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Research Paper

Prevalence and Causes of traumatic dental injury among children attending the University of Abuja Teaching Hospital, Gwagwalada, Abuja, Nigeria

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ABSTRACT
Background: Traumatic dental injury (TDI) has become an important public health problem not only because their prevalence is high, but also because it has substantial impact on the child's quality of life. This study aimed to determine the prevalence and the causes of TDI among the children that attended the dental clinic of the University of Abuja Teaching Huspital (UATH)
Methods. This was a prospective study of pediatric patients aged 1-16 years that visited the dental clinic of UATH over a period of 12 months. The data obtained included age, sex, causes of dental trauma, place of trauma, number of teeth affected, type of tooth, and type of tooth trauma. Traumatized teeth were classified using Garcia-Godoy's classification. Statistical analysis was carried out using SPSS version 20.0.
Results. The overall TDI prevalence was 9.5%, higher in male than in female, 11.7 % and 7.5% respectively. The highest number of TDIs, 41(36.0%) occurred within the age group of 1-5 years and the least susceptible group was the 16- years age group, 6 (5.3%). Falls of various types accounted for 64 (56.0%) of causes of TDIs, followed by violence/assault 19 (16.7%), collision 15 (13.2%), RTA 7 (6.1%) sports 6 (5.3%), and biting on bone 1 (0.9%) while the cause of TDIs was unknown in 2 (1.8%) of the patients. TDIs from falls, violence/assaults and RTA were higher among males while injuries from sports and collision were commoner among females. The majority 104 (91.2%) of TDIs occurred either at home 45 (39.4%), in school 41 (36%) or in the street 18 (15.8%). The commonest injury in permanent dentition was enamel-dentine fracture without pulp exposure 23 (14.2%), while luxation was most frequent injury sustained in deciduous dentition 15 (9.2%). The majority of TDIs involved upper central incisors 129 (79.6%), and most children 73 (64%) had TDIs involving a single tooth.
Conclusion. The prevalence of TDI among our study population was relatively low (9.5%), with a slightly higher prevalence among boys. The commonest cause was fall and majority occurred at home and in school with highest prevalence among the age group 1-5 years. There is need for oral health education and promotion on the causes and prevention of TDIs among parents and educators.
KEYWORDS: *Traumatic dental injury, Prevalence, Causes*

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I. INTRODUCTION

Traumatic Dental Injury (TDI) refers to trauma to the oral region leading to damage to the teeth, lips, cheeks, tongue, and temporamandibular joints.[1] It is very common in children and adolescents.[2,3] and when permanent teeth are involved, it is a challenge to save them. Traumatic injuries to anterior teeth may lead to restriction in biting, changes in physical appearance, abnormal swallowing habits and speech defects. In addition to physical-somatic disturbances triggered at the time of trauma, emotional imbalances are also produced in young patients. All these have psychological impacts that affect the child's quality of life and intense repercussions on their parents and guardians.[1,4,5.]

Epidemiological studies from various parts of the world show that the prevalence of TDI varies from 2.4% - 58%.[5,6,7,8,9] with a male: female ratio ranging from 1.3 – 2.3:1[2,3,6]. In Brazil, for instance, the study of Kramer et al showed a prevalence of 35.9%,[10] while Beltrao et al reported a prevalence of 10.2%.[11] In Turkey,

two studies[12,13] had prevalence of 4.9% and 9.5% respectively. African studies also reported diverse prevalence of TDIs. In different communities of South Africa, Naidoo et al and Hargreaves et al reported prevalence of 6.4%,[14] and 15%[15] respectively. In Nigeria the prevalence is reported to be between 6.5% -31.0% amongst children,[8,16,17,18] Akpata reported a prevalence of 12.4% in Lagos, southwest Nigeria,[19] Adekoya et al in two different studies in Ile-Ife, also southwest Nigeria found prevalence of 23.2% and 9.1% respectively,[8,20] and Folaranmi reported 10.5% in Enugu,[21] southeast and Eigbodo 9.1% in Port Harcourt, South-south[22] Nigeria.

The majority of traumatic lesions are associated with accidents while playing and practicing sports, such as cycling, skating, contact sports and others while a lower percentage results from traffic accidents.[23,24] Falls have always accounted for a large proportion of traumatic injuries in children. For example, mouth injuries can occur when a child trips or is pushed with an object in his mouth or as a result of direct violence.[6,24,25,26.]

