International Journal of Dental Hygiene

Official Journal of the International Federation of Dental Hygienists

ORIGINAL ARTICLE

SAS Moimaz
PC Araújo
FY Chiba
CAS Garbín
NA Saliba

Authors' affiliations:
SAS Moimaz, PC Araújo, FY Chiba, CAS GarbínNA Saliba, Department of Infant and Social Dentistry, Faculty of Dentistry, Araatuba Dental School, UNESP, Araçatuba, Brazil

Correspondence to:
S.A.S. Moimaz
José Bonifácio Street
1193. Neighborhood: Vila Mendonça
Araçatuba-SP
16015-050
Brazil
Tel.: +55 18 36363249
Fax: +55 18 36363332
E-mail: sasaliba@foa.unesp.br

Dates:
Accepted 11 January 2013

To cite this article:
Int J Dent Hygiene **11**, 2013; 226–230.
DOI: 10.1111/idh.12020
Moimaz SAS, Araújo PC, Chiba FY, Garbín CAS, Saliba NA. Prevalence of deciduous tooth erosion in childhood.

Prevalence of deciduous tooth erosion in childhood

Abstract: *Objectives:* The objective of this study was to estimate the prevalence of deciduous tooth erosion and to identify possible associations with sex, age and toothbrushing frequency in children aged 4–6 years. *Methods:* The sample was drawn from attendants (n = 7058) of 57 public preschools in a Brazilian city. Tooth wear index was used to evaluate erosion. Descriptive statistical analysis consisted of the calculation of the prevalence of dental erosion; chi-squared and Fisher's exact tests were performed to verify the association between dental erosion and sex, age and toothbrushing frequency. *Results:* Two thousand and seven hundred and fifty-nine preschool students were examined. Deciduous tooth erosion was observed in 0.6% of children and its incidence did not differ between sexes. The highest prevalence was observed in children aged 6 years (58.3%) and the most affected sextants were the fourth (22.86%) and sixth (20.00%), indicating that lingual and occlusal tooth surfaces were most frequently involved. The degree of involvement was classified as incipient in 54.29% of children and moderate in 45.71%. The significance level was set at 5%. No association was found between erosion and sex, age or toothbrushing frequency. *Conclusions:* The prevalence of deciduous tooth erosion was low in Brazilian children, and this disorder is not considered a public health problem in this part of the population.

Key words: child; dental erosion; health survey; oral health

Introduction

The control and treatment of dental caries were the focus of public health initiatives in the field of dentistry for nearly half a century. However, as the incidence of caries has declined (1–3), dental clinicians and researchers have devoted more attention to other oral pathologies (4, 5). Among diseases involving the oral cavity, the erosive tooth wear is a growing concern, and its strong relationship with the style and quality of life was recognized (6).

Dental erosion is the irreversible and gradual loss of tooth structure caused by chemical processes and is not associated with the actions of microorganisms (7). It is usually diagnosed during dentists' professional practice and can involve delimited dental areas and occur in many forms. Dental erosion can be related to many external and internal causative factors (8); external factors are the result of exogenous acid action originating from drug (9), dietary (10–15) and environmental sources, whereas internal factors are related to the contact of gastric acid with tooth surfaces, such as through regurgitation due to gastrointestinal disorders (16, 17), pregnancy, bulimia and alcoholism (18).

Eroded teeth show concave failures and smooth enamel surfaces (19). Intrinsic aetiological factors can be identified by the appearance of the greatest amount of wear on the palatal and occlusal surfaces of the maxillary teeth, and the lingual and occlusal surfaces of the posterior mandibular teeth (20). External causal factors result in wear that also involves buccal tooth surfaces. Despite the specificity and ready visibility of clinical characteristics associated with dental erosion, its association with other agents that also promote tooth wear makes diagnosis difficult (21).

Researches have examined the aetiology of dental erosion, but more studies are needed to quantify its epidemiological extension (22), and thus epidemiological surveys are important to determine the prevalence of dental erosion and associated oral problems, because the collected data enable the planning, execution and evaluation of health initiatives that target the treatment, prevention and control of pathologies in affected segments of the population. Erosive tooth wear is among the oral problems that can be assessed in epidemiological surveys.

