

DENTAL EROSION IN 5- AND 6-YEAR-OLD SCHOOL CHILDREN AND ASSOCIATED FACTORS: A PILOT STUDY

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Abstract

To determine the prevalence of dental erosion among 5 and 6 year olds school children living in Ajman, United Arab Emirates and to establish associated risk factors.

Samples of 207 children of both sexes were randomly selected. Information about potential risk factors for dental erosion was collected via questionnaires filled by the parents. Clinical examinations of buccal, occlusal/incisal and lingual surfaces of deciduous canines and molars were conducted in a school clinic.

The prevalence of wear was 36.7 percent. There was no difference in the amount of wear between boys or girls. Bivariate analysis showed a statistically significant relationship between dental erosion and four erosion-related questionnaire variables, specifically; age ($P=.05$), non use of straw on drinking sports drink, carbonated drink ($P=.04$), the use of medication on regular basis ($P=.03$) and experiencing gastro esophageal reflux before ($P=.04$). Interestingly there were no statistically significant associations between tooth wear and the consumption of fruit, yoghurt, pickled foods, fizzy drinks or fruit-based drinks.

The level of erosion found on the sample population was mostly within the enamel and did not require immediate intervention. However, consideration must be given to the actuality, that the primary dentition examined should be maintained till the permanent arrives and this makes prevention and preservation of the primary dentition vital.

Clinical article (*J Int Dent Med Res* 2012; 5: (1), pp. 36-40)

Keywords: Dental erosion, risk indicators, children.

Received date: 09 November 2011

Accept date: 22 February 2012

Introduction

Dental erosion is a chemical form of tooth wear devoid of bacteria¹. Several factors may instigate or aggravate erosion². It occurs primarily due to acid exposure or reduced ability to combat acid attack by salivary action³.

Erosion is a problem of increasing concern amongst populations and is often overlooked. Broadly, etiology is divided into intrinsic and extrinsic factors⁴. Intrinsic factors include GERD (Gastro esophageal reflux

disease), saliva quality and quantity (dehydration)⁵. While, extrinsic factors include diet, medicine, environment⁶.

Oral hygiene practices have been found to play a role in erosion including brushing frequency⁷ and the use of hard brush⁸. The primary dentition is more susceptible to erosion as the hard tissues are thinner and the enamel is more prone to acid dissolution than its permanent counterpart⁹. An association seems to exist between general health and socio-economic status. A positive correlation has been seen to relate tooth wear to social deprivation¹⁰.

The early signs of erosion present as a smooth silky-shining glazed surface and advanced stages of erosion exhibit as morphological changes. Structural changes may include concavities on smooth surfaces, exposing dentine or pulp¹¹ or even cupping¹².

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Currently, there is no universal standard of measurement for erosion which makes comparison of erosion related studies difficult^{9, 13}.

Tooth wear index (TWI)¹⁴, and its modifications have been widely used in a large number of studies which would suggest widespread acceptance of the index. However, it is believed to be faulty when applied to aging individuals¹⁵.

The TWI is based on studying individual tooth surfaces for amount of tooth structure loss, the variations exist as to the scoring criterion applied. To the best of our knowledge, No study on dental erosion among young children has been undertaken in the UAE.

Materials and methods

A sample of 207 children aged 5 and 6 was selected randomly from private schools in Ajman, U.A.E. Permissions from the school principals' were first sought. The study was approved by the ethical committee in Ajman University of Science & Technology. For sampling purposes, each school was considered to be a homogeneous cluster with no single school being representative of the entire population. Clusters were randomly selected with a probability proportional to the size of the school. Questionnaires were first distributed to the parents of the sample population via the students with the aid of the section supervisor coordination.

A maximum period of one week was allowed for return of the questionnaires. The clinical examinations were coordinated with the school nurses, where the students with parental consents were brought to the schools' clinic for examinations. The erosion was recorded on a form designed for the purpose. The form was identified to the questionnaire via the student name and a serial number. It is important to note that before the clinical step none of the questionnaires were studied to avoid bias in the observations made.

The school clinic was used to conduct the clinical examinations, natural light source was used wherever possible, otherwise an LED (Light emitting diode) light was used for illumination. Individually wrapped mirrors were used to aid the examinations. Cotton rolls had been used to dry tooth surfaces, dental mirrors were used to visually inspect the teeth. The buccal, lingual, and incisal/occlusal surfaces of the primary

molars and canines were assessed for degrees of erosion. Table 1 shows how the extent of erosion was classified based on the work of Millward and co-researchers⁹.