TDIs has become an important public health problem not only because their prevalence is high, but also because it has substantial impact on the child's quality of life,[3,27,28] while cost to the injured patient and community arising from such injuries are substantial. This study therefore aimed to determine the prevalence and the causes of TDI among the child patients that attended the dental clinic of the University of Abuja teaching hospital Gwagwalada, Abuja, located at the northcentral region of Nigeria.

II. MATERIALS AND METHODS

This was a descriptive cross-sectional study of 114 consecutive patients aged 1-16 years that presented in the Dental and Maxillofacial clinic of UATH Gwagwalada with TDIs to anterior teeth over a period of 12 months. Verbal informed consent was obtained from parents/guardians and approval for the study was obtained from the Ethics and Research Committee of the University of Abuja Teaching Hospital. A data acquisition form was used to collect biodata information from the patient/his or her parent/guardian who presented with anterior TDI after consent has been obtained. The data obtained include age, sex, cause of dental trauma, place of trauma, number of teeth affected, type of tooth, type of tooth trauma. Intraoral (periapical/occlusal) and panoramic radiographs were used to confirm the diagnosis. Traumatized teeth were classified using Garcia-Godoy's classification.[29] Statistical analysis was carried out using Statistical Package for Social Science (SPSS) version 20.0. Associations between variables were tested using Chi-square test and level of significance was set at $p<0.05$

III. RESULTS

A total 1202 children (540 males and 682 females) aged 1 – 16 years were examined. Of these, 114 TDI patients, with mean age 8.57 years (SD±4.80) consisting of 63 (55.3%) males and 51(44.7%) females were found. The overall TDI prevalence was 9.5%. while it was 11.7 % and 7.5% in male and female respectively. The resultant male: female ratio of 1.2:1 was statistically significant. (P=0.020, Table 1) The most frequent causes of TDIs were fall of various types 64 (56.0%), violence/assault 19 (16.7%) and collision with objects 15 (13.2%). Table 2. The highest number of TDI from fall occurred from bicycle, 19 patients (30.0%). Other types of falls include from stairs, playground, bed, tree, while running and tricycle which accounted for 27.0%, 23.0%, 6.0%, 5.0%, 6.0% and 3.0% respectively. (Figure 1) Falls were responsible for most TDIs in both genders. TDIs from falls, violence/assaults and RTA were higher among males while injuries from sports and collision were commoner among females. However there was no significant association between gender and the aetiology of trauma (Table 2). The highest number of TDIs, 41(36.0%) occurred within the age group of 1-5 years. This was closely followed by the 11-15 years age group, which had 40 (35.1%) and the 6-10 years age group which accounted for 27 (23.6%) cases. The least susceptible group was the 16 years age group which only had 6 (5.3%) cases. When TDIs were regrouped based to less than or 10 years and above 10 years, most TDIs significantly occurred in children less than or equal 10 years (P=0.0006, Table 3).

Tables 4 and 5 show the majority of TDIs occurred either at home [45 (39.4%)], jnvolving 23 female 20.1% and 22 male 19.3% and in school [41 (36.1%)], 17 (15%) female, 24 (21.1%) male. Most [30 (26.3%)] TDIs occurring at home happened among 1-5 year olds and the majority of TDIs occurring in the school [20 (17.5%) and on the street [9 (7.9%)] were among 11-15 year olds.

Of the total of 162 teeth involved in TDIs permanent teeth accounted for 110 (67.9%), and deciduous teeth 52 (32.1%). The commonest injury in permanent dentition was enamel-dentine fracture without pulp exposure accounting for 23 cases (14.2%) while luxation was most frequent injury sustained in deciduous dentition, 15 cases (9.2%). (Table 6) The majority of TDIs involved upper central incisors 129 (79.6%), (Table 7) and most children 73 (64%) had TDIs involving a single tooth (Figure ii).

