

Dental erosion and consumption of industrialized beverages in a group of children in Recife/Pernambuco, Brazil

Erosão dental e consumo de bebidas industrializadas em crianças de Recife/Pernambuco, Brasil

Abstract

Purpose: This study aimed to assess the occurrence of dental erosion in a group of children aged 5 to 12 year-old in the city of Recife/Pernambuco, Brazil, and its association with the consumption of industrialized beverages.

Methods: The sample was composed of 970 children. Data were collected by using interviews and clinical examination. Dental erosion was considered as the presence of cervical lesions on vestibular surfaces with the following clinical characteristics: wide, shallow, U-shaped lesions, with a smooth surface and no clear angles. Pearson's chi-square test was used for the statistical analysis.

Results: The occurrence of dental erosion in the sample was 3.4%: 2.5% of the deciduous dentition and 1.8% of the permanent dentition. In both dentitions, dental erosion was associated with the consumption of industrialized beverages ($P=0.02$), especially soft drinks ($P=0.004$).

Conclusions: The occurrence of dental erosion was low in the present study, suggesting that this type of condition does not constitute a public health problem for the population investigated.

Key words: Tooth erosion; epidemiology; beverages

Resumo

Objetivo: Observar a ocorrência de erosão dental em um grupo de crianças de 5 a 12 anos de idade, da cidade do Recife/Pernambuco e sua associação com o consumo de bebidas industrializadas.

Metodologia: A amostra foi composta por 970 crianças e a coleta de dados abrangeu entrevistas e exames clínicos. Considerou-se como erosão dental a presença de lesões cervicais em superfícies vestibulares com as seguintes características clínicas: lesões largas, rasas, sem ângulos nítidos, com superfície lisa e em forma de "U". Para a análise estatística foi utilizado o teste Qui-quadrado de Pearson.

Resultados: A ocorrência de erosão dental na amostra estudada foi de 3,4%, sendo 2,4% para a dentição decídua e 1,8% para a dentição permanente. Tanto na dentição decídua, quanto na permanente, a erosão dental foi associada ao consumo de bebidas industrializadas ($P=0,02$) e de refrigerantes especificamente ($P=0,004$).

Conclusão: Neste estudo, a ocorrência de erosão dental foi baixa, sugerindo que este tipo de agravamento não se configura em um problema de saúde pública para a população investigada.

Palavras-chave: Erosão de dente; epidemiologia; bebida

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Introduction

Dental structure can be lost after its formation due to several causal factors. Besides cases of carious lesions and trauma fractures, the enamel destruction can be initiated by means of abrasion, friction, erosion or abfraction (1). According to Imfeld (2) and Jensdottir et al. (3), unlike the mechanical dental loss in abrasion and friction, during erosion the enamel is demineralized by acids and is later removed through normal or parafunctional friction. Such acids are present in the oral cavity because of food, regurgitation of stomach acid or frequent vomiting. Thus, erosion is a localized non-carious lesion that develops as a consequence of the chronic loss of dental structure caused by chemical action, with no bacterial involvement (3-6).

Initially, the most common clinical characteristic of erosion is the loss of enamel shine, and the surface becomes smooth. The lesion is wide and shallow, in the shape of a “U” or saucer, with no clear angles. When the lesion reaches the dentin, it can cause sensitivity to cold, heat and osmotic pressure. When erosion affects restored teeth, the restorations become prominent, projecting over the tooth surface (7).

The origin of dental erosion may be either intrinsic or extrinsic. Intrinsic factors include illnesses that cause regurgitation of stomach acid or a reduction in saliva flow. Extrinsic factors include diet (fruit, acidic beverages), environment (industrial chemicals, chlorinated pools) and medication (vitamin C, aspirin, hydrogen chloride) (4,6). According to Seraidarian and Jacob (8), the main extrinsic etiological factor for dental erosion is acids from diet. The majority of foods and beverages with low pH (below 4.5) are a potential cause of dental erosion.

The intake of liquids in the diet has been increasingly recommended and is accentuated in tropical countries. Thus, the considerable offer of beverages in the market and the diversity of fruit in the Brazilian flora lead to the possibility of some of these beverages being related to the development of dental erosion (9). Along with fruit juice, in recent years there had been an increase in the consumption of industrialized soft drinks, which have a low pH. When excessive, this new dietary habit is also indicated as one of the main causes of lesions due to dental erosion (10).

