

THE PREVALENCE OF DENTAL CARIES AMONG CHILDREN IN ORPHANAGES IN IBADAN

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ABSTRACT

Background: A number of challenges are being faced by children in orphanages, a major one being their oral health as a common unmet need. Studies have shown high prevalence of dental caries and oro-facial trauma. This has been attributed to overcrowding, lack of adequate staff, poor oral hygiene, improper dietary habits, inadequacies in the orphanage system, as well as inadequacies in the healthcare system.

This study aimed at assessing the prevalence and factors affecting dental caries and trauma among children in orphanages in Ibadan.

Materials and Method: All the children within the age group (7 – 15 years) in all the 18 registered orphanages in the 5 Local Government Areas within Ibadan metropolis were recruited into the study. Intra-oral examination was done under natural light and caries detection was done using tactile and visual method. Sterile mouth mirrors and CPI probes were used for this purpose. Dental caries status and the predisposing factors in each child were assessed. Presence of dental trauma and the predisposing factors were also assessed. Data processing was carried out with the aid of SPSS version 21.

Results: One hundred and forty-six children participated in the study, 51.4% of them were males while 48.6% were females. The age range and the mean age of the children were 7 – 15 years 9.69 ± 3.78 respectively. The prevalence of dental caries among the children was 17.8% while that of dental trauma was 7.5%. The mean DMFT/dmft was found to be 0.42 ± 1.06 . Gender and the presence of deep pits and fissures were the statistically significant predictors of dental caries.

Conclusion: Oral health is of utmost importance across all ages, much more pertinent among institutionalized children who are prone to dental caries and trauma as revealed by this study.

An average child in an orphanage may be affected by both dental caries and trauma, but appears to be more prone to dental caries in this environment.

Keywords: Orphanage, Dental caries, Dental trauma

INTRODUCTION

Oral health care is one of the common unmet health care needs of institutionalized children and therefore, they are at increased risk of developing oral diseases. They are likely to experience untreated dental caries usually compounded by poor oral hygiene due to neglect.² Children from orphanages have shown a high prevalence of dental caries and dental trauma.³ This has been attributed to overcrowding, lack of adequate staff for supervision, poor oral hygiene, improper dietary habits, inadequacies in the orphanage system, as well as inadequacies in the healthcare system.³

Researchers have consistently documented the poor health of institutionalized children, which is characterized by high instances of infectious diseases which may be due to low caretaker-to-child ratio in

the institutions.¹ These children face a number of challenges including high risk of poor general and oral health.

Earlier studies have shown caries experience to be high in some children in Mashhad orphanages in terms of prevalence and severity with most of these children having varying types of treatment needs.⁴ In the documented health status of United States of America (US) adopted Eastern Europe orphans, dental caries was found to be common⁵. Khareet *et al.*⁶ studied the prevalence of dental caries in orphans in India and reported a prevalence of 49.6% and 41% in primary and permanent teeth respectively. However, a prevalence of 96% of dental caries among orphans between the ages 4-12 years was reported in a study

carried out in Saudi-Arabia⁷. Shanbhog *et al*⁸, in their study, used the PUFA (Pulp visualization, Ulcer, Fistula, and Abscess) index to assess untreated dental caries among children in orphanages in India, and found a prevalence of 37.7%.

Studies have been reported among children in orphanages in this environment, but none has been specific for dental caries². Meanwhile, the prevalence of dental caries among school children in this environment is 11.2%.⁸

Also, orphan children are said to have high prevalence of dental trauma alongside dental caries and gingivitis^{9,10}. However, there is dearth of information on the prevalence of dental trauma among these children in this environment. Meanwhile, researchers have reported a varying range of prevalence among other children who are not in orphanages in Nigeria.^{11,12} This present study was aimed at assessing the oral health of children in orphanages in Ibadan focusing on dental caries and dental trauma.

MATERIALS AND METHOD

This is a cross-sectional observational study carried out among the children staying in the 18 registered orphanages in the five Local Government Areas within Ibadan metropolis where children within the age group of 7 – 15 could be located. An average of eight children who were within this age group was found in each orphanage home, and were recruited into the study.

