Prevalence and Predictors of Dental Erosion in School Children of Karachi Pakistan
Naheed Najmi, Anis Ahmed Bugti, Muhammad Nadeem, Hafsah Hannan, Farzeen Tanwir, Faiza Shafiq

ABSTRACT

Aims: To assess the prevalence of dental erosion and to determine the predictors among school children aged between 12 to 14 years. Venue: A cross sectional study was conducted at a private school of Karachi, Pakistan from April 2011 till March 2012. Materials and Method: The subjects were selected on the basis of non-probability convenient sampling. Children aged 12-14 years were included for this study and children having frequent hospitalizations were excluded. The two previously calibrated examiners participated in the clinical examinations and visited the selected schools. The clinical examinations were performed in well-lit classrooms or in shaded places under natural light using plane mouth mirrors and sterilized cotton to remove debris. The central incisors, lateral incisors, and first molars in the upper and lower jaws were examined. Results: School children were assessed by O’sullivan index which showed dental erosion of 42.8% on labial or buccal surface, 9.7% on lingual or palatal surface, 7.4% on occlusal or incisal, 4% on labial, incisal/occlusal and 7% on lingual, incisal/occlusal surfaces. Grades of severity of dental erosion showed normal enamel in 43.1%, matt appearance of enamel surface with no loss of contour in 20.1% and loss of enamel only in 35.8% and loss of enamel with exposure of dentine in 1%. Conclusion: The study concludes that dental erosion is a multifactorial condition, which with time is becoming increasingly common in younger age group. As health providers it is our responsibility to identify the possible risk factors and make the community aware of the ways to prevent this condition.

Key words: Dental Erosion; School Children; Pakistan; Teeth; Dental caries

Introduction

Dental erosion is the irreversible loss of hard mineralized tooth structure, which results in a chemical etching and dissolution by acids without bacterial involvement.12 It is characterized by partial demineralization and the subsequent loss of an ultra-thin layer of enamel and exposure of the softer dentine every time an acid attack takes place, which results in poor aesthetics, tooth hypersensitivity, dental abscess, severe loss of tooth surface, over closure and consequently reduced chewing function.5,13

Dental erosion is now recognized as commonly occurring attention seeking risk factor in children’s, adults and adolescents and has been on the increase during the last few decades.5-11 If dental erosion is prolonged and left untreated it may involve the destruction of dentin and pulp.5 The erosive structure of tooth often requires preventive and restorative treatment plans, which will add the family and government’s public health burden.11,12

The etiology of dental erosion in children and adolescents is multi-factorial. These factors can be exogenous and endogenous. The exogenous sources can be soft drinks, carbonated beverages, citrus fruits, sports drink, acidic medication, acidic flavored candies, vinegar conserves and acidic herbal teas.13-16 The intrinsic sources include gastro-esophageal refluxes causing erosion of tooth surface due to the interaction of gastric juices with the tooth surfaces.17

There is still lack of awareness regarding dental erosion among adults and school going children. Not only the common people but the dental professionals also confuse the sign and symptoms of dental erosion.18 A recent study conducted in China indicates the prevalence of dental erosion among school children to be 27.3%.19 No significant studies have been conducted in Pakistan to measure the widespread of dental erosion in Pakistan. Early diagnosis and prevention is the need of time therefore this study focuses on the prevalence of dental erosion among school going children in Karachi, Pakistan. This study examined the etiological role of risk factors recognized to be relevant to the onset of dental erosion and socioeconomic status in developed societies faced by school children in Pakistan.

Materials and Method

A cross sectional study was conducted at a private school of Karachi, Pakistan from April 2011 till March 2012. The subjects were selected on the basis of non-probability convenient sampling. Children aged 12-14 years were included for this study and children having frequent hospitalizations were excluded. The sample size calculation was done using the W.H.O. software for “Sample Size Calculation” edited by L. Lemeshow and S.K. Lwanga. The reference study used for this sample size calculation is: Ping Wang, Huan Cai Lin, Jian Hong Chen, Huan You Liang.7 “The Prevalence of dental erosion and associated risk factors in 12-13 year old school children in Southern China.” BMC Public Health. 2010 Aug 12;10:478. The results of this study are valid as confirmed by sample size calculation using W.H.O. software for sample size calculation, where α = 5%, 1- = 90, Po = 0.27, Pa = 0.35, n (sample size) = 282. The researcher recruited 299 subjects to avoid the chances of type 2 errors.