The present study aimed to assess the occurrence of dental erosion among a group of children between 5 and 12 year-old in the city of Recife, state of Pernambuco, Brazil, and its association with the consumption of industrialized beverages (juices, soft drinks, isotonic solutions).

Methods

This study was approved by the Ethics Committee of the University of Pernambuco State (process n° 044/06). An exploratory, cross-sectional study was carried out in the city of Recife (Brazil). Recife has area of 218 km² and population of 1,422,905 inhabitants. It is the demographically most important area of the state of Pernambuco, concentrating more than 40% of the state population (11).

The sample consisted of a group of children visiting the municipal zoological park of the Recife city on the National Children’s Day on October 12, 2006. A non-probabilistic, convenience sample was carried out, as the researchers selected the most accessible members of the population. The inclusion criteria were: children between 5 and 12 year-old, attending the municipal zoological park of Recife on October 12, 2006, who agreed to participate in the study, and their parents/guardians signed an informed consent form.

Data collection occurred in two steps: an interview with parents/guardians and a clinical exam of the child in order to identify characteristics of dental erosion. A form was used for the interview with parents/guardians and was filled out by 19 previously trained undergraduate students of the Faculty of Dentistry of Pernambuco State University. The form contained information on age, gender, and questions regarding the consumption of industrialized beverages (soft drinks, juices, isotonic solutions). A frequency of at least three times a week was considered for the intake of industrialized beverages.

The clinical exams were performed by six previously trained dental surgeons (graduate students in Pediatric Dentistry). After the training of the examiners, 87% agreement was achieved, with a Kappa value of 0.86. The exams were performed under natural light with the child seated in a common chair, using wooden tongue depressors, masks, caps, and disposable gloves. As the intention was to determine dental erosion associated mainly with the consumption of industrialized beverages, the presence of cervical lesions was considered only on the vestibular surfaces, with the following clinical characteristics: wide, shallow, U-shaped lesions with a smooth surface and no clear angles (7). All deciduous and permanent teeth in the oral cavity were evaluated. Children in need of treatment were referred to the public health units nearest their homes or the Pediatric Dentistry clinics of the Faculty of Dentistry, Pernambuco State University.

The data were recorded and analyzed using the Statistical Package for the Social Sciences – version 13.0 (SPSS Inc., Chicago, IL, USA). Pearson’s chi-square test was used with a significance level of 0.05.

Results

Nine hundred seventy children were examined, 471 (48.6%) of whom were male and 499 (51.4%) were female. The largest percentage of children was between 5 and 6 years of age (35.1%) (Table 1). Dental erosion was detected in 3.4% of the children, occurring in 2.5% of the deciduous dentition and 1.8% of the permanent dentition (Table 2).

Table 3 displays the occurrence of dental erosion according to the intake of industrialized beverages as well as the specific consumption of soft drinks, industrialized juices, and isotonic beverages. Dental erosion was found to be associated with the intake of industrialized beverages ($P=0.021$) and, more specifically, with the consumption of soft drinks ($P=0.004$). Prevalence ratios were used to estimate to what extent the children exposed to the variables investigated exhibited a greater or lesser predisposition to dental erosion (Table 3).

Table 1. Distribution of children examined according to age group (in years) and gender. Recife, 2006.

Variables	Children	
	n	%
Gender		
Male	471	48.6
Female	499	51.4
TOTAL	970	100.0
Age Group (years)		
5 and 6	341	35.2
7 and 8	290	29.9
9 and 10	225	23.2
11 and 12	114	11.8
TOTAL	970	100.0

Table 2. Distribution of children examined according to the occurrence of dental erosion in deciduous and/or permanent teeth. Recife, 2006.

Variables	Children	
	n	%
Dental Erosion		
Present	33	3.4
Absent	937	96.6
TOTAL	970	100.0
Dental erosion in deciduous teeth		
Present	24	2.5
Absent	946	97.5
TOTAL	970	100.0
Dental erosion in permanent teeth		
Present	17	1.8
Absent	953	98.2
TOTAL	970	100.0

Table 3. Occurrence of dental erosion according to consumption of industrialized beverages as well as the specific consumption of soft drinks, industrialized juices, and isotonic beverages. Recife, 2006.