The children were interviewed and their responses recorded in a prepared proforma Information retrieved included age, gender, frequency of teeth cleaning, teeth cleaning materials, frequency of daily snacking in between meals and the use of psycho-active substances which may predispose them to violence that can make them sustain physical injury and dental trauma.

Intra-oral examination was done under natural light by a group of four dentists who had earlier been calibrated by a Paediatric Dentist using kappa statistics. Sterile mouth mirrors and CPI probes were used for this purpose. Dental caries assessment was done using G.V. Black¹³ with its modification, and the World Health Organization (WHO)¹⁴ code description for scoring caries experience. Salivary function and duct patency was done by drying the Stenson's duct on the buccal mucosal using sterile gauze and gently massaging or squeezing the duct until saliva was expressed with the time taken to express saliva for each child noted¹⁵. Oral hygiene was assessed using Simplified Oral Hygiene index of Greene and Vermillion¹⁶.

Furthermore, presence of visible plaque on anterior teeth, presence of gingivitis using the gingival index of Loe and Silness.¹⁷ Presence of white spot lesions on drying each tooth with manual pump, presence of teeth with enamel hypoplasia and retentive pits and fissures were assessed.

To assess the existing traumatic dental injuries, Ellis classification¹⁸ was used. This was done without assessing classes VI – IX because no radiographs were taken. Also assessed were some predisposing anatomical factors that may increase the susceptibility to dental trauma, which include 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. 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 and t-test was used for continuous variables in determining the relationships between variables. *P* value was set at 0.05. Ethical approval was obtained from University of Ibadan/ University College Hospital Ethical Review Committee before the commencement of the study. The study was also approved by the Oyo State Ministry of Women Affairs, Community Development and Social Welfare.

RESULTS

One hundred and forty-six children participated in the study, 51.4% of them were males while 48.6% were females. Also, 32.2% of them were within the age group

Table 1: Biodata and some oral lesions in the children

Variable	N	%
Age (years)		
7-9	47	32.2
10-12	61	41.8
12-15	38	26.0
Sex		
Male	75	51.4
Female	71	48.6
School Attendance		
Yes	142	97.3
No	4	2.6
Presence of Dental Caries		
Yes	26	17.8
No	120	82.2
Presence of Dental Trauma		
Yes	11	7.5
No	135	92.5

Table 2: DMFT/dmft distribution among the children

Variables	N	Total DMFT/dmft n(%)	Mean DMFT/dmft \pm SD
Age (Years)			
7 - 9	47	22 (36.1)	0.47 \pm 1.12
10 - 12	61	31 (50.8)	0.51 \pm 1.04
13 - 15	38	8 (13.1)	0.21 \pm 1.02
Total	146	61(100.0)	0.42 \pm 1.06

7 – 9 years, 41.8% were 10 – 12 years and 26.0% were 13 – 15 years. The mean age was 9.69 ± 3.78 . Majority of them, 97.3%, were going to school. The prevalence of dental caries among the children was 17.8%, while the prevalence of dental trauma was 7.5%. (Table 1)

The mean DMFT/dmft was found to be 0.42 ± 1.06 which were mainly the decay component. (Table 2)

Gender and the presence of deep pits and fissures were the statistically significant predictors of dental

