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Pattern of traumatic dental injuries among children seen at the University of Abuja Teaching Hospital, Gwagwalada, Abuja, Nigeria

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Abstract
Aim*: To determine the pattern of traumatic dental injuries in children seen at the University of Abuja Teaching Hospital, Gwagwalada, Nigeria.*
Methods*: A total of 114 pediatric patients with 162 TDIs aged 1-16 years that met the inclusion criteria were examined clinically and radiographically. Data collected included age, sex, cause of dental trauma, number of teeth affected, type of tooth and type of tooth trauma. Injuries were classified using the Garcia – Godoy's Classification. Data were analysed using SPSS version 20*
Results
A total 114 patients with a male :female ratio of 1.2:1 presented with 162 TDIs. The age group 1- 5years, had the highest TDI cases (28%, 32 patients). The main causes of TDIs were falls (56%), violence/assaults (16.7%) and collision (13.2%). The highest number of TDIs (36.0%) occurred within the age group of 1-5 years followed by the 11-15 years age group (35.1%). TDIs involving permanent teeth accounted for 67.9%, and deciduous teeth 32.1%. Enamel fracture and enamel-dentine fracture without pulp exposure accounted for highest cases of TDIs (25, 15.4% each), The commonest injury in permanent dentition was enamel-dentine fracture without pulp exposure (14.2%) while luxation was the most frequent injury sustained in deciduous dentition, (9.2%). Upper central incisors were involved 79.6% of cases and most children (64%) had TDIs involving a single tooth.
Conclusion
The results of this study are similar to other studies on the patterns of TDIs in Nigeria. With fall accounting for highest occurrence of TDIs and mostly occurring among the 1-5 years age group, it is important to educate the parents on the prevention of TDIs among children.
Key words: *Traumatic dental injury, children, anterior teeth*

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I. Introduction

Trauma can result in injuries to any part of the body and when it occurs to the dental tissues it may lead to fracture, displacement, or loss of teeth. Traumatic dental injury (TDI) is an unpleasant and upsetting experience that affects the teeth and when this occurs in children, the management is distressing and tragic for the child and parent and often difficult for the dentist.[1,2]

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. These equally have intense repercussions on their parents and guardians and such psychological impacts affect the child's quality of life.[3,4]

Fall, sport related accidents, car related accidents, violence, and child abuse have been reported to be the main causes of TDI depending on the age and sex[5,,6] While children between the ages of 7 and 11 years[7] are reported to be most susceptible to sport related oral injuries, children aged 4-7 and 12-15 years are at the greatest risk of being physically abused[8,9] Facial and dental injuries as a result of road traffic accidents are more frequent in late teens and in children not using seat belt[10,11]

TDIs to anterior teeth are common injuries. In the primary dentition such trauma results in concussion, subluxation and luxation while permanent teeth are likely to suffer from simple fracture of enamel to more complicated cases as pulpal exposure or avulsion.[2,12] TDI has become an important public health problem not only because their prevalence is high, but also because this has substantial impact on the child's quality of

life,[13,14] while cost to the injured patient and community arising from such injuries are substantial. Therefore studies are important in the evaluation of this condition including occurrence, various etiologic factors, type and pattern of tooth fractures as such studies can also facilitate the planning of preventive measures.

This study therefore aimed to determine the pattern of TDI to anterior teeth in 1 – 16 years old patients presenting at the department of Dental and Maxillofacial Surgery, University of Abuja Teaching Hospital, Gwagwalada, Federal Capital Territory (FCT), Abuja, Nigeria.

II. Materials and Method

This was a descriptive prospective study of all 114 consecutive pediatric patients aged 1-16 years that presented with TDIs to anterior teeth in the Dental and Maxillofacial Surgery department of University of Abuja Teaching Hospital Gwagwalada, Abuja, Federal Capital Territory, Nigeria.

Patients below 1 year, above 16 years, patients with no clinically obvious TDI, and patients/parents who are not willing to participate were excluded from the study.

