

Tooth Erosion and its Relationship with Dietary Habits in 6-18 Year Old Schoolchildren in Bangalore-A Cross Sectional Study

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Abstract

Introduction: Dental erosion is the most common chronic disease in both children and adolescents. It is a progressive, irreversible loss of dental hard tissues by a chemical process. There is a limited literature with regard to the prevalence of dental erosion in school-going children in India. Hence, this study was undertaken to assess the prevalence and severity of dental erosion in school-going children in Bangalore. **Aims:** To assess tooth erosion and its relationship with dietary habits in 6–18-year-old schoolchildren. **Methods and Materials:** The present cross-sectional study was conducted in Bangalore, India. A sample of 1000 schoolchildren, aged 6–18 years answered questionnaire containing information about dietary habits, gastric disorders, and oral hygiene and dental erosion was recorded using Modified O'Brien index. **Results:** Of the 1000 participants, 77 (7.7%) had erosive tooth wear. Frequent consumption of soft drinks and citrus fruit intake were strongly associated with dental erosion ($P = 0.001$). The posterior surface (5%) was most commonly affected by erosive lesions and milk was considered to be a protective indicator for erosion ($P = 0.001$). **Conclusions:** The findings give an inference that a low prevalence on dental erosion but a significant relation exists between diet and dental erosion and there is a need for enhancing awareness about dental erosion among the schoolchildren, their parents and should be recognized and treated early.

Keywords: Dental erosion, diet, school children

INTRODUCTION

In past decades, there is decline in the prevalence of dental caries^[1] and increase in dental erosion.^[2] Five studies per year were published in 70's, fifty in the current scenario.^[3] Dental erosion is irreversible loss of hard tissues by a chemical process.^[4] According to Pindborg, "superficial loss of dental hard tissue by a chemical process that does not involve bacteria."^[5] It is the most common chronic disease of children aged 5–17 years.^[6] Worldwide, prevalence is 30% in a systematic review.^[7] Moreover, 5%–100% has been reported globally.^[8] Dental erosion results from more than one factor acting together.^[9]

METHODS AND MATERIALS

The present observational study was done among randomly selected 1000 schoolchildren from Bangalore which included 544 boys and 456 girls aged between 6 and 18 years using convenient sampling. Institutional ethical clearance was

obtained before conducting the study. Prior informed consent was obtained from the parents and the school authorities for participation in the study.

Inclusion criteria

- Children within the age group of 6–18 years
- Children from whom written consent has been obtained from their parents/guardian
- Assent of children will be taken.

Exclusion criteria

- Children suffering from systemic disorders and special children.

Using a previously validate index proposed by O'Brien (1994),^[4] a single examiner under standardized condition conducted the dental examination using sterile gauze, Prepacked sterilized

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oral examination kits containing a plain mouth mirror and a blunt probe to detect dental erosion by removing food debris on both primary and permanent dentition.

Modified O'Brien index used for scoring erosive lesions Table 1 and Table 2.

A self-completion questionnaire containing information regarding patient identification, dietary habits, gastric disorder symptoms, oral hygiene habits, and tooth grinding habits was provided aimed to establish association between diet and dental erosion. Children and adolescents were supervised during the questionnaire completion, followed by clinical examination.

The data obtained were subjected to descriptive statistical analysis and mean and standard deviation were obtained. Odds ratio with confidence interval was calculated for different variables related to outcome, to determine whether any statistically significant differences are present ($P < 0.05$).

RESULTS

Of the 1000 participants, 77 (7.7%) had erosive tooth wear. Shows the distribution of participants regarding dental erosion prevalence according to gender and type of dentition. The variables gender ($P = 0.791$) and type of dentition ($P = 0.062$) were not significantly associated with dental erosion ($P > 0.05$). Concerning dietary habits, frequent consumption of soft drinks and temperature ($P = 0.016$) were strongly associated with dental erosion ($P = 0.001$). Other types of drinks ($P = 0.999$) and the method of drinking ($P = 0.999$) were not significantly associated with erosion [Table 3].