Table 3: Association between the predictors and dental caries

Predictors	Dental caries			χ^2	p value
	Yes n (%) 26(100.0)	No n (%) 120(100.0)	Total N (%) 146(100.0)		
Age (years)					
7-9	9(19.1)	38(80.9)	47(100.0)		
10-12	15(24.6)	46(75.4)	61(100.0)	6.06	0.05*
13-15	2(5.3)	36(94.7)	38(100.0)		
Gender					
Male	20(26.7)	55(73.3)	75(100.0)		
Female	6(8.5)	65(91.5)	71(100.0)	8.26	0.00
Tooth cleaning materials					
Toothbrush	26(17.9)	119(82.1)	145(100.0)		
Chewing stick	0(0.0)	1(100.0)	1(100.0)	0.22	1.00*
Frequency of tooth cleaning					
Once daily	23(19.0)	98(81.0)	121(100.0)		
Twice daily	3(13.6)	19(86.4)	22(100.0)	1.03	0.45*
Less than once daily	0(0.0)	3(100.0)	3(100.0)		
Salivary flow					
Before 1Minute	26(17.8)	120(82.2)	146(100.0)		
After 1 minute	0(0.0)	0(0.0)	0(0.0)	-	-
Presence of visible plaque on anterior teeth					
Yes	15(18.1)	68(81.9)	83(100.0)	0.00	0.92
No	11(17.5)	52(82.5)	63(100.0)		
Presence of white spot lesions.					
Yes	2(40.0)	3(60.0)	5(100.0)		
No	24(17.0)	117(83.0)	141(100.0)	1.74	0.19*
Presence of deep pits and fissures					
Yes	3(50.0)	3(50.0)	6(100.0)		
No	23(16.4)	117(83.6)	140(100.0)	4.43	0.04*
Intra-Oral appliances					
Yes	26(17.9)	119(82.1)	145(100.0)		
None	0(0.0)	1(100.0)	1(100.0)	0.22	0.64*
Presence of hypoplasia.					
Yes	4(40.0)	6(60.0)	10(100.0)		
No	22(16.2)	114(83.8)	136(100.0)	3.61	0.06*
Snacking habit					
None	1(100.0)	0(0.0)	1(100.0)		
Less than 3 times/day	22(18.3)	98(81.7)	120(100.0)	5.2	0.07*
3 or more times/day	3(12.0)	22(88.0)	25(100.0)		
		Mean \pm SD		t-test	p-value
Oral hygiene		1.99 \pm 0.86	2.04 \pm 0.95	0.29	0.77
Gingivitis		1.00 \pm 0.31	0.92 \pm 0.33	-1.14	0.26

*Fisher's Exact Test values

Table 4: Association between the predictors and dental trauma

Risk Factors	Dental trauma			χ^2	<i>p-value</i>
	Yes N (%) 11(100.0)	No N (%) 135(100.0)	Total N (%) 146(100.0)		
Age					
7-9	3(6.4)	44(93.6)	47(100.0)		
10-12	3(4.9)	58(95.1)	61(100.0)	2.41	0.30*
13-15	5(13.2)	33(86.8)	38(100.0)		
Sex					
Male	7(9.3)	68(90.7)	75(100.0)		
Female	4(5.6)	67(94.4)	71(100.0)	0.71	0.40*
Lip competence					
Competent	11(8.0)	127(92.0)	138(100.0)		
Potentially competent	0(0.0)	8(100.0)	8(100.0)	0.70	0.70*
Incompetent	0(0.0)	0(0.0)	0(0.0)		
Anterior open bite					
Present	0(0.0)	9(100.0)	9(100.0)		
Absent	11(8.0)	126(92.0)	137(100.0)	0.78	0.37*
Angles class of occlusion					
Class I	10(7.4)	125(92.6)	135(100.0)		
Class II (Division 1)	1(12.5)	7(87.5)	8(100.0)	0.53	0.77*
Class II (Division 2)	0(0.0)	3(100.0)	3(100.0)		
Over-jet Measurement					
Reversed Over-jet	0(0.0)	3(100.0)	3(100.0)		
0-4mm	10(7.4)	125(92.6)	135(100.0)	1.61	0.66*
>4mm	1(12.5)	7(87.5)	8(100.0)		
Substance use					
Yes	0(0.0)	2(100.0)	2(100.0)	0.17	0.68*
No	11(7.6)	133(92.4)	144(100.0)		

*Fisher's Exact Test values

caries in this study ($p = 0.04, 0.05$ respectively). Carious lesions were found in about 26.7% of the male population and 8.5% of the female. Also, it is observed in the frequency of tooth cleaning that only 13.6% of those who brush twice daily had dental caries whereas it affected as much as 19.0% of those who only clean once daily. However, none of the three children who clean less than once daily had dental caries (Table 3).

