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TRAUMATIC DENTAL INJURIES TO PERMANENT ANTERIOR TEETH IN 12-15 YEAR OLD CHILDREN IN NAIROBI

M. K. MUASYA, P. M. NG'ANG'A, G. N. OPINYA and F. G. MACIGO

ABSTRACT

***Objective*: To determine the prevalence and pattern of occurrence of traumatic injuries to permanent anterior teeth.**
***Design*: A descriptive cross-sectional survey.**
***Setting*: Public primary schools in the City of Nairobi.**
***Subjects*: A sample of 1382 children (672 males and 710 females) were interviewed and examined.**
***Results*: Among the 1382 children examined, 222(16.1%) had experienced traumatic dental injuries (TDIs). Males had experienced a significantly higher prevalence of trauma 126(18.8%) than females 96(13.5%) p=0.008. Falls were the leading cause of TDIs as reported by 78(35.1%) children. Amongst the, male children, falls were the leading cause of traumatic injuries to the permanent anterior teeth 47(37.3%). Approximately half 43(44.8%) of the females did not remember the cause of injury while 31 (36.5%) had sustained TDIs due to falls. One hundred and seventy two (77.5%) children who had experienced TDIs had no symptoms associated with the traumatised teeth. Ninety six (43.2%) of the children were injured while in the home environment. The maxillary central incisors were the most commonly traumatised teeth accounting for 220(73.5%) out of 299 injured teeth. The most frequently observed type of dental trauma was enamel fracture 206(68.9%) followed by enamel-dentin fracture 71(23.8%). Two hundred (90%) children had not sought treatment for TDIs.**
***Conclusion*: Overall traumatised permanent incisors were found to occur fairly frequently with males having experienced significantly more TDIs than females. The prevalence of TDIs was 16.1%; enamel fractures were the most frequently observed injury and falls were the leading cause of trauma.**

INTRODUCTION

Trauma refers to injury; damage; impairment; external violence producing injury or degeneration (1). The predominant concern of paediatric dentistry has been treatment and prevention of dental caries. With the decline in the prevalence of this disease, the awareness of other oral health problems such as dental trauma has been raised (2). Majority of traumatic dental injuries (TDIs) to children occur as a result of their activities and so long as these children remain active, these injuries will continue as a frequent dental problem that requires dedicated care (3). An injured permanent tooth is often a traumatic experience to the child and parent who are concerned due to pain, discomfort as well as aesthetic appearance. The clinician's concern, however, is usually on the extent, intensity and gravity of the injury, which may not only affect the tooth but also involve the supporting structures as well. The type of dental traumatic injury varies considerably from minor injuries that do not require any treatment to more severe injuries that require both emergency treatment and several appointments for follow-up and various procedures. Prevalence of dental traumatic injuries to permanent incisors has been found to range from 2.7 to 29.6% (2, 4-10) in many parts of the world. Data from Africa, however remains scanty. The aim of the present study was therefore to determine the pattern of occurrence of traumatic injuries to permanent anterior teeth in African children aged 12-15 years from public primary schools in Nairobi, Kenya.

MATERIALS AND METHODS

One thousand three hundred and eighty two male and female children aged 12-15 years from six out of the 203 public primary schools in Nairobi were examined. This sample was selected by multi-stage random sampling. Two hundred and twenty two children with history of traumatic dental injuries were identified. A structured

questionnaire was used to obtain information on the trauma. The parameters sought were: symptoms associated, cause, site of trauma and if any treatment was sought. Further data were collected by clinical examination of permanent anterior teeth of the children based on a modification of the WHO criteria. The number and type of teeth injured, classification of the trauma and type of treatment, if any were recorded. Data were analysed aided by computer using the Statistical Package for Social Sciences (SPSS) program, version 12. Chi-square test and odds ratios were done to determine the differences in trauma experience between males and females. Student's t-test was used to determine differences in mean number of traumatised teeth between males and females. A p-value of less than 0.05 was considered significant. The study was carried out following approval of the proposal by the Ethics, Research and Standard Committee of Kenyatta National Hospital and University of Nairobi (Approval Ref. No. KNH-ERC/01/3593).

