

Dental Trauma Experience among Selected Public Primary and Secondary School Pupils in Ibadan, Southwest Nigeria

***Ayebameru O. E.¹, Popoola O.B.², Bankole O.O.², Denloye O.O.²**

¹Department of Child Dental Health, Lagos State University Teaching Hospital, Ikeja, Nigeria.

²Department of Child Oral Health, College of Medicine/University College Hospital, Ibadan, Nigeria.

ABSTRACT

Dental trauma is a public health problem, accounting for 17% of injuries to the body in those below the age of 6years compared to an average of 5% across all ages. It is more rampant among very young people. The prevalence in Nigeria is increasing. A prevalence of 10.8% was reported in Ibadan about a decade ago. The current study is therefore aimed at finding the prevalence of dental trauma in Ibadan. This was a cross-sectional study carried out among children aged 7 - 15 years in public schools in Ibadan North Local Government Area of Oyo State, Nigeria. Three primary and 3 secondary schools were selected. An interviewer-administered proforma was used to obtain information. Factors assessed were some predisposing factors of dental trauma, among which are Angle's Class II division 1 malocclusion, increased over-jet, anterior open bite and lip competence. Data was analyzed using SPSS version 21 and the level of significance was set at $p < 0.05$. Two hundred and thirty-five children participated in the study. There were 114(48.5%) males and 121(51.5%) females. Prevalence of dental trauma was 11.1%. None of the assessed factors that were statistically significant. The commonest dental trauma was Enamel fracture (Ellis class I), while the most affected teeth were the two upper central incisors. Also, more females and 10 – 12 years old had Enamel-Dentin-Pulp trauma. Dental trauma experience among the children in Ibadan in the last one decade has not significantly changed. Teeth most commonly affected by dental trauma are the upper central incisors. The commonest dental trauma was Ellis class I.

Keywords: Dental trauma, Experience, School pupils

*Author for correspondence: Email: brodashow@yahoo.com; Tel: +234-8066271140

Received: February 2021; Accepted: December 2022

DOI: <https://doi.org/10.4314/ajbr.v26i3.4>

INTRODUCTION

Dental trauma is an injury to the mouth, especially teeth and periodontium, caused by an external mechanical force (Trullas *et al.*, 2013). It is regarded as a public dental health problem because of its frequency, occurrence at a young age and continuity of the treatment for the rest of the patient's life (Glendor, 2008). It is has been said to be more rampant in younger people accounting for 17% of injuries to the body in those below the age of 6years compared to an average of 5% across all ages (Eilert-Petersson, Andersson and Sorensen, 1997), (Zaleckiene *et al.*, 2014). It causes pain, aesthetic and functional challenges which may affect the quality of life of the child and may take a life time to resolve (Brüllmann, Schulze and Hoedt, 2011; Arhakis, Athanasiadou and Vlachou, 2017).

It is more frequently observed in males compared to females and this may be attributed to the behavioural factors, with the boys tending to be more energetic and inclined toward vigorous outdoor activities as compared to girls (Kalaskar, Tawani and Kalaskar, 2013), (Ramanathan, 2012).

The risk factors of dental trauma include Angles' Class II division 1 malocclusion, anterior open bite, socio-demographic factors such as gender, mother's age, income and birth order (Sharma, Dua and Sunila Sharma, 2012), (Siqueira *et al.*, 2013). Increased over-jet remains one of the most significant factors contributing to Traumatic Dental Injuries (TDIs) (Bendgude *et al.*, 2012). Children with increased over-jet are said to be more prone to dental injuries (Siqueira *et al.*, 2013), (Otuyemi, 1994), (M. L. V. Frujeri *et al.*, 2014). Bonini *et al* (Bonini *et al.*, 2012) stated that increased over-jet is strongly associated with dental trauma in the presence of incompetent lip seal while Otuyemi (Otuyemi, 1994) in another study concluded that incisor over-jet greater than 3mm and inadequate lip seal were strong predisposing factors to anterior dental trauma. It has also been noted in different studies that children with anterior open bite were more prone to dental injuries (Oliveira *et al.*, 2007), (ElKarmi *et al.*, 2015). Oliveira *et al* (Oliveira *et al.*, 2007) reported that children with anterior open bite are more involved with traumatic dental injuries than others. They mentioned that those with anterior