Very little is known about the epidemiology of erosive tooth wear in children. Some studies have demonstrated the association of erosive tooth wear with oral health problems and factors such as the socioeconomic, cultural and nutritional status of preschool-aged children (23, 24), but few studies have analysed the incidence of dental erosion and its relationship with individual and behavioural variables in this age group. Thus, this study aimed to determine the prevalence of dental erosion and the most frequently involved teeth and surfaces and to analyse its relationship with sex, age and toothbrushing frequency in Brazilian preschool students aged 4–6 years.

Study population and methodology

This study was conducted in Araçatuba, São Paulo, Brazil, and was approved by the Ethics Committee on Research Involving Humans of Araçatuba Dental School; the written consent was obtained, and all dictates of Declaration of Helsinki and Resolution No. 196/1996 were respected (25).

The study population consisted of 1993 children aged 4–6 years who were enrolled in the 57 public preschools in Araçatuba City. Children were excluded from the sample due to parents' failure to provide informed consent, absence from the preschool on the day of examination or refusal of the oral examination. We used the method recommended in the World Health Organization's (WHO) Guide for Basic Epidemiological Surveys in Oral Health, 4th edition (26).

The examination team comprised 10 researchers and 10 assistants who recorded the results. The examiners were trained before the epidemiological survey began to ensure standardized interpretation, comprehension and application of the criteria. The consensus technique was used, and the minimum value of interexaminer concordance (kappa statistic) was 0.842 (27).

Biosecurity precautions were adopted to protect the researchers and examination participants. The examinations were performed in schoolyards under natural light at a standardized time of day, utilizing a dental mirror and the community periodontal index (CPI) probe developed by the WHO.

Dental erosion was evaluated by the tooth wear index (TWI) used by Mendes-Silva (28). This index was developed to identify the prevalence and severity of tooth wear, in permanent and deciduous teeth, evaluating the surfaces and measuring the depth of the involvement, using numbers and letters as codes. It enables the visual evaluation of the buccal, lingual and occlusal/incisal tooth surfaces individually. Scores range from 0 to 4 according to the degree of dental tissue involvement: enamel only; enamel and dentin; enamel, dentin and pulp; and restored surface due to wear. A questionnaire was also used to know the brushing habits of the children.

Data were processed using Epi Info™ software (ver. 3.5.1) (29). Descriptive statistical analysis consisted of the calculation of the prevalence (%) of dental erosion, and chi-squared and Fisher's exact tests were performed to verify the association between dental erosion and sex, age and toothbrushing frequency. The significance level was set at 5%.

Results

In total, 1993 preschool students (985 boys, 1008 girls) were examined (Table 1). All primary schools of the city were included in the study. Dental erosion was observed in 0.6% of children and its prevalence did not differ between sexes. Table 2 presents the distribution of the examined children according to sex, age and pathological status. The highest prevalence of dental erosion was observed in children aged 6 years (58.3%). The most affected sextants were the fourth (22.86%) and sixth (20.00%), indicating that the lingual and occlusal tooth surfaces were most frequently involved (Tables 3 and 4). The degree of erosion was classified as incipient in 54.29% of children and moderate in 45.71%.

One-third (33.3%) of the children's adult guardians reported that their children performed toothbrushing three times per day, and 25% and 16.7%, respectively, reported that toothbrushing was performed twice and once per day.

Statistical analyses found no association between dental erosion and sex (chi-squared test, $P = 0.99$), age (Fisher's exact tests: 4 years, $P = 0.50$; 5 years, $P = 0.24$; and 6 years, $P = 0.51$) or toothbrushing frequency (Fisher's exact test, $P = 0.60$).

Discussion

The study population included infants and children aged 4–6 years, due to the lack of information about dental erosion

Table 1. **Distribution of children in the study population according to sex**

Sex	*n*	%
Female	1008	50.58
Male	985	49.42
Total	1993	100.00

Table 2. **Distribution of children according to sex, age and prevalence of dental erosion**

		No erosion		Erosion		Total	
Age (years)	Sex	*n*	%	*n*	%	*n*	%
4	Male	301	99.7	1	0.3	302	100
	Female	303	99.3	2	0.7	305	100
	Total	604	99.5	3	0.5	607	100
5	Male	367	99.5	2	0.5	369	100
	Female	379	100	0	0	379	100
	Total	746	99.7	2	0.3	748	100
6	Male	311	99.0	3	1.0	314	100
	Female	320	98.8	4	1.2	324	100
	Total	631	98.9	7	1.1	638	100