RESULTS

A total of 1382 children (672 males and 710 females) from six primary schools in Nairobi were examined (Table 1). Two hundred and twenty two (16.1%) children were found to have experienced traumatic dental injuries. One hundred and twenty six (56.8%) of these were males while 96 (43.2%) were females (Table 2). Experience of traumatic dental injuries was found to be significantly higher in males than females; (X^2=7.001, p=0.008) with an odds ratio of 1.5 (95% CI: 1.11-1.97). The prevalence of TDIs in the male and female children was 126(18.8%) and ninety six (13.5%) respectively. Out of the 222 children who had experienced TDIs, 72(32.4%) were 13 years old, sixty four (28.8%) were 14 years old while 47(21.2%) and thirty nine (17.6%) were aged 12 and 15 years respectively (Table 2). It was found that the prevalence of TDIs in 13 year-olds was significantly higher than in children of other ages examined; X^2= 8.27, p=0.041. In all age groups, there were more males than females (Table 2).

Among the 222 children who had experienced TDIs, one hundred and sevnty two (77.5%) had no symptoms associated with the traumatised tooth. Thermal sensitivity was experienced by 28 (12.6%), pain by 20 (9%) and swelling was reported in two (0.9%) of the children.

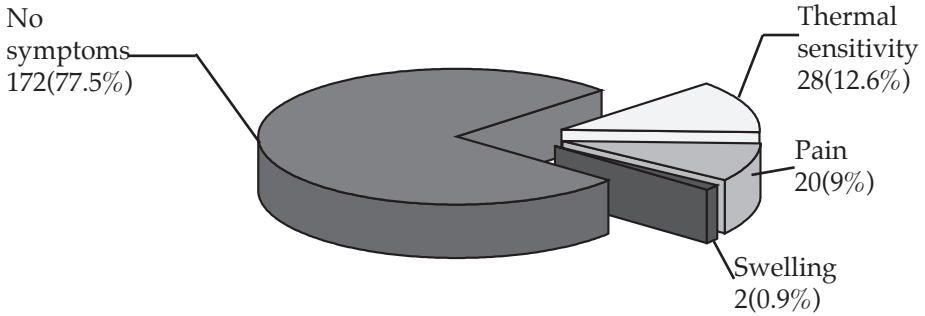
Table 1
Distribution of the children by school and gender

	Name of primary school						
Gender	Kibera	Ndurarua	State House	Plainsview	Kimathi	St. Brigid	Total
Male	203 (30.2%)	177 (26.3%)	87 (12.9%)	80 (11.9%)	65 (9.7%)	60 (9.0%)	672
Female	234 (33.0%)	160 (22.5%)	89 (12.5%)	85 (12.0%)	97 (13.7%)	45 (6.3%)	710
Total	437	337	176	165	162	105	1382

Table 2
Distribution of children with, TDIs by Age and Gender

Age (years)	Male (%)	Female (%)	Total (%)
12	27(21.4)	20(20.8)	47(21.2)
13	42(33.3)	30(31.3)	72(32.4)
14	38(30.2)	26(27.1)	64(28.8)
15	39(17.6)	20(20.8)	39(17.6)
Total	126(100)	96(100)	222(100)

Figure 1
Distribution of children with TDIs by symptoms



About half the children one hundred and nineteen (53.6%) reported to have sustained TDIs more than one year prior to the examination. Sixty four (28.8%) children did not remember when their teeth had been injured while twenty nine (13.1 %) reported to have been injured between six months to a year prior to the examination. Eight (3.6%) children had been injured in the period of more than one month to six months prior to examination while only two (0.9%) children had been injured in the month prior to the date of examination.

Regarding the site where the injuries had occurred, fivety eight (46%) male children and thirty eight (39.6%) females sustained TDIs at home. Thirty six (28.6%) of males and twenty three (24%) of females were injured at school. Thirty (23.8%) male children and thirty two (33.3%) of the females did not remember where the injuries had occurred while two (1.6%) boys and three (3.1 %) girls were injured at other sites such as the road from home to school and while on a school trip (Table 3).

When the 222 children with TDIs were interviewed on how they sustained the injuries, a variety of causes of the TDIs were encountered. Falls were the leading cause of TDIs as reported by seventy eight (35%) children followed by collision with a stationary object thirty eight (14.4%). A large number of children seventy one (32%) could not remember the causes of their injuries. More females than males could not remember. Amongst the 126 male children with TDIs, falls were reported by fourty seven (37.3%) of them. Out of the 96 females with TDIs, falls were reported in thirty one (36.5%). About twenty eight (22.2%) male children did not remember the cause of injury while this was the case in approximately half of the females forty three (44.8%). Collision with a stationary object caused TDIs in 23(18.3%) of males and nine (9.3%) of the females. Six (4.8%) and three (2.4%) of the males had been injured in a fight and during games respectively while neither of these two causes of TDIs was found to be the cause of injury amongst females. Only one (0.8%) male and four (4.2%) of the female children had sustained injuries due to road traffic accidents (RT A). Among the male children 18(14.2%) had sustained injuries due to other causes out of which seven children had injured their teeth while biting a hard object, five in collisions with friends, three had been hit by a stone, one was hit by a compass, one hit by a golf ball and one hit by a swing. Among the females, 5(5.2%) had sustained injuries due to other causes; 4 out of these having been hit by a stone and one was injured on biting a hard Object (Figure 2).