Dental trauma experience among school pupils in Ibadan

open bite have tendency for dental trauma twice as much as those with normal occlusion (Norton and Anne C. O'Connell, 2011). Furthermore, dental trauma is said to be common among individuals with incompetent lip seal (M. L. V. Frujeri *et al.*, 2014). Also, gender has been found to have an influence on dental trauma in terms of frequency with a greater occurrence among males due to higher physical activities than their female counterparts (Martins, Sousa, *et al.*, 2013), (Jesus *et al.*, 2010). Age has been considered a significant risk factor for dental trauma. It has equally been observed that most dental injuries occur in childhood and adolescent periods (Glendor, 2008).

Alcohol consumption has been linked to dento-alveolar trauma and maxillo-facial injuries generally because of proneness to violence, accidents and falls (Santos *et al.*, 2010), (Ranchod, Smit and JA Morkel, 2014). Dental trauma is prevalent and associated with illicit drug use like marijuana or cocaine in association with over-jet greater than 3mm (Filho *et al.*, 2014). The majority of dental injuries in permanent and primary dentitions involve the anterior teeth of upper jaw, especially the maxillary central and lateral incisors (Zaleckiene *et al.*, 2014). Traumatic dental injuries usually affect a single tooth, but certain trauma events, such as sports, violence and traffic accidents result in multiple tooth injuries (Zaleckiene *et al.*, 2014).

The prevalence of dental trauma in Nigeria is increasing (Adeyemo *et al.*, 2005). A prevalence of 10.9% was reported by Otuyemi (Otuyemi, 1994) amongst 12-year old Nigerian children. This is comparable with a prevalence of 9.1% among suburban adolescents, with the boys sustaining more injuries than the girls (ratio 2:1) and that the dental injuries were almost entirely restricted to the maxillary central incisors (75%) (Adekoya-Sofowora, Bruimah and Ogunbodede, 2004). Higher prevalences of 23.2% and 12.8% were reported among 3-5 year old and 12-year old children in Ile-Ife respectively (Adekoya-Sofowora, Adesina and Nasir, 2007), (Adekoya-Sofowora *et al.*, 2009). In Benin-City, a prevalence of 19.06% among first year secondary school pupil was reported (Naqvi and Ogidan, 1990). Taiwo *et al* (Taiwo and Jalo, 2011) also reported a prevalence of 15.2% on dental injuries among 12-year-old Nigerian pupils.

A prevalence of 10.8% was reported among children that were 12 - 19 years of age in Ibadan a decade ago (Ajayi, Denloye and Abiodun-Solanke, 2010). The aim of the present study, therefore, was to update the prevalence of dental trauma among school children in Ibadan.

MATERIALS AND METHODS

Study population and selection: This study was a cross-sectional carried out among children aged 7 - 15 years public and secondary schools in Ibadan North Local Government Area of Oyo State, Nigeria. Three primary schools and 3 secondary schools were selected. All the pupils aged 7 - 15 years were selected from different classes and an average of 35 children were randomly included in the study from each school.

Ethical consideration: Ethical approval was obtained from University of Ibadan/University College Hospital Ethical Review Committee before the commencement of the study.

The Local Education Authority of Ibadan North Local Government Area supplied the list of schools and approved the study.

Table 1:
Distribution of the children

	Variable	N	%
Gender	Male	114	48.5
	Female	121	51.5
	Total	235	100.0
Age	7 - 9	30	12.8
	10 - 12	87	37.0
	13 - 15	118	50.2
	Total	235	100.0
Class	Primary 1 - 6	117	49.8
	JSS 1 - 3	88	37.4
	SSS 1 - 3	30	12.8
	Total	235	100.0
Substance use	No	222	94.5
	Yes	13	5.5
	Total	235	100.0
Lip competence	Competent	185	78.7
	Potentially competent	44	18.7
	Incompetent	6	2.6
	Total	235	100.0
Anterior Open Bite	Present	14	6.0
	Absent	221	94.0
	Total	235	100.0
Malocclusion	Class I	211	89.8
	Class II Division 1	18	7.7
	Class II Division 2	6	2.6
	Total	235	100.0
Overjet	0 - 4mm	221	94.0
	Greater than 4mm	14	6.0
	Total	235	100.0
Visit to dental clinic.	Yes	16	6.8
	No	219	93.2
	Total	235	100.0
Dental trauma	Yes	26	11.1
	No	209	88.9
	Total	235	100.0