In both primary and permanent dentitions, the posterior surface 67 (5%) was most commonly affected by erosive lesions [Table 4]. Lesions involving over one-third to two-thirds [Table 5] of the surface 43 (4%) and loss of enamel characterization 72 (7%) were most commonly seen [Table 6].

Significant association was seen with citrus fruit intake ($P = 0.001$). Regarding general health problems, the presence of gastric disorders and frequent vomiting were not significantly associated with dental erosion. Milk was considered

to be a protective indicator for erosion ($P = 0.001$). Furthermore, it was possible to observe that older children with permanent dentition had a higher prevalence of erosive tooth wear than younger children with primary or mixed dentition [Table 3].

The variables such as tooth brush ($P = 0.383$), mouth wash ($P = 0.732$), and tooth grinding habit were also not statistically significant with dental erosion Table 3.

DISCUSSION

Data regarding prevalence of dental erosion are the basic foot hole in understanding scope and magnitude of the problem.^[10] The first study on the prevalence of tooth erosion began in the UK (1993) under the National Survey of Children's Dental Health in the age group ranging from 1.5 to 18 years. It was also worth noticing that there was variation in the prevalence of dental erosion within the same sample in different studies.^[11]

One of the important factors to be considered in the long-term oral health of children and adolescents is dental erosion, especially in industrialized countries as its seen affecting more than 80% of the children.^[6] Frequent consumption of acidic drinks or foods, environmental exposure to acids or reflux of gastric acid into the mouth along with lifestyle, and behavior differences play a significant role in the development of dental erosion. It is of uttermost importance to detect this condition as early as possible as the tooth tissue loss is insidious in nature and may not be apparent until the patient reports of sensitivity or the fracture of thinned incisal edges which would eventually lead to severe sensitivity to pain associated with pulp exposure, altered occlusion, and poor esthetics.^[12]

A modified version of the O'Brien (1994) index was chosen for this study owing to the fact that there is no universally accepted or validated index to classify erosive lesions. It is the most commonly used index in the primary dentition, and it possesses most of the ideal characteristics of an index, as listed by Nahás Pires Corrêa MS (2011).^[4]

In the present study, the prevalence of dental erosion was found to be 7.7%. This was in accordance with the study

Table 1: Lesion depth

- 0: Normal (healthy)
- 1: Enamel only-loss of surface characterization
- 2: Enamel and dentine-loss of enamel exposing dentine
- 3: Enamel and dentine with pulpal proximity-possible to visualize redness of pulp through translucency of remaining tissue
- 9: Assessment cannot be made (missing element or full crown)

Table 2: Lesion area

- 0: Normal (healthy)
- 1: Less than one-third of surface involved
- 2: One-third, up to two-thirds of surface involved
- 3: Enamel and dentine with pulpal proximity-possible to visualize redness of pulp through translucency of
- 9: Assessment cannot be made (missing element or full crown)