Among the 222 children who had sustained TDIs, 299 teeth had been injured giving a mean of 1.4 (SD 0.6) teeth injured per child. There was a mean of 1.4 (SD 0.6) injured teeth per male child and 1.3 (SD 0.6) per female child. The male and female children did not demonstrate a statistically significant difference in the mean injured teeth per child (Z=-0.485, p=0.628). Majority of the injured teeth 206(68.9%) had enamel fracture while enamel-dentin fractures were the second most common, having been observed in seventy one (23.8%) of the teeth (Table 4). Six (2%) teeth were discolored, four (1.3%) had been avulsed and three (1.0%) were restored. Complicated crown fracture and luxation injuries were each found in one (0.3%) of the teeth. Combined injuries were found in seven (2.3%) of the teeth.

Table 3

Distribution of the children with TDIs by gender and site where injury occurred

Site of injury	Male (%)	Female (%)	Total (%)
Home	58(46)	38(39.6)	96(43.2)
School	36(28.6)	23(24)	59(26.6)
Do not remember	30(23.8)	32(33.3)	62(27.9)
Others	2(1.6)	3(3.1)	5(2.3)
Total	126(100)	96(100)	222(100)

Table 4

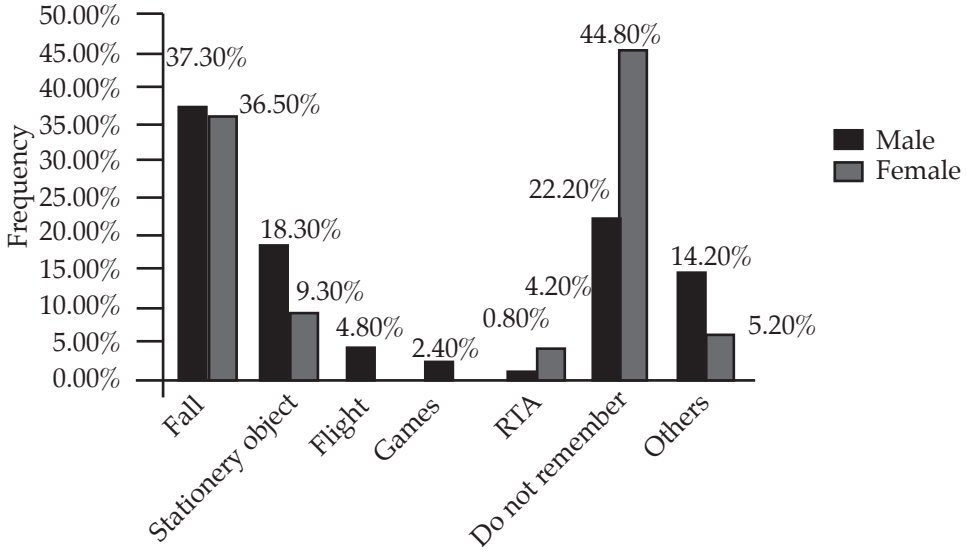
Distribution of teeth by type of injury

Type of injury	No. of teeth injured	Percentage of injured teeth
Enamel fracture	206	68.9
Enamel-dentin fracture	71	23.8
Discoloured due to trauma	6	2
Avulsed	4	1.4
Restored due to trauma	3	1
Complicated crown fracture	1	0.3
Luxated	1	0.3
Combined injuries	7	2.3
Total	299	100

Regarding the type of teeth injured, the maxillary central incisors were the most commonly traumatised (Figure 3). The right central incisor accounted for 120 (40.1%) of the cases and the left one for 100(33.5%) of the cases. The maxillary left and right lateral incisors accounted for 24(8%) and 23(7.7%) of the injured teeth respectively. In the mandibular arch, the right central incisor had the highest number of injuries with 13(4.4%) while the left one had nine (3%) of the injuries. The left lateral incisor accounted for seven (2.3%) of the injured teeth while right lateral incisor had the least number, three (1.0%) of the injured teeth. No traumatised canines were either reported or found on examination (Figure 3).