Method: A questionnaire administered by the interviewer was used to obtain information from the children. Factors assessed as included some predisposing anatomical factors that may increase the susceptibility to dental injuries, among which are Angle's Class II division 1 malocclusion, increased over-jet (greater than 4 mm), anterior open bite, short or hypotonic upper lip and oral breathing individuals. Another factor assessed is the use of psycho-active substances which may predispose them to violence and poor motor coordination that can make them sustain physical injury and dental trauma. Measurement of over-jet was done using sterilized community periodontal index probe. The tip of the sterilized probe was placed on the labial surface of the lower central incisors when the child closed in the retruded condylar position. It was extended horizontally to the incisal end of the upper central incisors and the horizontal relationship of the tip of the upper

Dental trauma experience among school pupils in Ibadan

central incisors to the lower central incisors was measured in millimeters.

The lips were examined for competence with the masticatory and facial muscles at rest. Upper and lower lips were scored separately according to the method described by Jackson (Zamzam and Luther, 2001) (Otuyemi, 1993). The position of the middle third of the lower border of the upper lip was recorded as 0, 1, 2 or 3 according to its position on the labial surface of the maxillary incisors. The position of the lower lip on the maxillary incisors was recorded similarly but from incisal to cervical region of the central incisors. In addition, if the lower lip was trapped behind the upper incisor, a negative classification (-1) was recorded. Competent upper and lower lip position was recorded when the combination of scores is 3/1 or 2/2 (Kolawole, Otuyemi and Oziegbe, 2010). Teeth already involved in traumatic dental injury were assessed using Ellis classification (Pagadala and Tadikonda, 2015).

Data analysis: Data processing was carried out with the aid of SPSS version 21 (SPSS Inc., Chicago Illinois, USA). Summary statistics (frequency, percentage) were performed to determine the prevalence and pattern of presentation. Chi square was used for categorical variables. An observation was considered significant when the p value is ≤ 0.05 .

RESULTS

Two hundred and thirty-five children participated in the study. One hundred and fourteen (48.5%) of them were males while 121(51.5%) were females. The children were categorized into 3 age groups i.e. 7 – 9, 10 – 12 and 13 – 15 years which were 12.8%, 37.0% and 50.2% respectively. Thirteen (5.5%) of the children said they had been involved in substance use before. Six (2.6%), 14(6.0%), 6(2.6%) and 14(6.0%) had incompetent lip seal, presence of anterior open bite, class II division 1 malocclusion and overjet greater than 4mm respectively. Only 16(6.8%) had visited a dental clinic before. Prevalence of dental trauma was 11.1%. (Table 1).

Although, none of the assessed factors of dental trauma were statistically significant, it was noted that 14.9% of the male had dental trauma compared to 7.4% of the females. It was only 11.0% of those aged 13 - 14 years that had dental trauma in this study, while 14.9% of 10 – 12 years old had dental trauma. Also, more (15.9%) of those with potentially competent lip seal had dental trauma compared to only 10.3% of those with competent lip seal. More (16.7%) of those in SSS1 - 3 in secondary school had dental trauma compared to others. (Table 2).