Table 3. **Localization of dental erosion in children aged 4–6 years**

Sextant	*n*	%
1	5	14.29
2	6	17.14
3	6	17.14
4	8	22.86
5	3	8.57
6	7	20.00
Total	35	100.00

Table 4. **Localization of dental erosion according to tooth surface in children aged 4–6 years**

Surface	*n*	%
Incisal	2	5.71
Lingual	14	40.00
Occlusal	18	51.43
Palatal	1	2.86
Total	35	100.00

in this age group. Many studies (30–32) have sought to determine the prevalence of dental erosion and to identify its aetiological factors, but few have examined the deciduous dentition. Some authors have suggested a gradual increase in dental erosion throughout childhood due to changes in nutrition and have found differences in its prevalence based on lifestyle and socioeconomic status (33, 34).

The prevalence of dental erosion found among children aged 4–6 years in this study (0.6%) was lower than that found by Peres *et al.* (30) (13%) among 12-year-olds in a city in southern Brazil. Many other authors have found a high prevalence of dental erosion in children, such as 24.0% in the Hague (33) and 58.0% in São Paulo (8). Differences among studies may be due to factors such as geographic region, diagnosis criteria and indices used, study designs, examined teeth, age groups, cultural and socioeconomic factors, and the absence of standardized examination procedures (34). These characteristics make it difficult to compare findings and often prevent the establishment of a problem profile at a national or global level.

Given the strong association between dental erosion and dietary habits, the low prevalence of dental erosion observed in this study may be related to changes in school menus based on the implementation of new dietary guidelines. As the sample group comprised students in public preschools where nutritionists guide meal planning, extrinsic aetiological factors were likely minimized. Millward *et al.* (35) observed a higher prevalence of dental erosion in children with the highest socioeconomic status, attributable to differences in dietary standards (more access to the consumption of industrialized drinks) and oral hygiene habits (higher toothbrushing frequency).

In this study, no association was found between the presence of dental erosion and sex, corroborating the findings of Peres *et al.* (30) and Murakami *et al.* (8). However, Truin *et al.* (33) observed a higher prevalence of dental erosion in 12-year-old boys than in girls of the same age. The present study found that dental erosion was more prevalent in 6-year-olds (58.3%) than in children aged 4 (25%) or 5 (16.6%) years, confirming the finding of Nunn *et al.* (36) that the prevalence of dental erosion increased with age. In our study population, no significant difference was found in the prevalence of dental erosion among children aged 4, 5 and 6 years.

The present study found no association between dental erosion and toothbrushing frequency, in agreement with the findings of Truin *et al.* (33). The fourth (22.8%) and sixth sextants were most frequently affected, and the occlusal (51.43%) and lingual (40.0%) surfaces were most often involved. In contrast, Peres *et al.* (30) found that the palatal surface (24.7%) was the second most affected region, and Al-Majed *et al.* (37) found that the buccal surface was most frequently affected. In our study population, 54.29% and 45.71% of preschool students showed incipient and moderate involvement, respectively, indicating that erosion frequently involved the enamel and dentin. The extent of involvement has been a topic of debate due to differences in the evaluation of erosion and the examination of study participants with different dietary habits, which can affect the tooth surface in many forms and to varying degrees.

Dental erosion can have a range of consequences depending on the aetiological agents involved and the severity of involvement, including crown destruction or, in severe cases, early tooth loss. Erosion can also affect the development of masticatory and phonetic functions and be associated with discomfort and pain (38), tooth sensitivity, enamel trauma and aesthetic changes (39), which can negatively impact affected individuals' self-perceptions about oral health and quality of life.

Few large-scale epidemiological studies have examined the prevalence of dental erosion and its possible associations in children, especially in the deciduous dentition. The prevalence of dental erosion (0.6%) found among preschool-aged children in Araçatuba, São Paulo, Brazil, is a strong indicator that nutritional factors are being addressed appropriately in the city's public preschool, highlighting the importance of the paediatric dentist in the diagnosis of morphological, physiological and behavioural alterations in preschoolers.

The prevalence of deciduous tooth erosion was low among Brazilian preschool students, but increased with age. No association was found between dental erosion and sex, age or toothbrushing frequency. The fourth and sixth sextants and occlusal and lingual surfaces were most frequently affected.