Tooth surface assessment grading	Surface
No loss of enamel surface characteristics	B,L,O,I
Loss of enamel surface characteristics	B,L,O,I
Loss of enamel with visible dentine	B,L,O,I
Loss of enamel and substantial loss of dentine but not exposing pulp or secondary dentine	B,L,O,I
Complete loss of enamel exposing secondary dentine or pulp	B,L,O,I
C- Tooth surface carious	B,L,O,I
R- Tooth surface restored	B,L,O,I
M- Tooth missing	

Table 1. Diagnostic criteria for Tooth Wear Index (after Millward *et al*, 1994). B= buccal or labial,; L= lingual or palatal,; O = occlusal; I= incisal.

The process of contacting schools, questionnaire distribution, and clinical examinations took a period of 2 months to complete. This was accomplished during February and March of 2010. The questionnaire was designed to elicit information on weaning, consumption of fruit juice from a bottle or feeding cup, and consumption of fruit based drinks at bedtime. The consumption of citrus and other fruits, yoghurt, pickles, fizzy drinks, fruit juice was also recorded. A positive history of gastro esophageal reflux, heart burn, recurrent vomiting, acidic taste in mouth, projectile vomiting as an infant, or grinding of teeth was recorded. The questionnaires were designed to collect information, widely believed to contribute to erosion.

Moreover, lifestyle habits such as drinking out of a drinking cup or straw, age of weaning, oral hygiene practices and swimming were studied. A cover page attached to the questionnaires was used to describe to the parents the nature and purpose of the study, and to obtain the parent consent for the clinical examinations. Questionnaires translated into the Arabic language were used in schools where Arabic was the mode of communication.

To enable a correlation between the dental examination and the questionnaire, the dental examination data file was merged with the questionnaire data file to produce one merged data file. Only those children who attended the

examination session and returned a completed questionnaire were included in the analysis. All questionnaires were coded and analyzed using SPSS version 13.0 (Chicago, IL).

Results were expressed as a number and percentage of respondents for each question. Chi-square test was used to evaluate the differences between the different variables and dental erosion, and the level of significance was set at $P < 0.05$.

Results

Data was available for a total of 207 children of whom the mean age was 5.6. The proportion of males was 46.4% and females 53.6%. The prevalence of tooth wear was similar in boys and girls and there was no significant difference between the left and the right sides. The prevalence of wear was 36.7% of children, with one or more teeth with wear involving dentine. On analysis using the SPSS software, a mean enamel loss through to dentine was 2.2 and a standard deviation of 4.55. Table 2 shows the main characteristics of the study population.

Characteristic	Frequency	Percentage
Gender		
Male	96	46.4
Female	111	53.6
Age		
5-year-olds	76	36.7
6-year-olds	131	63.3
Ethnicity		
Arabs	116	56.5
Non-Arabs	90	43.5
Mother Education level		
Secondary education	72	34.8
College graduates	103	49.8
Higher degree	20	9.7

Table 2. Characteristics of study population.

Table 3 depicts that only 12.1% of the sample population had a medical condition and 7.7% used medications. 14.5 % of the reported medical conditions were gastro esophageal reflux and 14.5 % of the children ground their teeth. Of the sample, 169 children (81.6%) were weaned before 12 months, 136 consumed fruit based drinks regularly (65.7%) and 97.1% did not swim or swam only rarely (Table 4).

Characteristic	n	%
Having medical problems	25	12.1
Medications used	16	7.7
Having gastro esophageal reflux	30	14.5
Having recurrent vomiting	9	4.3
Having teeth grinding	30	14.5

Table 3. Characteristics of study population based on medical problems and medications used.

Food/Drink	Consumption frequency (f) and percentage (%)							
	Never		Daily		Weekly		Monthly	
	n	%	n	%	n	%	n	%
Citrus fruit	45	21.7	39	18.8	98	47.3	25	12.1
Other fruit	7	3.4	119	57.5	68	32.9	13	6.3
Yoghurt	10	4.8	112	54.1	75	36.2	10	4.8
Pickled food	125	60.4	7	3.4	36	17.4	39	18.8
Fizzy drinks	72	34.8	14	6.8	68	32.9	53	25.6
Fruit juice or other fruit based drinks	5	2.4	123	59.4	65	31.4	14	6.8
Sports drinks	189	91.3	1	0.5	9	4.3	8	3.9
Sour candy	115	55.6	24	11.6	37	17.9	31	15.0

Table 4. Frequency of food and drinks consumed by children.