Table 2:
Factors affecting dental trauma

Factors	Dental Trauma			χ^2	p-value	
	Yes (%)	No(%)	Total(%)			
Gender	Male	17(14.9)	97(85.1)	114 (100.0)	3.33	0.10
	Female	9(7.4)	112(92.6)	121 (100.0)		
	Total	26(11.1)	209(88.1)	235 (100.0)		
Age	7 – 9	0(0.0)	30(100.0)	30(100.0)	5.06	0.08*
	10 – 12	13(14.9)	74(85.1)	87(100.0)		
	13 – 15	13(11.0)	105(89.0)	118(100.0)		
	Total	26(11.1)	209(88.9)	235(100.0)		
Class	Primary 1 – 6	14(12.0)	103(88.0)	117(100.0)	1.92	0.38
	JSS 1 – 3	7(8.0)	81(92.0)	88(100.0)		
	SSS 1 – 3	5(16.7)	25(83.3)	30(100.0)		
	Total	26(11.1)	209(88.9)	235(100.0)		
Substance use	No	25(11.3)	197(88.7)	222(100.0)	0.16	1.00*
	Yes	1(7.7)	12(92.3)	13(100.0)		
	Total	26(11.1)	209(88.9)	235(100.0)		
Lip competence	Competent	19(10.3)	166(89.7)	185(100.0)	1.92	0.38*
	Potentially competent	7(15.9)	37(84.1)	44(100.0)		
	Incompetent	0(0.0)	6(100.0)	6(100.0)		
	Total	26(11.1)	209(88.9)	235(100.0)		
Anterior Open Bite	Present	0(0.0)	14(100.0)	14(100.0)	1.85	0.18*
	Absent	26(11.1)	195(88.2)	221(100.0)		
	Total	26(11.1)	209(88.9)	235(100.0)		
Malocclusion	Class I	24(11.4)	187(88.6)	211(100.0)	0.77	0.68*
	Class II Division 1	29(11.1)	16(88.9)	18(100.0)		
	Class II Division 2	0(0.0)	6(100.0)	6(100.0)		
	Total	26(11.1)	209(88.9)	235(100.0)		
Overjet	0 – 4mm	25(11.3)	196(88.7)	221(100.0)	0.23	1.00*
	Greater than 4mm	1(7.1)	13(92.9)	14(100.0)		
	Total	26(11.1)	209(88.9)	235(100.0)		
Visit to dental clinic	Yes	3(18.8)	13(81.2)	16(100.0)	1.03	0.25*
	No	23(10.5)	196(89.5)	219(100.0)		
	Total	26(11.1)	209(88.9)	235(100.0)		

*Fischer's Exact

The teeth most commonly affected by dental trauma are the two upper central incisors (47.1 + 44.1 = 91.2%). This is remotely followed by the lower right central incisors (5.9%). (Figure 1)

More (55.6%) females had more multiple teeth involved in dental trauma compared to males (17.6%), although, this is statistically significant ($p = 0.10$). More (38.5%) of older children i.e. 13 – 15 years had multiple dental trauma compared to 23.1% among 10 – 12-year old. This was however not statistically significant ($p = 0.08$). (Table 3)

The commonest dental trauma was Enamel (Ellis class I) fracture which was 73.5% of the total dental trauma. This is followed by Enamel-Dentin (Ellis class II) fracture which was 17.7% and Enamel-Dentin-Pulp (8.8%). (Figure 2)

More (14.3%) of the females had Enamel-Dentin-Pulp (Ellis class III) trauma compared to 5.0% of the males. Conversely, more (12.5%) of those aged 10 – 12 years had Enamel-Dentin-Pulp (class III) trauma compared to 5.5% of those aged 13 –

15 years. These are, however, not statistically significant. (Table 4).

Table 3:
Multiple versus single trauma

Factors	Type of dental trauma in individuals			χ^2	p-value
	Single trauma(%)	Multiple trauma(%)	Total(%)		
Gender					
Male	14(82.4)	3(17.6)	17(100.0)	3.97	0.08*
Female	4(44.4)	5(55.6)	9(100.0)		
Total	18(69.2)	8(30.8)	26(100.0)		
Age					
10 – 12	10(76.9)	3(23.1)	13(100.0)	0.72	0.67*
13 – 15	8(61.5)	5(38.5)	13(100.0)		
Total	18(69.2)	8(30.8)	26(100.0)		