IV. DISCUSSION

The prevalence of TDIs ranges from 2.4% - 58% [6,7,8,9] from various epidemiological studies. The differences could be explained by different classifications used for TDIs, dentition type under consideration, study design, methodology, patient selection, location, and inclusion/exclusion criteria. The prevalence of TDIs in the present study was 9.5%. This figure is less than a Brazilian[10] and Iranian[30] studies which reported prevalence of 35.9% and 27.6% respectively but higher than a Turkish[12] and Spanish studies[31] with prevalence of 4.9% and 6% respectively. However, the prevalence in our study falls within the range of 6.5% -31% reported in previous studies amongst Nigerian children.[16-20] While Akpata[18] in a study among 6-21-years old Nigerians in Lagos on traumatized anterior teeth and Olaniyi et al[17] in a study among 12-years old Nigeria students reported prevalence of 12.4% and 15.2% respectively, Otuyemi[16] et al in a study among primary school childrenin Ile-Ife and Adekoya et al's study[20] among 600 children aged 3-5 years also in Ile-Ife, reported prevalence of 6.5% and 9.1% respectively.

Most patients with TDI present when there are unbearable symptomssuch aspain, swelling and tooth sensitivity. The lower TDI prevalence observed in the present study is therefore expected of a hospital – based study compared with community-based Nigerian studies.

The general agreement in literature is that boys suffer more TDIs than girls[7,23,24]. However, the ratio of 1.2: 1 in this study is at variance with the 2:1 reported in a Southern Nigeria[8] and 4: 1 reported in Chennai[5] studies. This could be adduced to the fact that those studies were community based studies with different methodology, unlike the present study which was hospital based. The fact that girls are becoming more inclined towards vigorous activities and a decline in the restricted behavior enforced on girls could also explain the findings in the present study.

The present study observed the highest prevalence of TDIs among the 1-5 (36.0%) This 1-5 year peak is in agreement with a previous South-African study[34] which reported a peak at 4-5 years. The high prevalence of TDI in the age group 1-5 years is because at this stage children take their first steps but they do not have sufficient motor coordination to avoid possible falls. As children gain confidence and coordination, the incidence of TDIs decreases and then rises again during the active age range of 9 – 15 years. This rise has been attributed to bicycle riding, as well as playground and sports accidents.[10,24.]

The maxillary central incisors were found to be the most affected by TDI in the present study, constituting 79.7% of cases. This finding corroborates reports of several studies such as, Castro[35] (58.3%), and Beltroa[11] (94.4%) in Brazil, Altun[13] (88.2%) in Turkey, and Schatz[36] (91.2%) in Switzerland. In Nigeria, Adekoya et al[20] and Olaniyi et al[17] observed that TDIs were almost entirely restricted to the maxillary central incisors. The prominent and vulnerable position of the maxillary incisors has been blamed for their frequent involvement in fractures.

Most TDIs in the present study occurred at home (39.5%). This agrees with previous studies in Brazil[37,38] and in India[39,40]. This may be related to the fact that children spend more time at home than at school or in playgrounds. The lower incidence in school may be because of supervision by school authorities.[41]

In this present study, the most frequently observed type of injury in deciduous teeth were luxation (9.2%) while the most frequently observed type of TDIs among permanent teeth were crown fractures of different types. These findings were in agreement with previous studies, like in Kenya, where Muriithi et al found luxation to be the commonest type of TDI in the deciduous dentition,[42] Flores et al[25] in Chile, Brazil and Evuboglu et al[12] who reported similar findings among Turkish children. The present study also corroborates findings reported by Nigerian authors; Agbelusi et al[43] Olaniyi et al[17] who found crown fractures to be the commonest TDIs in permanent teeth. Greater self-consciousness with age could explain the preponderance of enamel fractures recorded in the permanent dentition. Furthermore, greater bone marrow space and consequent higher elasticity could explain the higher cases of luxation in the deciduous teeth.

The majority (64.0%) of patients seen in the present study had single tooth involvement with TDIs, thereby corroborating findings from other studies.[11,20] The prevalence of single-tooth TDIs could be related to the aetiology of TDIs among children. Falls of various types being the major cause of TDIs among children often result in single-tooth TDIs compared with multiple tooth involvements of other forms of trauma for example RTAs[23,24]. Such falls among children result from several sources including falls from stairs, plays, cycling which cumulatively accounted for 56% of falls seen in the present study. This finding agrees with those of previous investigators in Turkey,[12,13] in Brazil,[26,37,38] in South Africa[14] in Kenya[42] and in Nigeria.[17] The second commonest cause of TDIs in the present study was violence especially in the 11 – 15 years age group corroborating previous studies.[6,44,45] The rise of TDIs due to violence is easily explained by increasing youthful exuberance that often characterizes this age group.