Clinical relevance

Scientific rationale for study

The erosive tooth wear is a growing concern especially because of its strong relationship with the style and quality of life. Principal findings: No association was found between erosive tooth wear and sex, age or toothbrushing frequency for children aged 4–6 years. Practical implications: This study suggests that the low prevalence of dental erosion found among preschool-aged children is a strong indicator that nutritional, psychological and behavioural factors are being addressed appropriately in this population. However, the health professionals should be aware of the range of consequences of this pathology.

Acknowledgements

The authors acknowledge the Coordination for the Improvement of Higher Education Personnel (CAPES) for providing a master's degree scholarship to Paula Caetano Araújo and the São Paulo Research Support Foundation (FAPESP) for providing a doctorate scholarship to Fernando Yamamoto Chiba and financial support for the project execution.

References

1 Künzel W, Fischer T, Lorenz R, Brühmann S. Decline of caries prevalence after the cessation of water fluoridation in the former East Germany. *Commun Dent Oral Epidemiol* 2000; **28**: 382–389.
2 Gushi LL, Rihs LB, Soares MC *et al*. Dental caries and treatment needs of adolescents from the São Paulo state, 1998 and 2002. *Revista de Saúde Pública* 2008; **42**: 480–486.
3 Do LG. Distribution of caries in children: variations between and within populations. *J Dent Res* 2012; **91**: 536–543.
4 Peres KG, Armenio MF. Dental erosion. In: Antunes JLF, Peres MA, eds. *Epidemiology of Oral Health*. Guanabara Koogan, Rio de Janeiro, 2006, pp. 195–204.
5 Gorman A, Kaye EK, Apovian C, Fung TT, Nunn M, Garcia RI. Overweight and obesity predict time to periodontal disease progression in men. *J Clin Periodontol* 2012; **39**: 107–114.
6 Grippo JO, Simring M, Schreiner S. Attrition, abrasion, corrosion and abfraction revisited: a new perspective on tooth surface lesions. *J Am Dental Assoc* 2004; **135**: 1109–1118.
7 American Society for Testing and Materials. *Designation G 40–02: Terminology Relating to Wear and Erosion*. Philadelphia, PA, American Society for Testing and Materials, 2002.
8 Murakami C, Corrêa MSNP, Rodrigues CRMD. Prevalence of dental erosion in children and adolescents of São Paulo. *UFES Revista de Odontologia* 2006; **8**: 4–9.
9 Zero DT. Etiology of dental erosion: extrinsic factors. *Eur J Oral Sci* 1996; **104**: 162–177.
10 Auad S, Moynihan P. Diet and dental erosion. *Quintessence Int* 2007; **38**: 130–133.
11 Ponduri S, Macdonald E, Addy M. A study in vitro of the combined effects of soft drinks and tooth brushing with fluoride toothpaste on the wear of dentine. *Int J Dent Hyg* 2005; **3**: 7–12.
12 Lifante-Oliva C, López-Jornet P, Camacho-Alonso F, Esteve-Salinas J. Study of oral changes in patients with eating disorders. *Int J Dent Hyg* 2008; **6**: 119–122.
13 Brand HS, Gambon DL, Van Dop LF, Van Liere LE. Veerman EC The erosive potential of jawbreakers, a type of hard candy. *Int J Dent Hyg* 2010; **8**: 308–312.
14 Sauro S, Mannocci F, Piemontese M, Mongiorgi R. In situ enamel morphology evaluation after acidic soft drink consumption: protection factor of contemporary toothpaste. *Int J Dent Hyg* 2008; **6**: 188–192.
15 Knevel RJ, Van der Woord JE. Tooth wear. *Int J Dent Hyg* 2007; **5**: 195–196.
16 Boston DW, Al-bargi H, Bogert M. Abrasion, erosion, and abfraction combined with linear enamel hypoplasia: a case report. *Quintessence Int* 1999; **30**: 683–687.
17 Linnett V, Seow WK. Dental erosion in children: a literature review. *Pediatr Dent* 2001; **23**: 37–43.
18 Baratieri LN. *Restorative Dentistry: Principles and Possibilities*. Santos, São Paulo, 2001.
19 Ganss C, Lussi A. Diagnosis of erosive tooth wear. *Monogr Oral Sci* 2006; **20**: 32–43.
20 Litonjua LA, Andreana S, Bush PJ, Cohen RE. Tooth wear: attrition, erosion, and abrasion. *Quintessence Int* 2003; **34**: 435–446.
21 Ali DA, Brown RS, Rodriguez LO, Moody EL, Nasr MF. Dental erosion caused by silent gastroesophageal reflux disease. *J Am Dental Assoc* 2002; **133**: 734–737.
22 Mondelli J. *Aesthetic and Cosmetic Restorative Integrated Into Clinical*. Quintessence, São Paulo, 2003.
23 Freire MCM. Public politics for healthy eating. In: Bönecker M, Sheiham A, eds. *Promoting Oral Health in Childhood and Adolescence: Knowledge and Practices*. São Paulo, Santos, 2004, pp. 109–132.
24 Mantonanaki M, Koletsi-Kounari H, Mamai-Homata E, Papaioannou W. Dental erosion prevalence and associated risk indicators among preschool children in Athens, Greece. *Clin Oral Investig* 2012; in press. Doi: 10.1007/s00784-012-0730-4.
25 Ministry of Health, Brazil. *National Health Council Resolution No. 196: Guidelines and Standards Regulating Research Involving Human*. Brasília, DF, Official Gazette of the Union, 1996, pp. 21082–21085. Available at: http://conselho.saude.gov.br/web_comissoes/conep/aquivos/resolucoes/23_out_versao_final_196_ENCEP2012.pdf (acessed 6 February 2013).
26 World Health Organization. *Oral Health Surveys: Basic Methods*. Geneva, WHO, 1997.
27 Bulman JS, Osborn JF. Simple summary calculation. *Br Dent J* 1989; **166**: 87–90.
28 Mendes-Silva H, Sales Peres SHC, Sales-Peres A, Lauris JRP, Bastos JRM, Buzalaf MAR. Prevalence study of Tooth Wear Index (TWI). *Braz Oral Res* 2005; **19**(Suppl): 31. Available: http://iadr.confex.com/iadr/brazil05/preliminaryprogram/abstract_86047.htm (acessed 6 February 2013).
29 Center for Disease Control and Prevention. *EpiInfo 3.5.1*. Atlanta, CDC, 2008.
30 Peres KG, Armênio MF, Peres MA, Traebert J, Lacerda JT. Dental erosion in 12-year-old schoolchildren: a cross-sectional study in Southern Brazil. *Int J Pediatr Dent* 2005; **15**: 249–255.

