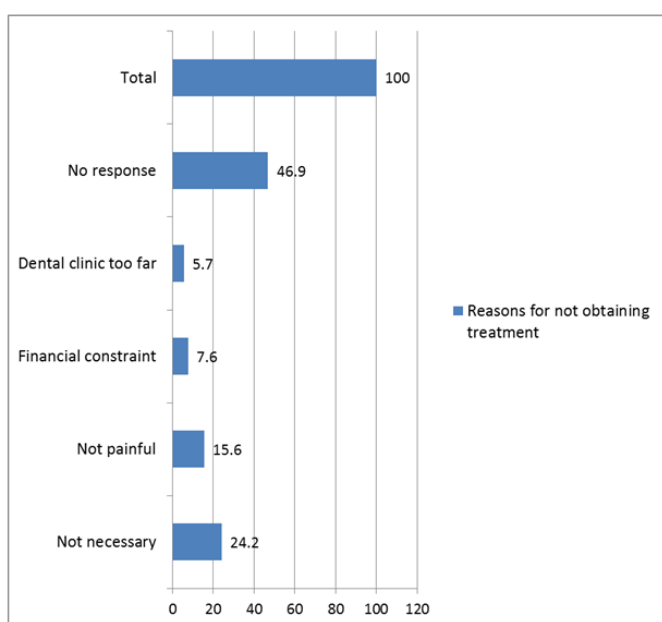


Figure 4: Reasons for not obtaining treatment

could be related to the peculiarity of different environment where the studies were carried out. In Lagos, a lot of the road traffic accidents occur as a result of the increased use of motorcycles as a major means of transportation coupled with the reckless riding and inexperience on the part of the operators. Likewise, a lot of the children in this study walk to school and some are involved in street trading and hawking which expose them to the menace of road traffic accidents.

Traumatic injuries occurred more in respondents with overjet more than 3.0 mm, as similarly reported by another study [38]. Lip competence had no association with the trauma experience as was observed in another study that was done in India, [39] although some researcher have observed an association. Increased overjet, protrusion of the maxillary incisors and insufficient lip closure are some factors that are known to be associated with TDIs. Other factors that determine the outcome or type of injuries include the energy of impact, elasticity of impacting object, shape of the object and the direction of the object as well as the use of protective mouth guards [2].

The Majority of respondents did not go for treatment because enamel fracture was the most common type of injury in this study, followed by enamel infraction. Similar low rate of treatment has been documented in other Nigerian studies [18, 33]. Most of the respondents could not give any reason for not treating their traumatized tooth/teeth. However it was observed that enamel fracture and infarction were the most common type of tooth injury hence their lack of immediate symptoms could be responsible for their non-treatment or delay in seeking dental treatment. Other reasons for not receiving treatment included financial constraints and the distant location of dental clinics. Most Nigerians still practice out of pocket payment method of settling medical bills as observed in our dental practice. A majority is yet to access the National Health Insurance scheme, while the classification of dental practitioners as secondary care provider also negatively impacts on dental care. The main treatment modality required by the respondents was acid-etch composite restoration, as similarly to reported by a previous study [25].

Prevention is the most economical way to reduce TDIs prevalence and related costs. An appreciation of the high-risk behaviors and groups susceptible to facial injuries will enable health care professionals to institute appropriate methods of intervention. Mouth guards and helmets for facial protection are often obligatory in some high-risk sports in developing countries but such measures have not been made compulsory in Nigeria. Making the playgrounds safer through appropriate supervision and restrictions could also reduce the prevalence of TDIs.

CONCLUSION

The prevalence of traumatic dental injury (TDI) in this study population was 16.7%. This higher prevalence of TDI compared with some other Nigerian studies may be a reflection of the suburban location of the study. Enamel fracture was the most common pattern of dental injury and the absence of immediate symptoms was associated with a delay seeking dental treatment. Delay in the management of TDIs results in complications such as tooth discoloration, dentoalveolar abscess, fistula, tooth loss, loss of masticatory function, poor aesthetics and loss of self-esteem. Thus, traumatic dental injuries require prompt attention and early management for good prognosis and to prevent the ensuing complications of delayed treatment.

Author Contributions

Piponsuhu R.A. – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, revising it critically for important intellectual content, Final approval of the version to be published

Agbaje M.O. – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Osisanya M.O. – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Oyapero A. – Analysis and interpretation of data, Revising it critically for important intellectual content, Drafting the article, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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