The two previously calibrated examiners participated in the clinical examinations and visited the selected schools. The clinical examinations were performed in well-lit classrooms or in shaded places under natural light using plane mouth mirrors and sterilized cotton to remove debris. The central incisors, lat-
Site on erosion on each tooth (make a Variable of Presence or Absence of erosion)

- Code A: Labial or buccal only
- Code B: Lingual or palatal only
- Code C: Occlusal or incisal only
- Code D: Labial and incisal/occlusal
- Code E: Lingual and incisal/occlusal
- Code F: Multi-surface

Grade of severity (worst score for an individual tooth recorded)

- Code 0: Normal enamel
- Code 1: Matt appearance of the enamel surface with no loss of contour
- Code 2: Loss of enamel only (loss of surface contour)
- Code 3: Loss of enamel with exposure of dentine (enamel-dentin junction visible)
- Code 4: Loss of enamel and dentine beyond enamel dentin junction
- Code 5: Loss of enamel and dentine with exposure of the pulp
- Code 9: Unable to assess (e.g., tooth crowned or large restoration)

Area of surface affected by erosion

- Code -: Less than half of surface affected
- Code +: More than half of surface affected

Form No: _____________________
Name:                                            Age:               Gender: M/F
Education of Parents
Father: School/College/Graduate/Post Graduate
Mother: School/College/Graduate/Post Graduate

Q1: How many times do you brush your teeth daily?
   i) Once or less daily ii) Twice or more daily: Twice

Q2: What is the duration of brushing?
   i) ≤ 1 minute ii) 2 minutes iii) ≥ 3 minutes: 1 min

Q3: What type of beverage do you drink?
   i) Carbonated Drink ii) Sport Drink iii) Fruit Juices
   iv) Others: Coke

Q4: How many times do you drink the beverage?
   i) Once daily ii) Twice daily iii) More than twice daily iv) Less than once: once

Q5: What is the method of drinking?
   i) With straw ii) Without Straw: with straw

Table 1: O’Sullivan index for measurement of dental erosion

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code A Labial or Buccal</td>
<td>128</td>
<td>42.8</td>
</tr>
<tr>
<td>Code B Lingual or Palatal</td>
<td>29</td>
<td>9.7</td>
</tr>
<tr>
<td>Code C Occlusal or incisal</td>
<td>22</td>
<td>7.4</td>
</tr>
<tr>
<td>Code D Labial and incisal/occlusal</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Code E Lingual and incisal/occlusal</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>Code F Multi-surface</td>
<td>52</td>
<td>17.4</td>
</tr>
</tbody>
</table>

Table 3: Prevalence of dental erosion by O’Sullivan index

Table 4: Grade of severity of dental erosion

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal enamel</td>
<td>129</td>
<td>43.1</td>
</tr>
<tr>
<td>Matt appearance of enamel surface with no loss of contour</td>
<td>60</td>
<td>20.1</td>
</tr>
<tr>
<td>Loss of enamel only</td>
<td>107</td>
<td>35.8</td>
</tr>
<tr>
<td>Loss of enamel with exposure of dentine</td>
<td>3</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Table 5: Probability of dental erosion-Binary Logistic Regression Analysis

<table>
<thead>
<tr>
<th>Variables</th>
<th>Odds ratio*</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of tooth brushing in school children with dental erosion</td>
<td>1.75 (1.03-3.00)</td>
<td>0.03</td>
</tr>
<tr>
<td>Duration of brushing in school children with dental erosion</td>
<td>2.24 (1.32-3.79)</td>
<td>0.002</td>
</tr>
<tr>
<td>Type of beverage in school children with dental erosion</td>
<td>1.90 (1.10-3.27)</td>
<td>0.02</td>
</tr>
<tr>
<td>Frequency of beverage consumed in school children with dental erosion</td>
<td>1.93 (1.14-3.25)</td>
<td>0.013</td>
</tr>
<tr>
<td>Method of beverage consumed with straw in school children with dental erosion</td>
<td>2.24 (1.32-3.79)</td>
<td>0.002</td>
</tr>
</tbody>
</table>

* (95% confidence interval)
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The school children completed a questionnaire at the schools prior to the clinical examination. The questionnaire was designed to reflect the socio-economic status, behavioral factors, and general health involved in the etiology of erosion, as proposed by Lussi and in other studies. The pilot study was carried out to test and refine the questionnaire (Table 2).