Variables	Dental Erosion						P-value	Prevalence ratio
	Present		Absent		Total			
	n	%	n	%	n	%		
Consumption of industrialized beverages								
Yes	27	4.4	582	95.6	609	100.0	0.02**	2.58
No	6	1.7	355	98.3	361	100.0		
TOTAL	33	3.4	937	96.6	970	100.0		
Consumption of soft drinks								
Yes	27	4.9	528	95.1	555	100.0	0.004**	3.50
No	6	1.4	409	98.6	415	100.0		
TOTAL	33	3.4	937	96.6	970	100.0		
Consumption of industrialized juices								
Yes	8	3.0	256	97.0	264	100.0	0.69†	0.85
No	25	3.5	681	96.5	706	100.0		
TOTAL	33	3.4	937	96.6	970	100.0		
Consumption of isotonic beverages								
Yes	0	0.0	13	100.0	13	100.0	0.49**	0.00
No	33	3.4	924	96.6	924	100.0		
TOTAL	33	3.4	937	96.6	970	100.0		

* Significant association at the 5% significance level.

† Pearson's chi-square test.

Discussion

Despite the impossibility to generalize the present results, this non-probabilistic sample was used in an exploratory study, which is useful to obtain preliminary knowledge on the distribution of dental erosion in the target population. The occurrence of dental erosion in the present study was low (3.4%), which is similar to the result described by van Rijkom et al. (12), who found a 3% prevalence among Dutch children between 10 and 13 years of age. The findings are also in agreement with those described by Luo et al. (13) among preschoolers in China (5.7%). However, Truin et al. (14) found a 24% prevalence in Holland; Murakami et al. (15) reported a 58% prevalence of dental erosion among children and adolescents in the city of Sao Paulo; and Wiegand et al. (16) found a 32% prevalence among German children between 2 and 7 year-old.

The different results of these studies may be explained by the different methods used to diagnose dental erosion. Van Rijkom et al. (12) considered the criteria proposed by Lussi in a previous study for the diagnosis of dental erosion. Luo et al. (13) only examined the maxillary incisors and used a score system based on the National Children's Oral Health Survey of the United Kingdom and Saudi Arabia for the diagnosis of dental erosion. On the other hand Truin et al. (14) used the criteria described by Van Rijkom et al. (12), and Murakami et al. (15) considered the occurrence of erosion lesions based on the area and depth affecting each face of the tooth. Wiegand et al. (16) used a score system based on the O'Sullivan Index as the diagnostic criteria of dental erosion.

The present study showed that the deciduous dentition was more affected by dental erosion than permanent dentition, which corroborates the findings by Murakami et al. (15) and Wiegand et al. (16). According to Ganss et al. (17), dental erosion in the deciduous dentition may be considered a predictor of dental erosion in the permanent dentition, which alerts to the need for orientation that may contribute toward preventing and controlling this disease. However, it is important to consider in the aforementioned studies – especially those involving children over 8 years of age – that physiological wear is commonly seen in the deciduous dentition with the advance in age and may have biased the diagnosis of dental erosion.

Araújo et al. (18) found that cola-based soft drinks, which are widely consumed throughout the world, can have a harmful effect on tooth enamel when ingested frequently, leading to a reduction in dental microhardness. In the present study, the consumption of industrialized beverages, especially soft drinks ingested with a frequency of at least three times a week, had a statistically significant association with the occurrence of dental erosion. The children who consumed soft drinks exhibited 3.5 times more dental erosion than those who did not consume these beverages.

The modern lifestyle has changed the development pattern of certain diseases, including oral diseases. The growing consumption of industrialized beverages has been associated with an increase in the prevalence of dental erosion in ever younger populations (13,19,20). However, the considerable discrepancy between studies reflects the need for further research in order to broaden the scientific basis of this association. It should be stressed that individual modifying factors should be observed, including the amount and composition of saliva, characteristics of the teeth, dietary patterns and the practice of oral hygiene (21,22).

Conclusions

- The occurrence of dental erosion was low in the population investigated in both the deciduous and permanent dentitions, suggesting that this type of condition does not constitute a public health problem for this group.
- In the present study, dental erosion proved significantly associated with the consumption of industrialized beverages, more specifically with the consumption of soft drinks.

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