*Fischer's Exact

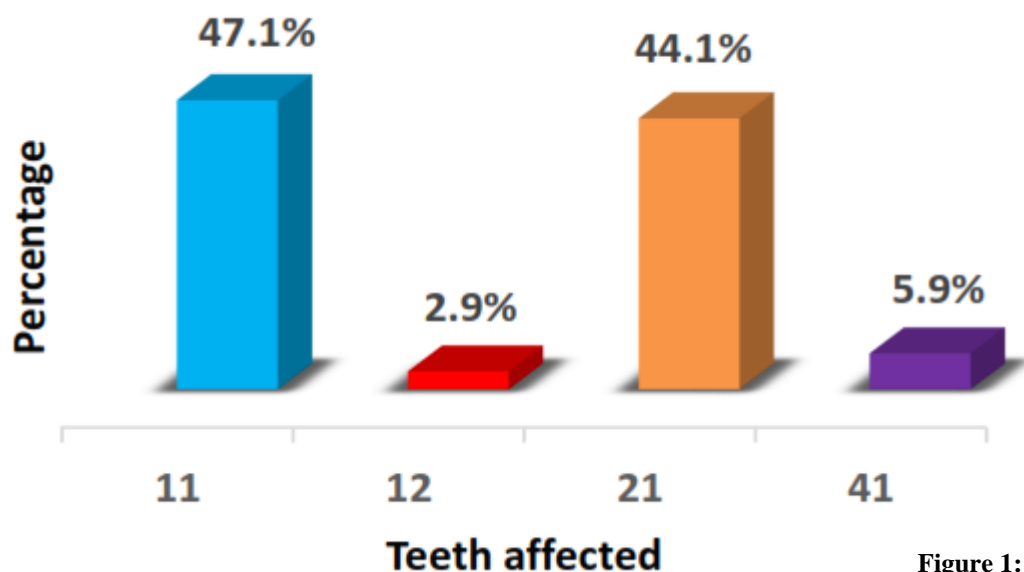


Figure 1:
Teeth affected by dental trauma.

Table 4:
Type of dental trauma in association with the factors

Factors	Ellis classification			Total(%)	χ^2	p-value
	Enamel(%)	Enamel-Dentine(%)	Enamel-Dentine-Pulp(%)			
Gender						
Male	16(80.0)	3(15.0)	1(5.0)	20(100.0)	1.27	0.61*
Female	9(64.3)	3(21.4)	2(14.3)	14(100.0)		
Total	25(73.5)	6(17.7)	3(8.8)	34(100.0)		
Age						
7 – 9	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0.58	0.86*
10 – 12	11(68.7)	3(18.8)	2(12.5)	16(100.0)		
13 – 15	14(77.8)	3(16.7)	1(5.5)	18(100.0)		
Total	25(73.5)	6(17.7)	3(8.8)	34(100.0)		

*Fischer's Exact

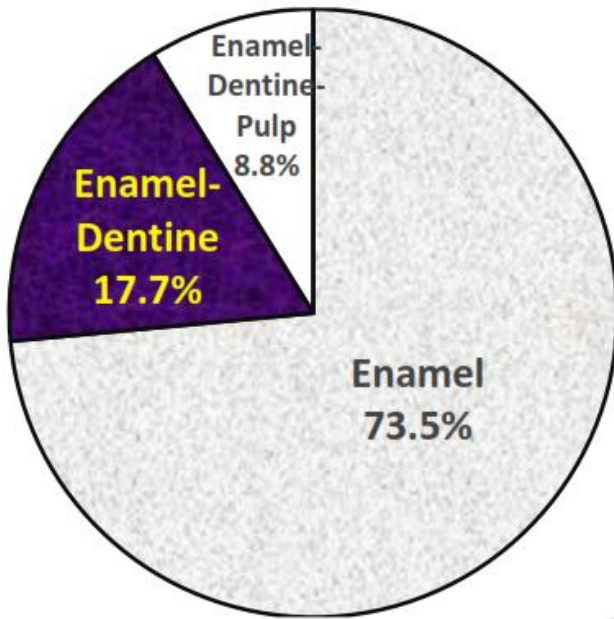


Figure 2:
Type of dental trauma

DISCUSSION

The prevalence of dental trauma in the present study is similar to what obtained about a decade ago but lower compared some of those obtained in developed countries. This may be connected with the fact that children in developed regions tend to be more free and daring in sporting activities probably due to presence of adequate facilities and protective gadgets.

It agrees with many previous studies in that males were more commonly affected compared to female (Martins, Sousa, et al., 2013), (Jesus et al., 2010). This may be attributed to the tendency of boys to more active than girls. Although, majority of the previous studies observed that males were more affected by dental trauma, a few studies have reported that there was no difference in gender involvement concerning dental trauma (M. de L. V. Frujeri *et al.*, 2014).