When asked whether they had sought treatment for the injured teeth, majority of the children reported that they had not done so. Only 22(9.9%) had sought treatment. Of the 126 male children with TDIs, only 14(11.1%) reported having sought treatment for the injured teeth while only 8(8.3%) of the 96 female children reported having done so. The rest 112(88.9%) of the males and 88(91.7%) of the female children had not sought treatment.

Figure 2
Distribution of the children wit TDIs according to cause of injury



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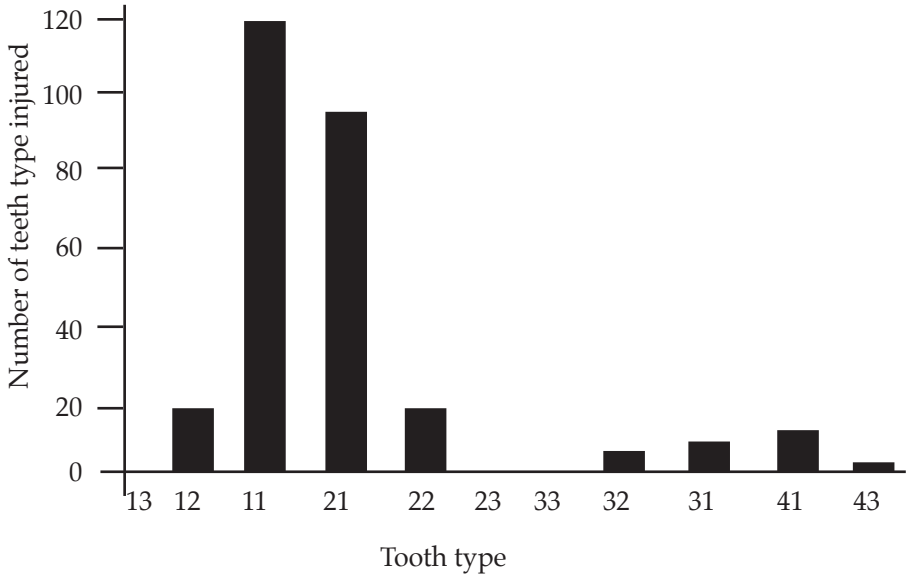

DISCUSSION

Based on the WHO criteria, 16.1% of the primary school children studied had experienced TDIs. Ng'ang'a *et al*. (7) reported a prevalence of fractured incisors of 16.8% in 13-15 year olds which is almost similar to the current study even with respect to the age group studied. They however did not use a specific index while in the current study a modification of the WHO criteria was used and recorded other injuries apart from fractures. Ohito *et al*. (8) found TDIs to occur in 11 % of normal children aged 5-15 years. The lower prevalence of TDIs in normal children reported by Ohito *et al.* (8) may be due to the wide age range (5-15 year olds) of the children they studied. Muriithi *et al*. (10) in a hospital based study of 0-15-year olds reported dental injuries to have a prevalence of 4.8%. This is a much lower prevalence than in the current study and could be explained by the fact that theirs was a hospital based study and not all children with dental injuries report to hospital to seek dental care. Furthermore the age range was also wide with primary, secondary and mixed dentitions.

In the present study, males experienced significantly more trauma than females (male to female ratio of 1.5: 1). This was in agreement with Kenyan studies which had reported a male to female ratio of 2:1, 1.7:1, with a prevalence of 14% for males and 11% for females (7, 8, 10). This was also in agreement with other studies done outside Kenya (11-13). Love *et al*. (11) and Tangade in (12) in New Zealand and India respectively reported a male to female ratio of 1.9:1 and 1:0.5 in secondary teeth, while Soriano *et al* in (13) in a study of 12 year old Brazilian children reported 12.2 and 8.8% males and females respectively having experienced TDIs. This could be explained by the fact that boys engage in contact sport and are generally more aggressive in nature and are therefore at greater risk of accidents while girls display more mature behaviour at this age and engage in more passive games (8, 14, 15).

In our study, it was observed that 13-year-olds experienced more trauma than children of other age groups examined and they accounted for a third (32.4%) of children with TDIs. In the secondary dentition TDIs have been reported to peak at different ages in different studies. The results of the present study differ from those of Ohito *et al*. (8) who reported three quarters of injuries to occur between 10-12 years of age. The results also differ from those of Muriithi *et al*. (10) who found 5.3% of 12-year-olds to have experienced dental injuries while 13, 14 and 15 year olds had a lower prevalence of 4.0, 3.6% and 3.6% respectively. The larger age ranges studied by Ohito *et al* and Muriithi *et al*. may account for the differences in the ages when TDIs peak. It is notable that Muriithi's study was hospital based. However, it is worth noting that when questioned on the duration elapsed since injury occurred majority (55.6%) of 13 year olds in the current study reported this to have been more than a year ago meaning they were 12 years or younger and thus they may have been injured while in the 10-12 year age bracket.