Predictors assessed for dental trauma were not statistically significant among the children, but it was noted that more of those ages 13 – 15 years (13.2%) were affected by dental trauma compared to those ages 7 – 9 (6.4%) and 10 – 12(4.9%). Also, the males (9.3%) were more affected by dental trauma compared to their female (5.6%) counterparts while those with overjet greater than 4mm (12.5%) were more affected by dental trauma in comparison to those with overjet less than 4mm (7.4%). (Table 4)

DISCUSSION

It is observed in this study that the prevalence of dental caries among the children in orphanages is higher compared to those of school children in this environment.⁸ This may not be unconnected to poor oral hygiene usually observed among the children in

orphanages as a result of deficiency in handler-children ratio. The above findings were in agreement with those of Al-Jobair *et al.*⁷ in their study, where the oral health status of children in orphanages between ages 4 and 12 years were compared with those of children staying at home with their parents in Saudi Arabia. They observed that the orphans had higher caries prevalence with significantly lower health seeking practices. However, the findings of the present study is contrary to findings of Al-Maweri *et al.*¹⁹ where the prevalence of dental caries among institutionalized orphans was found to be insignificantly lower compared to that of the non-orphans. This was attributed to non-cariogenic daily diet and the absence of refined carbohydrate snacks between their meals.

Also, the prevalence of dental caries observed in this study is lower than those found in the studies carried out among orphans by Khare *et al.*⁶, Shanbhog *et al.*³, Al-Maweri *et al.*¹⁹ and Al-Jobair *et al.*⁷ which were 41.0%, 37.7%, 84.7% and 96.0% respectively. The reasons readily placed on the differences observed between these previous studies and the present one may be connected to the differences in the economies of developed and developing societies where children in orphanages in developed countries may have some

access to sugary diets than those in developing societies like ours.

In the present study, deep pits and fissures were found to have a statistically significant relationship with dental caries occurrence. Deep pits and fissures with the poor oral hygiene measures among the children will allow food debris and plaque to accumulate on the occlusal and buccal surfaces of the teeth allowing cariogenic bacteria to act on them. This has being the observation of many previous studies which has prompted the use of fissure sealant and other methods to prevent dental caries.^{21, 22}

Also, the influence of gender on the development of dental caries in this study shows that male gender was almost twice as prone to dental caries as female. This is in agreement with Dawaniet *al.*²³ study where the mean dmft for males was 2.30 (± 3.08) and that of the females was 1.90 (± 2.90). Sogiet *al.*²⁴ attributed this to poorer oral hygiene status found in males compared to females. Although studies reported that there is no difference in the prevalence of dental caries between male and female²⁵, Ur-Rehman *et al.*²⁶ reported a higher mean DMFT for girls (3.82 ± 3.42) compared to boys (2.79 ± 2.50).

Also this present study found that more of the children who clean their teeth once daily were affected by dental caries compared to those who clean twice daily. This is in consonance with the reports of Adeniyet *al.*²⁷.

The prevalence of dental trauma among the children in this study is lower compared to some previous reports by Muralidharan *et al.*⁹ and Pentapati *et al.*¹⁰, where high prevalence of dental trauma have been observed in orphanages in the Nellore and Uttara Kannada districts of India respectively.

Also, the prevalence of dental trauma among these children is lower compared to those of school children in this environment as observed by Ajayi *et al.*²⁰ This may infer that children in orphanages may be more reserved compared to an average child, and may not be involved in activities that may lead to injuries generally or dental trauma specifically. This may be due to the fear of the caregivers.

Although none of the risk factors of dental trauma was statistically significant, it was noted that more of those aged 13 – 15 years were affected compared to those aged 7 – 9 and 10 – 12. It has been suggested that the result of dental trauma seen among the children aged 13-15 years may be the consequences of cumulative occurrence of dental trauma which might have occurred before the attainment of that age because

studies have shown that most dental injuries occur in childhood especially among the preschool and school children²⁸. It has also 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 which can predispose them dental injuries.²⁹

Furthermore, the males were more affected compared to their female counterparts. This may be due to the natural tendencies of male to engage in physical activities compared to the females. It has been reported that being a male with incompetent lip seal confers higher chances of dental trauma on an individual.³⁰ Male and female occurrence ratio for dental trauma ranges between 1.5: 1.0 and 2.5: 1.0.^{29, 31} However, some authors noted that gender has no effect on the incidence of dental trauma.²⁷

Children with increased over-jet are said to be more prone to dental injuries.^{27, 28} Boniniet *al.*²⁹ stated that increased over-jet is strongly associated with dental trauma in the presence of incompetent lip seal. Another study documented that children with over-jet more than 3mm are twice prone to dental injuries compared to those with over-jet less than 3mm with the effect of increased over-jet being more pronounced on girls than boys.³⁰ In this study, those with overjet greater than 4mm (12.5%) were found to have dental trauma compared with those with overjet less than 4mm (7.4%).