This present study in corroboration with the previous studies,[14,36] found significantly more TDIs (67.9%) in the permanent dentition. Increasing activities in older children as well as the general tendency in risk taking and adventure explain this observation[12,45]. Other plausible explanations could be the tendency for parents

to ignore TDIs involving deciduous teeth since they will eventually exfoliate and younger children are less likely to complain to their parents about broken teeth especially when those teeth are symptomless.

In conclusion, the prevalence of TDI among our study population was low (9.5%), with a slightly higher prevalence among boys. The most common cause of TDIs was fall of various types and traumatic injuries occurred mostly at home and in school environment with highest prevalence among the age group 1-5 years. This study therefore demonstrated the need for oral health education and promotion on the causes and prevention of TDIs among parents and educators.

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Table 1: The number and proportion of children with traumatized anterior teeth

GENDER	TDIS			CHI-SQUARE	P-VALUE
	Present (n %)	Absent (n %)	Total		
MALES	63(11.7)	477(88.3)	540	5.44	0.0197
FEMALES	51(7.7)	611(92.3%)	662		
TOTAL	114 (9.5%)	1088	1202		

Table 2: Gender distribution according to aetiology of traumatized anterior teeth

ETIOLOGY	GENDER		
	Males (n %)	Females (n %)	Total (n %)
FALLS	37(59.2)	27(54.0)	64(56.)
SPORTS	1(1.6)	5(9.8)	6(5.3)
RTA	5(7.9)	2(4.0)	7(6.1)
COLLISION	5(7.9)	10(19.6)	15(13.2)
UNKNOWN	1(1.6)	1(2.0)	2(1.8)
BITE ON BONE	1(1.6)	0(0.0)	1(0.9)
VIOLENCE	13(20.6)	6(12.0)	19(16.7)
TOTAL	63(55.3)	51(44.7)	114(100.0)

Chi-square = 9.60, df= 6, P = 0.1424

Table 3: Age distribution of aetiology of TDIs

	AGE DISTRIBUTION IN YEARS				
CAUSES OF TDIS	1-5(N%)	6-10(N%)	11-15(N%)	16-20(N%)	Total(N%)
FALL	32(28.0)	13(11.4)	18(15.7)	1(0.9)	64(56%)
SPORTS	0(0.0)	2(1.8)	3(2.6)	1(0.9)	6(5.3)
RTA	0(0.0)	1(0.9)	5(4.4)	1(0.9)	7(6.1)
COLLISION	7(6.1)	5(4.7)	3(2.6)	0(0.0)	15(13.2)
BITE ON BONE	0(0.0)	0(0.0)	1(0.9)	0(0.0)	1(0.9)
VIOLENCE	0(0.0)	6(5.2)	10(8.8)	3(2.6)	19(16.7)
UNKNOWN	2(1.8)	0(0.0)	0(0.0)	0(0.0)	2(1.8)
TOTAL	41(36.0)	27(23.6)	40(35.1)	6(5.3)	114(100.0

Chi Square=17.19; df=3; P=0.0006 (Based on ages up to 10 years and above 10 years)

Table 4: Age distribution of location where TDIs occurred

PLACE OF TDI	AGE DISTRIBUTION (YEARS)				TOTAL(N%)
	1-5	6-10	11-15	16-20	
CRECHE	4(3.5)	0(0.0)	0(0.0)	0(0.0)	4(3.5)
HOME	30(26.3)	8(7.0)	6(5.2)	1(0.9)	45(39.4)
SCHOOL	7(6.1)	12(10.5)	20(17.5)	2(1.8)	41(36.0)
MARKET	0(0.0)	0(0.0)	1(0.9)	0(0.0)	1(0.9)
FARM	0(0.0)	0(0.0)	1(0.9)	0(0.0)	1(0.9)
PARK	0(0.0)	0(0.0)	3(2.6)	1(0.9)	4(3.5)
STREET	0(0.0)	7(6.1)	9(7.9)	2(1.8)	18(15.8)

TOTAL	41(36.0)	27(23.7)	40(35.0)	6(5.3)	114(100)