Single-tooth trauma was more common than multiple teeth trauma. This might be indicative of fall, as the major cause dental trauma in this study, as it has also been reported in some previous studies (Ajayi, Denloye and Abiodun-Solanke, 2010), (Patnana and Kanchan, 2020). Multiple dental trauma, in this present study, was more among the girls compared to boys. This may be an indication that the impact of falls was more pronounced on the girls than the boys. This may be the reason for the higher proportion of Enamel-Dental-Pulp fracture among them compared to the boys in this study. Like majority of the previous studies, enamel fracture takes the largest share among dental trauma. This may be resulting from weak impact of the causes of the trauma on the teeth (Martins, De Sousa, *et al.*, 2013).

According to the present study, children between ages 10 – 12 years of age have higher chances of having dental trauma compared with those who are between 7 – 9 and 13 - 15. This

is similar to a previous finding among mentally handicapped school children in Ibadan (Denloye, 1996). It has been suggested that the result of dental trauma seen among the older children may have been the consequences of cumulative occurrences of dental trauma in the past years because most dental injuries are known to occur in early childhood especially among the preschool and school children (Glendor, 2008). Also, it has been observed that older children (13-15) are the ones who will most likely be involved in contact sports and interpersonal violence compared to the other younger age groups (Zaleckiene *et al.*, 2014).

More of the boys were observed to have been involved in dental trauma compared to the girls in this study. This is in agreement with a few previous studies where dental trauma was found to be higher among male than female (Martins, Sousa, *et al.*, 2013), (Jesus *et al.*, 2010). This may be as a result of the fact that males tend to be more active and are known to be generally more involved in physical activities than their female counterparts. However a few studies have also observed that gender has no effect on the incidence of dental trauma (Frujeri *et al.*, 2014), (Cole, 2013).

The two upper central incisors were generally the most affected in this present study just as reported in a few previous studies (de Jesus *et al.*, 2010). This may be because the anterior permanent teeth are located in the most vulnerable part of the oral cavity. Most falls and accidents affect the anterior aspects of the face, and this was in agreement with many previous studies on dental trauma among children population (Oliveira *et al.*, 2007), (Denloye, 1996), (Prabhu *et al.*, 2013), (Sharma, Sinha and Kedia, 2015), (Elsideeg and Abuaffan, 2015). However, upper right central incisor was more frequently affected compared to the upper left in this present study. This is different from the observation of the previous study in Ibadan about a decade ago (Ajayi, Denloye and Abiodun-Solanke, 2010).

Also, it was observed in this study that the commonest form of trauma to the anterior teeth is the enamel fracture (Ellis class I). This shows that the impact of most trauma was minimal probably because of alertness and self-protective instincts in these children. Also, incompetent lip seal exposes mainly the incisal one-third of the upper anterior teeth making them liable to fracture at the tip which was similar to the report of previous studies (Naqvi and Ogidan, 1990), (Prabhu *et al.*, 2013), (Sharma, Sinha and Kedia, 2015), (Elsideeg and Abuaffan, 2015).

In conclusion, dental trauma experience among the children in Ibadan in the last one decade has not significantly changed. There are a lot of similarities between the observations of the present study and what was obtained a decade ago in terms of prevalence, gender and age despite significant increase in the western countries. Teeth most commonly affected by dental trauma are the upper central incisors. The most common dental trauma was Ellis class I.

REFERENCES

Adekoya-Sofowora, C. . *et al.* (2009) ‘Prevalence and causes of fractured permanent incisors in 12-year-old suburban