CONCLUSION

In conclusion, oral health is of utmost importance across all ages, much more pertinent among institutionalized children who are prone to dental caries and trauma as revealed by this study.

Dental caries is more common among the children in orphanages in this environment compared to dental trauma. The prevalence of both caries and trauma are higher in previous studies than the present study.

REFERENCES

1. **LeMare L.** A longitudinal study of the physical growth and health of postinstitutionalized Romanian adoptees. 2006;11:85–91.
2. **Ojahanon PI,** Akionbare O, Umoh OA. The oral hygiene status of institution dwelling orphans in Benin City, Nigeria. Niger J Clin Pract. 2013;16:41–44.
3. **Shanbhog R,** Godhi BS, Nandla B, Kumar SS. Clinical consequences of untreated dental caries evaluated using PUFA index in orphanage children from India. J Int Oral Heal. 2013;5:1–9.

4. **Mazhari F**, Ajami BAM, Ojrati N. Dental treatment needs of 6-12 year old children in Mashhad in Orphanages in 2006. *J Mashhad Dent Sch.* 2008;32:81–86.
5. **Johnson DE**, Albers HL, Iversion S, Mathers M *et al.* Health status of US adopted Eastern European Orphans. *Paediatr Res.* 1996;39:134.
6. **Khare V**, Koshy A, Rani PJ, *et al.* Prevalence of Dental Caries and Treatment Needs among the Orphan Children and Adolescents of Udaipur District, Rajasthan, India. *J Contemp Dent Pract.* 2012;13:182–187.
7. **Al-jobair AM**, Cert P, Al-sadhan SA, *et al.* Medical and dental health status of orphan children in central Saudi Arabia. *Saudi Med J.* 2013;34:531–536.
8. **Denloye O**, Ajayi D, Bankole O. A Study of dental caries prevalence in 12-14 year old school children in Ibadan, Nigeria. *Pediatr Dent J.* 2005; 15:147–151.
9. **Muralidharan D**, Fareed N, Shanthi M. Comprehensive dental health care program at an orphanage in Nellore district of Andhra Pradesh. *Indian J Dent Res.* 2012;23:171–175.
10. **Pentapati K**. Unmet restorative treatment needs among orphanage children of Uttara Kannada District. *J Educ Ethics Dent.* 2014;4:65–68.
11. **Adekoya-Sofowora C.**, Adesina O., Nasir W., *et al.* Prevalence and causes of fractured permanent incisors in 12-year-old suburban Nigerian schoolchildren. *Dent Traumatol.* 2009;25:314–317.
12. **Denloye O**, Ajayi D, Lagunju I. Oral health status of children seen at a paediatric neurology clinic in a tertiary hospital in Nigeria. 2012;22.
13. **Black GV**. A work on operative dentistry volume II: The technical procedure in filling teeth [Internet]. Volume II. Medico-Dental Publishing Company; 1908 [cited 2014 May 20]. Available from: [Archive.org/details/workonoperative](http://archive.org/details/workonoperative)
14. World Health Organization. Oral Health surveys: Basic methods [Internet]. 4th ed. Geneva; 1997. 93. Available from: www.paho.org/hq/dmdocuments/2009/oh_st_esurv.pdf.
15. **Hurlbutt M**. CAMBRA/: Best Practices in Dental Caries Management [Internet]. 2011. Available from: www.inedce.com
16. **Green JC**, Vermillion JR. The simplified Oral Hygiene Index. *J Am Dent Assoc.* 1964;68:7–12.
17. **Clerehugh V**, Kindelan S. Guidelines for periodontal screening and Management of children and adolescents under 18 Years of age [Internet]. 2012; 25. Available from: http://www.bsperio.org.uk/publications/downloads/54_090016_bsp_bspd-perio-guidelines-for-the-under-18s-2012.pdf
18. **Pagadala S**, Tadikonda DC. An overview of classification of dental trauma. *Int Arch Integr Med.* 2015;2:157–164.