The questionnaire included questions about general information (gender and age), socio-economic status, occupation and education levels of the parents, oral hygiene habits, frequencies of ingesting certain beverage types, amount of acidic drink intake per week (including carbonated drinks, sport drinks, lemon tea, and fruit juices), special drinking habits, general health (including frequency of vomiting and heartburn or nausea in this study), and vitamin C supplements.

The study data were entered into a computer using SPSS software (version16) and analyzed. Descriptive analysis was conducted to describe the prevalence and characteristics of dental erosion. A two-step approach was used to analyze risk factors of dental erosion. First, bivariate analysis was used to test the relationship between dental erosion and the associated factors. Then, a binary logistic regression analysis was used to analyze the factors that were independently related to the presence of erosion. The variables (p < 0.5) in the bivariate analyses were entered into a logistic regression model in an enter fashion. The level of statistical significance was set at 5%.

Results

School children were assessed by O’sullivan index which showed dental erosion of 42.8% on labial or buccal surface, 9.7% on lingual or palatal surface, 7.4% on occlusal or incisal, 4% on labial, incisal / occlusal and 7% on lingual, incisal / occlusal surfaces (Table 3). Grade of severity of dental erosion showed normal enamel in 43.1%, matt appearance of enamel surface with no loss of contour in 20.1%, loss of enamel only in 35.8% and loss of enamel with exposure of dentine in 1% (Table 4). Area of surface affected by dental erosion showed 26.4% of no area affected, 37.8% in less than half of surface affected and 35.8% in more than half of surface affected (Table 1). Type of beverage consumed showed 30.4% of carbonated drink, 22.7% of fruit juice and 4.7% of sport drink (Bar Chart 02). Frequency of beverage consumed showed 17.4% once daily, 61.5% twice daily and 21.1% more than twice daily (Bar Chart 03).

Frequency of tooth brushing once a day in school children had a high prevalence of dental erosion as compared to school children brushing their teeth more than once respectively (132/299; 44.1% v 167/299; 55.9%, p-value = 0.03). School children tooth brushing once a day had 1.75 times more, (95% CI, 1.03-3.00) the risk of dental erosions as compared to school children tooth brushing more than once. School children tooth brushing less than one-minute duration had a high prevalence of dental erosion as compared to school children tooth brushing more than one minute respectively (165/299; 55.2% v 134/299; 44.8, p-value = 0.002). School children tooth brushing less than one-minute duration had 2.24 times more, (95% CI, 1.32-3.79) the risk of dental erosions as compared to school children tooth brushing more than one minute.

School children consuming carbonated drinks had a high prevalence of dental erosion as compared to school children drinking fruit juices and sport drinks respectively (128/299; 42.8% v 171/299; 57.2%, p-value = 0.02). School children consuming carbonated drinks had 1.90 times more, (95% CI, 1.10-3.27) the risk of dental erosions as compared to school children drinking fruit juices and sport drinks. School children consuming more than once daily beverages had a high prev-
through this study it can be seen that there is a strong role of frequency and duration of tooth brushing in the control of dental erosion. Children brushing their teeth twice daily and for more than one minute have lesser prevalence of dental erosion as compared to those who brush only once and for less than one minute. This is related to the neutralizing and rematerializing effect of the ingredients in a dentifrice. Dietary counseling is of particular importance. This may be tailored to the individual and is only possible after diet has been thoroughly assessed. Instructions such as limiting the acidic foods and drinks to meal time and their avoidance at night times due reduced buffering activity of saliva at night time should be stressed. Habits such as frothing or swishing the drink around the mouth or drinking in small sips should be avoided. Rather the drinks should be consumed quickly to reduce the time for which the acid comes in contact with the teeth. If a straw is used it should be wide bore and kept at the back of the mouth in order to reduce the contact area between the acid and the teeth. After consumption of an acidic food or drink the tooth surface becomes increasingly porous, if at this time tooth brushing is done immediately it would lead to rapid loss of enamel surface, it would be a damage rather than a benefit. Therefore, a delay in brushing of half an hour to an hour will be helpful in preventing tooth surface loss.

Conclusion
It can be seen that dental erosion is a multifactorial condition, which with time is becoming increasingly common in younger age group. As health providers it is our responsibility to identify the possible risk factors and make the community aware of the ways to prevent this condition.

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