- Nigerian schoolchildren', *Dental Traumatology*, 25(3), pp. 314–317.
- Adekoya-Sofowora, C., Adesina, O. and Nasir, W. (2007)** 'Traumatic dental injuries in nursery school children from Ile-Ife, Nigeria.', *Internet Journal of Dental Science*, 5(2), p. At doi: 10.5580/2094.
- Adekoya-Sofowora, C., Bruimah, R. and Ogunbodede, E. (2004)** 'Traumatic Dental Injuries Experience in Suburban Nigerian Adolescents.', *The Internet Journal of Dental Science*, 3(1), p. 7. Available at: <http://ispub.com/IJDS/3/1/5673>.
- Adeyemo, W. L. et al. (2005)** 'Trends and characteristics of oral and maxillofacial injuries in Nigeria a review of the literature', *Head and Face Medicine*, 1(7), pp. 1–9.
- Ajayi, M. ., Denloye, O. and Abiodun-Solanke, F. . (2010)** 'The unmet treatment need of traumatized anterior teeth in selected secondary school children in Ibadan, Nigeria', *Dental Traumatology*, 26(1), pp. 60-63.
- Arhakis, A., Athanasiadou, E. and Vlachou, C. (2017)** 'Social and Psychological Aspects of Dental Trauma, Behavior Management of Young Patients Who have Suffered Dental Trauma', *The Open Dentistry Journal*, 11(1), pp. 41-47. doi: 10.2174/1874210601711010041.
- Bendgude, V. et al. (2012)** 'Correlation between dental traumatic injuries and overjet among 11 to 17 years Indian girls with Angle's class I molar relation', *J Contemp Dent Pract*, 13(2), pp. 142–146. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/22838047>.
- Bonini, G. . et al. (2012)** Combined effect of anterior malocclusion and inadequate lip coverage on dental trauma in primary teeth, *Dental Traumatology*.
- Brüllmann, D., Schulze, R. K. and Hoedt, B. (2011)** 'The Treatment of Anterior Dental Trauma', *Deutsches Ärzteblatt International*, 108(13), pp. 565-570. doi: 10.3238/arztebl.2011.0565.
- Cole, B. (2013)** 'Traumatic dental injury and social deprivation in five-year-old children in Scotland 1993-2007', *British Dental Journal*, 214(10), pp. 512–513.
- Denloye, O. O. (1996)** 'Fractured Anterior Teeth among Mentally Handicapped School Children in Ibadan, Nigeria', *African Dental Journal*, 10, pp. 24–27.
- Eilert-Petersson, E., Andersson, L. and Sorensen, S. (1997)** 'Traumatic oral vs non-oral injuries. An epidemiological study during one year in a Swedish county', *Swedish Dental Journal*, 22, pp. 55-68.
- ElKarmi, R. et al. (2015)** 'Prevalence of traumatic dental injuries and associated factors among preschool children in Amman, Jordan', *Dental Traumatology*, 31(6), pp. 487–492.
- Elsideeg, S. E. and Abuaffan, A. H. (2015)** 'Traumatic Dental Injuries and Associated Risk Factor among Sudanese School Children', *Journal of Dentistry and Oral care*, 2(1), pp. 1–4. doi: 10.15436/2379-1705.15.033.
- Filho, P. et al. (2014)** 'The prevalence of dental trauma and its association with illicit drug use among adolescents', *Dent Traumatol.*, 30(2), pp. 122–127.
- Frujeri, M. de L. V. et al. (2014)** 'Socio-economic indicators and predisposing factors associated with traumatic dental injuries in schoolchildren at Brasília, Brazil: A cross-sectional, population-based study', *BMC Oral Health*, 14(1), pp. 1–7. doi: 10.1186/1472-6831-14-91.
- Frujeri, M. L. V. et al. (2014)** 'Socio-economic indicators and predisposing factors associated with traumatic dental injuries in schoolchildren at Brasília, Brazil a cross-sectional, population-based study', *BMC oral health*, 14(91).
- Glendor, U. (2008)** 'Epidemiology of traumatic dental injuries - a 12 year review of the literature', *Dental Traumatology*, 24(6), pp. 603–611. doi: 10.1111/j.1600-9657.2008.00696.x.
- Jesus, M. A. et al. (2010)** 'Epidemiologic survey of traumatic dental injuries in children seen at the Federal University of Rio de Janeiro , Brazil', *Braz Oral Res.*, 24(1), pp. 89–94.
- de Jesus, M. A. et al. (2010)** 'Epidemiologic survey of traumatic dental injuries in children seen at the Federal University of Rio de Janeiro, Brazil', *Brazilian Oral Research*, 24(1), pp. 89-94. doi: 10.1590/S1806-83242010000100015.
- Kalaskar, R., Tawani, G. S. and Kalaskar, A. (2013)** 'Paediatric traumatic dental injuries in hospital of central India. A 2.5 year retrospective review', *International Journal of Research in Dentistry*, 3(3), pp. 1–10.
- Kolawole, K. A., Otuyemi, O. D. and Oziegbe, E. O. (2010)** 'The relationship between malocclusion , lip competence and gingival health in a group of schoolchildren', *Rev Clin Pesq Odontol.*, 6(3), pp. 239–247.
- Martins, V. M., Sousa, R. V. De, et al. (2013)** 'Comparative Analysis of Gender : A Population-Based Study on Dental Trauma', *Acta stomatol Croat.*, 47(2), pp. 147–153.
- Martins, V. M., De Sousa, R. V., et al. (2013)** 'Comparative analysis of gender: A population-based study on dental trauma', *Acta Stomatologica Croatica*, 47(2), pp. 147-153. doi: 10.15644/asc47/2/6.
- Naqvi, A. and Ogidan, O. (1990)** 'Traumatic Injuries of Anterior in First Year Secondary School Children in Benin-City, Nigeria', *African Dental Journal*, 4, pp. 11–15.
- Norton, E. and Anne C. O'Connell (2011)** 'Traumatic dental injuries and their association with malocclusion in the primary dentition of Irish children', *Dental Traumatology*, 28(1), pp. 81–86.
- Oliveira, L. . et al. (2007)** 'Traumatic dental injuries and associated factors among Brazilian preschool children', *Dental Traumatology*, 23(2), pp. 76–81.
- Otuyemi, O. . (1993)** 'Lower Lip Position and Incisor Overjet in a 12-Year-Old Nigerian Population', *African Dental Journal*, 7, pp. 27–30.
- Otuyemi, O. . (1994)** Traumatic anterior dental injuries related to incisor overjet and lip competence in 12-year-old Nigerian children, *Int J Paediatr Dent*.
- Pagadala, S. and Tadikonda, D. C. (2015)** 'An overview of classification of dental trauma', *International Archives of Integrated Medicine (IAIM)*, 2(9), pp. 157–164.
- Patnana, A. K. and Kanchan, T. (2020)** Tooth Fracture, StatPearls. Available at: <https://www.ncbi.nlm.nih.gov/books/NBK551650/> (Accessed: 2 September 2020).
- Prabhu, A. et al. (2013)** 'Attributes of dental trauma in a school population with active sports involvement.', *Asian journal of sports medicine*, 4(3), pp. 190–194. Available at: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=prem&NEWS=N&AN=24427477>.