A data acquisition form was used to collect biodata information from every paediatric patient/his or her parent who presented with anterior TDI after consent has been obtained and clinical examination of all maxillary and mandibular teeth from canine to canine was done for traumatic injury. The data collected included age, sex, cause of dental trauma, number of teeth affected, type of tooth and type of tooth trauma. Intraoral (periapical/occlusal) and panoramic radiographs were used to support the diagnosis. Traumatized teeth were them classified according to Garcia-Godoy's classification[15] Data collected were analysed using the Statistical Package for Social Science (SPSS) version 20.0. The data were subjected to descriptive analysis in the form of frequencies, percentages, cross-tabulations, mean and standard deviation. Associations between variables were tested using Chi-square test. Approval for the study was obtained from the Ethics Committee of the University of Abuja Teaching Hospital and verbal informed consent was obtained from patients/patient's parents.

III. Results

A total of 114 paediatric patients (1-16years), with mean age 8.57 years (SD=4.80) that presented with TDIs at the Dental and Maxillofacial surgery clinic of the University of Abuja Teaching Hospital during the study period of 12 months and met the inclusion criteria were included. There were 63 (55.3%) males and 51 (44.7%) females with a male: female ratio of 1.2:1.

Falls were responsible for most of the TDIs with 64 patients (56%), followed by violence/assaults, 19 patients (16.7%) and collision 15 patients (13.2%) and the least cause of TDIs was bite on bone, 1 patient (0.9%), while the cause of TDIs was unknown in 2 patients (1.8%) (Table1). 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) Overall, 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 occurred in children less than or equal 10 years. This was highly statistically significant. (P=0.0006) (Table3).

The distribution by type of trauma in permanent and deciduous dentitions is shown in table 4.

Of the total of 162 teeth involved in TDIs permanent teeth accounted for 110 (67.9%), and deciduous teeth 52 (32.1%). Enamel fracture and enamel-dentine fracture without pulp exposure accounted for highest cases of TDIs (25, 15.4% each), closely followed by luxation and extrusion accounting for twenty-two cases (13.6%) each. 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%).

The majority of TDIs involved upper central incisors 129 (79.6%), with upper left central incisors accounting for 67, (41.4%) and upper right incisors 62 (38.3%) (Table 5) and most children 73 (64%) had TDIs involving a single tooth. (Table 6)

Table 1: Distribution of TDI In Relation To Aetiology

Cause of Injury	N	%
Fall	64	56.0
Sports	6	5.3
Road Traffic Accident (RTA)	7	6.1
Collision	15	13.2
Unknown	2	1.8
Bite on Bone	1	0.9
Violence/assaults	19	16.7
Total	114	100.0

Table 2: Gender distribution of aetiology of TDI

Etiology	Gender		
	Males (n %)	Females (n %)	Total (n %)
Falls	37(58.7)	27(53.3)	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(11.8)	19(16.7)
Total	63(100.0)	51(100.0)	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(78.0)	13(48.1)	18(45.0)	1(16.7)	64(56%)
Sports	0(0.0)	2(7.4)	3(7.5)	1(16.7)	6(5.3)
RTA	0(0.0)	1(3.7)	5(12.5)	1(16.7)	7(6.1)
Collision	7(17.1)	5(18.5)	3(7.5)	0(0.0)	15(13.2)
Bite On Bone	0(0.0)	0(0.0)	1(2.5)	0(0.0)	1(0.9)
Violence	0(0.0)	6(22.2)	10(25.0)	3(50.0)	19(16.7)
Unknown	2(4.9)	0(0.0)	0(0.0)	0(0.0)	2(1.8)
Total	41(100.0)	27(100.0)	40(100.0)	6(100.0)	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: Distribution of TDIs by type of injury

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 5: Distribution of TDIs by the tooth type

	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

Table 6: Distribution of children according to number of traumatized teeth

Number of traumatized teeth	1	2	3	4
Number of children	73	36	3	2
Percentage	64.0	31.6	2.6	1.8

Number of teeth=162 mean=1

IV. Discussion

The general agreement in literature is that boys suffer more TDIs than girls. [1,12,16] However, the ratio of 1.2: 1 in this study is at variance with the 2:1 reported in a Southern Nigeria[17] and 4: 1 reported in a Chennai[4] study. This could be adduced to the fact that studies of Southern Nigeria and Chennai were community based study with different methodology, unlike the present study which is hospital base. The resultant lower male to

female ratio of 1.2: 1 in this study could be due to the fact that girls are getting more inclined towards vigorous activities and a decline in the restricted behaviors.