Table 3: Effect of different variables on erosion of teeth: Logistic regression

Independent variable	<i>n</i>	Erosion of teeth, <i>n</i> (%)	OR	<i>P</i>	95% CI for OR
Gender					
Male	544	43 (8)	1.07	0.791	0.667-1.701
Female [§]	456	34 (7)	1.00		
Type of dentition					
Primary or mixed	453	27 (6)	0.63	0.062	0.388-1.024
Permanent [§]	547	50 (9)	1.00		
Juice intake					
Yes	953	74 (8)	1.24	0.729	0.374-4.072
No [§]	47	3 (6)	1.00		
Soft drink intake					
Yes	987	76 (8)	1.00	<0.001*	0.128-7.803
No [§]	13	1 (8)	1.00		
Sports drink intake					
Yes	2	2 (100)	-	-	-
No [§]	998	75 (8)	-		
Milk intake					
Yes	935	30 (3)	0.01	<0.001*	0.007-0.024
No [§]	65	47 (72)	1.00		
Tea intake					
Yes	105	35 (33)	10.16	<0.001*	6.095-16.919
No [§]	895	42 (5)	1.00		
Usual drinking method					
Swallows immediately/using a straw	998	75 (8)	0.00	0.999	-
Holds drink in mouth before swallowing [§]	2	2 (100)	1.00		
Citrus fruit intake					
Yes	242	70 (29)	43.63	<0.001*	19.729-96.633
No [§]	758	7 (1)	1.00		
Frequent vomiting					
Yes	4	4 (100)	-	-	-
No [§]	996	73 (7)	-		
Reported gastroesophageal index					
Yes	0	0	-	-	-
No	923	77 (8)	-		
Reported gastrointestinal disorders					
Yes	2	2 (100)	-	-	-
No [§]	998	75 (8)	-		
Type of toothbrush					
Extra soft or soft	899	67 (7)	0.73	0.383	0.364-1.474
Medium or hard [§]	101	10 (10)	1.00		
Mouth rinse use					
Yes	18	1 (6)	0.70	0.732	0.092-5.341
No [§]	982	76 (8)	1.00		
Tooth grinding					
Yes	3	3 (100)	-	-	-
No [§]	997	74 (7)	-		
Juice intake frequency					
Some days	991	68 (7)	0.00	0.999	-
Everyday [§]	9	9 (100)	1.00		
Softdrink intake frequency					
Only on weekends	851	2 (0)	0.00	<0.001*	0.001-0.010
During the week [§]	149	75 (50)	1.00		

Contd...

Table 3: Contd...

Independent variable	n	Erosion of teeth, n (%)	OR	P	95% CI for OR
Softdrink type					
Regular	989	73 (7)	0.14	0.002*	0.040-0.487
Diet [§]	11	4 (36)	1.00		
Softdrink temperature					
Iced	16	4 (25)	4.16	0.016*	1.309-13.322
Cold-room temp [§]	984	73 (7)	1.00		

*Significant effect on erosion of teeth, [§]Reference category. OR: Odds ratio, CI: Confidence interval

Table 4: Lesion location

Location	n (%)
Absent	923 (92)
Anterior	10 (2)
Posterior	67 (5)
Total	1000 (100)

Table 5: Lesion area

	n (%)
Normal (healthy)	923 (92)
Less than one-third of surface involved	32 (3)
One-third, up to two-third of surface involved	43 (4)
More than two-thirds of surface involved	2 (0)
Assessment cannot be made (missing element, restoration, or sealant)	0
Total	1000 (100)

done by Vargas-Ferreira *et al.* and Kumar *et al.* reported the prevalence of 7.2% and 8.9%, respectively. However, studies done by Manguiera *et al.* and Deery *et al.* have reported a very high prevalence up to 60% of dental erosion affecting the schoolchildren in the US and UK, respectively.^[5] However, low prevalence of dental erosion in the present study can be attributed to the fact that the children have less exposure to fizzy and erosive drinks than in other countries such as the USA and UK.^[5]

In the present study, no difference was observed in the prevalence of dental erosion between boys and girls similar to study by Aguiar *et al.* (2007) and Nikolas Andreas (2012). However, other studies have recorded a significantly higher prevalence in boys than in girls El Aidi *et al.* (2010) and Chrysanthakopoulos NA (2012).^[9] However, in a study by Wang *et al.* (2010), more girls than boys had tooth erosion.^[9] It has been suggested that a higher rate of tooth erosion could be attributed to differences in the strength of musculature and biting forces and also to a higher consumption of acidic drinks among boys.^[13]