- Ramanathan, S. (2012)** Psychological and Social Factors related to Physical Activities and Everyday Activities among South Asian High School Girls in the Toronto Area.
- Ranchod, S., Smit, D. and JA Morkel (2014)** 'Substance abuse and maxillofacial injuries', *South Afr. dent. journal*, 69(10), p. 12.
- Santos, S. et al. (2010)** A 9-year retrospective study of dental trauma in Piracicaba and neighboring regions in the State of São Paulo, Brazil, *J Oral Maxillofac Surg*.
- Sharma, S., Dua, R. and Sunila Sharma (2012)** 'Prevalence, causes, and correlates of traumatic dental injuries among seven-to-twelve-year-old school children in Dera Bassi', *Contemporary Clinical Dentistry*, 3(1), p. 38. doi: 10.4103/0976-237X.94544.
- Sharma, S., Sinha, R. and Kedia, N. B. (2015)** 'Risk Factors Associated with Anterior Teeth Trauma in Children', *Int J Dent Med Res*, 1(5), pp. 38–40.
- Siqueira, M. B. L. D. et al. (2013)** 'Predisposing factors for traumatic dental injury in primary teeth and seeking of post-trauma care', *Brazilian Dental Journal*, 24(6), pp. 647–654. doi: 10.1590/0103-6440201302352.
- Taiwo, O. . and Jalo, H. . (2011)** 'Dental injuries in 12-year old Nigerian students', *Dental Traumatology*, 27(3), pp. 230–234.
- Trullas, J. M. et al. (2013) 'Frequency and characteristics of occupational dental trauma', *Occupational Medicine*, 63(2), pp. 152–155. doi: 10.1093/occmed/kqs214.
- Zaleckiene, V. et al. (2014)** 'Traumatic dental injuries: etiology, prevalence and possible outcomes.', *Stomatologija / issued by public institution 'Odontologijos studija' ... [et al.]*, pp. 7–14. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/24824054>.
- Zamzam, N. and Luther, F. (2001)** 'Comparison of lip incompetence by remote video surveillance and clinical observation in children with and without cerebral palsy', *European Journal of Orthodontics*, 23, pp. 75–84.