The present study observed higher prevalence of TDIs among the 1-5 and 11 – 15 years age groups which accounted for 36.0% and 35.1% respectively. The study also found an increase of TDIs with age, dropping at 6 – 10 years and peaking at 11 – 15 years with a drastic decrease at age 16. The 1-5 year peak is in agreement with a previous South-African study [18] which reported a peak at 4-5. The increase in TDIs 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. The finding in the present study is also in agreement with other studies such as a study involving 1545 children in Oanoas, Brazil, where Kramer et al[19] reported a peak at ages 3-4 years while Beltrao et al[20] found a peak at 2-3 years. Moreover, in another Brazilian studies, Granville-Garcia et al[21] reported a peak at 3 -5 years among preschool children aged 1-5 years, while Ferreira et al[22] reported a peak at 2-5 years in their study. However, while some authors[23,24] have reported a TDI peak at age 12 years, others[1,12] have found peak of TDI in the mixed dentition when compared with older children.

Although TDIs could occur at any age, they are more often seen during the developmental period of 2 – 4 years. During this period, children learn to walk and run. At this stage, their coordination and judgment are poorly developed making falls more common.[12,20] As children gain confidence and coordination, the incidence of TDIs decreases and then rises again during the active age range of 9 – 15 years.

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 several studies such as, Castro[16] (58.3%), and Beltroa[20] (94.4%) in Brazil. Altun[25] and Schatz[26] reported similar figures, 88.2% and 91.2% in Turkey and Switzerland respectively. In India, Dua et al[27] reported 43.8% while in Malaysia Gopinath[23] reported > 60%. In Nigeria, Adekoya et al[28] and Olaniyi et al[29] observed that TDIs were almost entirely restricted to the maxillary central incisors. The prominent and vulnerable position of the maxillary incisors had been blamed for their frequent involvement in fractures. This study reported a higher number of cases of TDIs involving the left maxillary incisors (51.3%). The resultant finding between TDIs occurring on the left or right quadrant shows no statistical significace. (P = 6338). This corroborates the findings of Wendt et al.[30] Interestingly, Dua et al found TDIs to be much commoner on the right maxillary incisor.[27]

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 agree with several previous studies.[20,31,32] The findings were also in agreement with those from several countries like in East Africa where Muriithi et al[33] found luxation to be the commonest type of TDI in the deciduous dentition, Flores et al[34] in Chile, Brazil and Evuboglu et al[35] who reported similar findings among Turkish children. The present study also corroborates findings reported by Nigerian authors[24,32] 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. Failure to attend to these fractures often attracts negative attention coupled with teasing with attendant psychological effects on children. In prospective studies such as this, TDIs cases that are likely to report following injuries are those with associated soft tissues involvement like lip/tongue lacerations, intrusion or occlusal interferences. Parents tend to either overlook or be unaware of mild TDIs. However, some children may not even inform their parents of the TDIs for fear of being scolded or punished. Furthermore, greater bone marrow space and consequent higher elasticity appear to explain the higher cases of luxation in the deciduous teeth.[12]

The majority (64.0%) of patients seen in the present study had single tooth involvement with TDIs corroborating previous studies.[11,19,20] The prevalence of single-tooth TDIs in this study could be related to the aetiology of TDIs among children. Falls 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[1,12]. The second commonest cause of TDIs in the present study was violence especially in the 11 – 15 years age group corroborating previous studies.[10,11] The rise of TDIs due to violence is easily explained by increasing youthful exuberance that often characterizes this age group. Furthermore the third commonest cause of TDIs was caused by collision and was highest in the age group 1-5 years. This could be that children within this age group may be involved with colliding with objects especially in a country like ours where there could be frequent power source interruption; the situation that usually excites some children to run in the dark.

This present study in agreement with the previous studies in South Africa[36] and in Switzerland[26] found significantly more TDIs (67.9%) in the permanent dentition (p=0.002). Increasing activity in older children as well as the general tendency in risk taking/adventure explains this observation[11,36,37] Another plausible explanation could be the tendency for parents to ignore TDIs involving deciduous teeth since they will eventually exfoliate. Again the reduced prevalence of TDIs presented among deciduous teeth could also be because younger children are less likely to complain to their parents about broken teeth especially when those teeth are symptomless.

In conclusion, the results of this study are in agreement with those of similar studies on TDIs. Falls are responsible for the highest number of TDIs which occurred mostly among the age group 1-5 years. Therefore there is need for public enlightenment on the prevention of TDIs among the children which should be targeted at various groups such as parents, school teachers, antenatal/postnatal clinics etc.

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