19. **Al-Maweri SA**, Al-Soneidar WA, Halboub ES. Oral lesions and dental status among institutionalized orphans in Yemen A matched case-control study. *Contemp Clin Dent.* 2014; 5: 81–84.
20. **Ajayi M.**, Denloye O, Abiodun-Solanke F. The unmet treatment need of traumatized anterior teeth in selected secondary school children in Ibadan, Nigeria. *Dent Traumatol.* 2010;26:60–63.
21. **Avinash J**, Marya C, Dhingra S, *et al.* Pit and Fissure Sealants/: An Unused Caries Prevention Tool. *J Oral Heal Comm Dent.* 2010;4:1–6.
22. **Azarpazhooh A**, Main PA. Pit and Fissure Sealants in the Prevention of Dental Caries in Children and Adolescents/: *J Can Dent Assoc (Tor).* 2008;74: 171–177.
23. **Dawani N**, Nisar N, Khan N, *et al.* Prevalence and factors related to dental caries among pre-school children of Saddar town, Karachi, Pakistan a cross-sectional study. *BMC Oral Health.* 2012;12: 59.
24. **Sogi G**, Bhaskar D. Dental caries and oral hygiene status of 13-14 year old school children of Davangere. *J Indian Soc Pedod Prev Dent.* 2001; 113–117.
25. **Saravanan SM**, Lokesh S, Polepalle T, Shewale A. Prevalence, Severity and Associated Factors of Dental Caries in 3-6 Year Old Children – A Cross Sectional Study. *Sci Educ Publ Sci Res to Knowledge* [Internet]. 2014;2:5–11. Available from: <http://pubs.sciepub.com/ijdsr/2/6A/2/>
26. **Ur-Rehman M**, Mahmood N, Ur-Rehman B. The Relationship of Caries With Oral Hygiene Status and Extra – Oral Risk Factors. *J Ayub Med Coll Abbottabad.* 2008;20:103–108.
27. **Adeniyi AA**, Ogunbodede EO, Jeboda OS, Sofola OO. Dental caries occurrence and associated oral hygiene practices among rural and urban Nigerian pre-school children. *J Dent Oral Hyg.* 2009;1:64–70.
28. **Glendor U**. Epidemiology of traumatic dental injuries - a 12 year review of the literature. *Dent Traumatol.* 2008;24:603–611.
29. **Zaleckiene V**, Peciuliene V, Brukiene V, Drukteinis S. Traumatic dental injuries: etiology, prevalence and possible outcomes. [Internet]. Vol. 16, *Stomatologija/issued by public institution “Odontologijos studija” ...* [et al.]. 2014. 7–14. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24824054>
30. **Al-Bajjali TT**, Lamis Darwish Rajab, Rajab LD. Traumatic dental injuries among 12-year-old Jordanian schoolchildren: an investigation on

- obesity and other risk factors. *BMC Oral Health* [Internet]. 2014;14:101. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=4141663&tool=pmcentrez&rendertype=abstract>
31. **Díaz J**, Bustos L, Brandt A, Fernández B. Dental injuries among children and adolescents aged 1-15 years attending to public hospital in Temuco, Chile. *Dent Traumatol*. 2010;26:254–261.
 32. **Naqvi A**, Ogidan O. Traumatic Injuries of Anterior in First Year Secondary School Children in Benin-City, Nigeria. *African Dent J*. 1990;4:11–15.
 33. **Frujeri MLV**, Frujeri JAJ, Bezerra ACB, *et al*. 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*. 2014;14.
 34. **Siqueira MBLD**, Gomes MC, Oliveira AC, Martins CC, Granville-Garcia AF, Paiva SM. Predisposing factors for traumatic dental injury in primary teeth and seeking of post-trauma care. *Braz Dent J*. 2013;24:647–654.
 35. **Nguyen Q V**, Bezemer PD, Habets L. A systematic review of the relationship between overjet size and traumatic dental injuries. *European Journal of Orthodontics* 1999; 503–515.