Variable	n	(%)	P- Value
Age			0.05
5 years	22	28.9	
6 years	54	41.2	
Did not use straw on drinking acidic drink	45	72.6	0.04
Medication used on regular basis	9	56.3	0.03
Experienced gastric reflux before	15	50	0.04

Table 5. Erosion of enamel through to dentin and associated risk factors.

Bivariate analysis showed a statistically significant relationship between dental erosion and four erosion-related questionnaire variables (Table 5); age ($P=0.05$), non use of straw on drinking sports drink, carbonated drink ($P=0.04$), the use of medication on regular basis ($P=0.03$) and experiencing gastro esophageal reflux before ($P=0.04$).

Discussion

The level of erosion found on the sample population was mostly within the enamel and did not require immediate intervention. This may be due to the fact that 91.3% of the children never consumed sports drinks and only 50-60% consumed any fruit, fruit based juices or yoghurt on a daily basis.

In the current study, the prevalence of wear was 36.7 percent, is greater than the 17-25 percent range observed in previous studies^{9,16}. It may be that children in the UAE have greater exposure to risk factors or may have lower exposure to protective factors (such as fluoride exposure). Alternatively, the finding may be artefactual, reflecting methodological differences in the recording of tooth surface loss and method of recording. Standardized techniques and criteria for measuring tooth surface loss would aid comparison of the outcomes of different studies.

And in agreement with previous studies, there was no difference in the amount of wear between boys or girls¹². Inconsistent with the findings of Johansson *et al*¹⁷, mild erosive loss was observed in children not using a straw regularly for consumption of fruit based drink and that approached significance level.

A major finding of the present study was that there were no associations between tooth wear and frequency of consumption of acidic drinks. This is in consistent with Ayers *et al*¹² who did not observe a relationship between tooth wear and consumption of carbonated drinks or acidic drink among New Zealand children. However, it is in contrast to Al-Daigan *et al*¹⁰ who reported significant association between prevalence of erosion and the consumption of soft drinks and carbonated beverages in a sample of 418 British teenagers. Jarvinen *et al*⁵ also reported a considerable risk of erosion with soft drinks drunk daily.

Other studies have also found associations between tooth wear and consumption of carbonated drinks or fruit-based drinks, particularly at bed time^{9,18}.

This may reflect the different drinking habits of Emirates children compared to other children, or it may reflect the different ages of the participants in the studies, the proportion of children affected by erosion in enamel and dentine has been reported to double between the

age of 8 and 15 years¹⁹. This may reflect an increase in the consumption of fruit juices and carbonated drinks with increasing independence and ability of adolescents to make choices about what they eat and drink. There may be a threshold below which the consumption of low-pH drinks will not cause substantial tooth wear. Our findings suggest that ages 5-6 are too young for low-pH drinks to become apparent as putative risk factors (at least in our relatively small sample).

Lussi *et al*² reinforce our findings of a significant relation between medication use and erosion. Medications such as tranquilizers, anti-histamines, anti-emetics and anti-parkinsonian medicaments or of salivary gland dysfunction can cause xerostomia or oral dryness, reducing the protective action of saliva against erosion. Repeated consumption of chewable Acetyl salicylic acid tablets and hydrochloric acids tablets for treatment of headaches and stomach disorders respectively can cause erosion. In accordance with the result of Wang *et al*²⁰ and Oginni *et al*²¹, dental erosion is observed in patients with GERD.

Cross-sectional studies of teeth wear such as the present investigation can show associations and suggest risk indicators, but cannot identify risk factors (for which a prospective study design is required). Tooth wear is thought to be a multi-factorial process¹, suggesting that most cases of tooth wear will have more than one cause and a predominant cause will not always be detectable.

Further work should be undertaken and research must continue into the development of an index that is universally acceptable and which permits comparison between studies. Research should also focus on potential protective factors so that tooth surface loss can be minimized in both primary and permanent dentitions.

Conclusions

Mild dental erosion is not widely prevalent among resident 5 and 6-year-olds in Ajman, U.A.E., nevertheless, it is clinically insignificant. The leading associated factors demonstrating statistical relations include age, non use of straw, medication and gastro esophageal reflux.

Despite the fact that the erosion revealed was only mild, the primary dentition is highly susceptible to erosive tooth wear and will only

progress with time. Consideration must be given to the actuality, that the primary dentition examined should be maintained till the permanent arrives and this makes prevention and preservation of the primary dentition vital. Hence, the mild erosion may advance to more severe erosion and must under no circumstances be ignored and the patient should be advised accordingly.

Declaration of Interest

The authors report no conflict of interest and the article is not funded or supported by any research grant.

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