The permanent dentition was more affected by dental erosion than the primary dentition similar to study done by Dugmore *et al.* (2010). However, most reports show higher prevalence of dental erosion in primary dentition Ganss C *et al.* (2001) and Al-Majed *et al.* (2002). Primary teeth have a higher risk

for erosion lesions because their enamel and dentin layers are thinner and less mineralized than permanent teeth.^[14] Erosion was found to be greater in posterior teeth (5%) than anterior teeth (2%) in this study, similar to the findings of Ganss *et al.* (2006), who reported that mandibular first molars were most affected by dental erosion.^[5] Loss of enamel surface characterization (7%) was observed in most of the cases, followed by loss of enamel exposing dentin (1%), which was similar to findings obtained by Talebi *et al.* (2009). In most of cases, more than half of the tooth's surface was affected (4%), similar to the findings of Peres *et al.* and Kumar S *et al.* (2010).^[5]

Due to low cost and high availability, the consumption of carbonated drinks has increased substantially among children and adolescents in the last years in all around the world.^[15] Statistically significant relation was seen between the ingestion of carbonated drinks and dental erosion also as reported by Moazzez *et al.* (2000) and Al-Daligan *et al.* (2001). Whereas Bartlett *et al.* (1998), Deery *et al.* (2000), and Arnadottir *et al.* (2003) did not find any relation.^[5] The major reason being carbonated drinks has lower pH than fruit juices. Besides causing erosion on tooth surfaces, carbonated drinks could reduce surface hardness of enamel, dentin, microfilled composite, and resin-modified glass ionomer cements.^[5]

Significant association was seen between citrus fruit intake and dental erosion possibly because of its chelating action on enamel surface which continues despite increase in the pH level as described in other studies by Al-Daligan *et al.* (2001), Millward A *et al.* (1994), and Milosevic A *et al.* (2004). Many authors, Waterhouse *et al.* (2008) and Deery C *et al.* (2000), have also found that citric fruits and their juices have no impact in the occurrence of erosive lesions.^[15] Consumption of milk was seen to have a protective action against dental erosion. This can be explained by the presence of remineralizing proteins in milk such as casein, which justifies the use of milk in the prevention of dental erosion.^[4] According to O'sullivan *et al.* (2000), low consumption of milk has been considered a risk factor for dental erosion. However, Waterhouse *et al.* (2008) and Milosevic *et al.* (2004) did not find a difference in the consumption of milk between the groups with and without erosion.^[15]

No association was seen between dental erosion and bruxism, oral hygiene habits, drinking methods, and gastric disorders. Diseases such as anorexia nervosa and bulimia, in which vomit is the main symptom, are causative factors of erosion according to previous

Table 6: Lesion depth

Lesion depth	n (%)
Normal (healthy)	923 (92)
Enamel only-loss of surface characterization	72 (7)
Enamel and dentine-loss of enamel exposing dentine	5 (1)
Enamel and dentine with pulpal proximity-possible to visualize redness of pulp through translucency of remaining tissue	0
Assessment cannot be made (missing element or full crown)	0
Total	1000 (100)

studies by Mahoney EK *et al.* (2003) and Chrysanthakopoulos NA *et al.* (2006).^[12]

Dental erosion is a multifactorial condition and there are many factors that were not investigated in the present study and could be associated with dental erosion such as the protective effect of saliva and the association between dental erosion and abrasion/attrition. It could be assumed also that other factors such as cultural, social, occupational, and inter and intra individual host factors might be relevant in the occurrence of dental erosion.

CONCLUSIONS

Within the limits of the present study, it can be concluded that a low prevalence on dental erosion is seen in the study population, but a significant relation exists between diet and dental erosion. The prevention of dental erosion requires a multifaceted approach as it is a major group health problem effecting children of all age groups. Schools have a plausible impact on the oral health as significant time is spent in school. Therefore, educating and motivating children regarding oral health awareness, dietary habits, and lifestyle is a major step in accomplishing good oral health. Furthermore, parent's awareness and knowledge regarding dietary habits and oral health play a pivotal role in accomplishing good oral health status.

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Conflicts of interest

There are no conflicts of interest.

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