31 Wiegand A, Müller J, Werner C, Attin T. Prevalence of erosive tooth wear and associated risk factors in 2–7-year-old German kindergarten children. *Oral Dis* 2006; **12**: 117–124.
32 Huew R, Waterhouse P, Moynihan P, Kometa S, Maguire A. Dental caries and its association with diet and dental erosion in Libyan schoolchildren. *Int J Pediatr Dent* 2012; **22**: 68–76.
33 Truin GJ, van Rijkom HM, Mulder J. van't Hof MA. Caries trends 1996–2002 among 6-and 12-year-old children and erosive wear prevalence among 12-year-old children in The Hague. *Caries Res* 2005; **39**: 2–8.
34 Sales-Peres SHC, Goya S, Araújo JJ, Sales-Peres A, Lauris JR, Buzalaf MA. Prevalence of dental wear among 12-year-old Brazilian adolescents using a modification of the tooth wear index. *Public Health* 2008; **22**: 942–948.
35 Millward A, Shaw L, Smith A. Dental erosion in four-year-old children from differing socioeconomic backgrounds. *ASDC J Dent Child* 1994; **61**: 263–266.
36 Nunn JH, Gordon PH, Morris AJ, Pine CM, Walker A. Dental erosion – changing prevalence? A review of British National children's' surveys. *Int J Pediatr Dent* 2003; **13**: 98–105.
37 Al-Majed I, Maguire A, Murray JJ. Risk factors for dental erosion in 5–6 year old and 12–14 year old boys in Saudi Arabia. *Commun Dent Oral Epidemiol* 2002; **30**: 38–46.
38 Sivasithamparam K, Harbrow D, Vinczer E, Young WG. Endodontic sequelae of dental erosion. *Aust Dent J* 2003; **48**: 97–101.
39 Kazoullis S, Seow WK, Holcombe T, Newman B, Ford D. Common dental conditions associated with dental erosion in schoolchildren in Australia. *Pediatr Dent* 2007; **29**: 33–39.