In the present study 172(77.5%) children who had experienced TDIs reported no symptoms while 48(21.6%) experienced thennal sensitivity or pain and two (0.9%) had a swelling related to the injury. A hospital based study in Jordan (17) reported differing findings from the current study with 32.8% of children having presenting complaint of aesthetic or parental concern while 31.3% had presented due to pain or sensitivity. The Jordanian study (17) reported that 17.5% of the children had swelling / sinus which is a larger proportion than the 0.9% reported in the present study. This could be because theirs was a hospital based study which is biased as many times patients present due to symptoms such as pain / sensitivity / swelling while a field based study would be expected to report a higher level of asymptomatic teeth. It is also notable that 95.5% of children with TDIs had sustained the injuries more than six months prior to examination and some of the symptoms such as sensitivity could have subsided. No other study has been published on the symptoms associated with traumatised teeth in Kenya.

The results of the current study corroborate those of Bauss *et al*. (18), Rajab *et al.* (15) and Soriano *et al.* (16) that a large percentage of TDIs are sustained in the home environment (Table 3). Sgan-Cohen *et a1*. (2) in a study of 1195 children aged 9 to 13 years in Jerusalem reported that the proportion of teeth injured at home was 31.4%. In the current study it was noted that 30 (23.8%) male and 32(33.3%) female children did not remember the site of injury. The children were young and may not have had good memory recall of events and therefore did not remember where the injuries occurred.

The majority, (90.1%) of the children who had sustained TDIs had not sought any treatment following injury. This finding is in agreement with the study by AI-Khateeb *et al*. (19) in Jordan. It is worth noting that in the current study 68.9% of children had enamel fractures which were probably asymptomatic. It is also notable that 77.5% of children with TDIs had no symptoms (Figure 1). Furthermore, it is possible that the majority of children with thermal sensitivity may not have considered the symptom serious enough to warrant seeking care. The main reported causes of TDIs in both males and females were falls and collision with stationary objects. These results are in agreement with the findings of Soriano *et al*. (16). About 45% of females did not remember the cause of TDIs while this was the case in 22.2% of males. Unlike the case of boys, none of the female children indicated having been injured during fighting or games. The above results are in line with those by Ohito *et al.* (8) and Muriithi *et al.* 2005 (10) where falls were the number one cause of injuries; Ohito *et al*. however did not analyse aetiology of injury based on gender. Eleven percent of children in Ohito *et al* study had been hit by' a stationary object which is almost similar to 14.4% as

found in the current study. TDIs as a result of road traffic accidents were encountered in 0.8% of male and 4.2% of female children in our study. This is a much lower prevalence than that reported by Muriithi *et al*. (10) who found 5.1 and 3.2% of male and female children respectively to have been injured following RTAs. The differences could be because they studied a wide age-range of 0-15 year olds which included the more at risk younger age groups.

The most common fractures in the current study were those involving only enamel in 68.9% of the injured teeth followed by enamel-dentin fractures which were encountered in 23.8% of the injured teeth. This corroborated the findings of several previous studies (13,14,16,19). The permanent teeth are firmly embedded in alveolar bone and are more likely to fracture rather than luxate when injured as compared to primary teeth (19). However since more than 98% of the injuries were sustained more than one month earlier, it is possible that most of the luxation injuries had healed and were not diagnosable at the time of examination. In this regards, it is notable that a hospital based study (10) in which 69.5% of the patients presented on the day of injury or one day after trauma found a predominance of luxation injuries accounting for 47.5% of all injuries.

Maxillary central incisors were the teeth most involved in dental trauma. Similar findings have been reported in other studies (10,13). The explanation for this probably relates to the morphology and vulnerable location of these teeth. The importance of this finding lies in the fact that these incisors play an important role in aesthetic, phonetic and functional activities (13). In the present study the mean number of injured teeth per child was 1.4. This rate has been reported to vary from 1.3-1.62 (7,20). However it is possible that in our study there was under-reporting given that several teeth may have sustained injuries such as luxation which would have healed by the time the examination was done. Classification of injuries in different studies has also been reported to account for the variation in the mean number of teeth injured per child.

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