Chi-square=19.34; df=3; P=0.0002

Table 5: Gender distribution of TDIs according to location of injury

	GENDER		
LOCATION	Males (n%)	Females (n%)	Total (n%)
CRECHE	3(2.6)	1(0.8)	4(3.4)
FARM	0(0.0)	1(0.8)	1(0.8)
HOME	22(19.3)	23(20.1)	45(39.4)
MARKET	1(0.8)	0 (0.0)	1(0.8)
PARK	3(2.6)	1(0.8)	4(3.4)
SCHOOL	24(19.1)	17(15.0)	41(36.1)
STREET	10(8.8)	8(7.1)	18(15.9)
TOTAL	**63(55.4)**	**51(44.6)**	**114(100)**

Chi-square =1.254; df=2; P=0.5342 (Home, School and Others).

Table 6: Pattern of TDIs by dentition type

TYPE OF TDI	PERMANENT (N %)	DECIDUOUS (N %)	TOTAL (N %)
ENAMEL CRACK	1 (0.6)	0(0.0)	1(0.6)
ENAMEL FRACTURE	21(13.0)	4(2.4)	25(15.4)
ENAMEL-DENTINE FRACTURE WITHOUT PULP EXPOSURE	23(14.2)	2(1.2)	25(15.4)
ENAMEL-DENTINE-CEMENTUM FRACTURE WITHOUT PULP EXPOSURE	6(3.7)	0(0.0)	6(3.7)
ENAMEL-DENTINE-CEMENTUM FRACTURE WITH PULP EXPOSURE	5(3.1)	3(1.8)	8(4.9)
ROOT FRACTURE	5(3.1)	0(0.0)	5(3.1)
CONCUSSION	7(4.3)	8(4.9)	15(9.2)
LUXATION	7(4.3)	15(9.2)	22(13.5)
LATERAL DISPLACEMENT	5(3.1)	5(3.1)	10(6.2)
INTRUSION	5(3.1)	8(4.9)	13(8.0)
EXTRUSION	17(10.5)	5(3.1)	22(13.6)
AVULSION	8(4.9)	2(1.2)	10(6.1)
TOTAL	110(67.9)	52(32.1)	162(100.0)

Chi – square =18.70, p value = 0.000147, df =1..

Table 7: Distribution of TDIs by the quadrant of the mouth frequently affected

	RIGHT			LEFT			TOTAL(N%)
	Central	Lateral	Canine	Central	Lateral	Canine	
UPPER	62(38.3)	7(4.3)	2(1.3)	67(41.4)	16(9.9)	0(0.0)	154(95.0)
LOWER	3(1.9)	0(0.0)	0(0.0)	5(3.1)	0(0.0)	0(0.0)	8(5.0)
TOTAL	**65(40.2)**	**7(4.3)**	**2(1.3)**	**72(44.4)**	**16(9.9)**	**0(0.0)**	**162(100.0)**

Chi – square = 0.23 p value = 0.6338

Figure i: Trauma distribution according to various types of falls

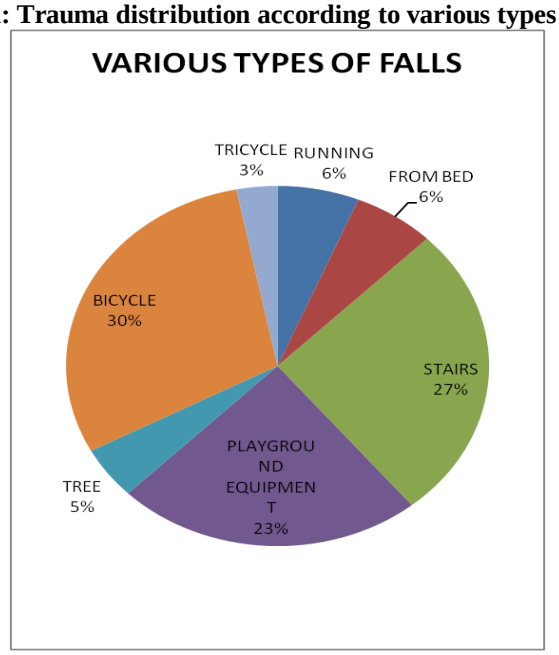

Figure ii: Distribution of children according to number of traumatized teeth