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*Full Length Research Paper*

# Dental erosion in patients with gastro esophageal reflux disease (GERD)

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**The aim of this study was to investigate the effects of gastro esophageal reflux disease (GERD) on dental erosion. The study group comprised 140 patients with the average age of 30 to 50 years old. All subjects completed a detailed questionnaire regarding dental and medical situations. Dental examination was performed by two examiners agreement method, and endoscopy was done by a gastroenterologist. Patients were divided into three groups of healthy, suspected of GERD, and with GERD. Data were collected and analyzed by Chi-Square test. The prevalence of dental erosion in GERD patients (22.6%) was found to be higher than suspected (5.3%) and healthy (7%) subjects. This study has showed that GERD patients are at increased risk of developing dental erosion compared to healthy subjects.**

**Key words:** Dental erosion, reflux, heart burn.

## INTRODUCTION

Gastroesophageal reflux disease (GERD) is a situation in which the esophagus is injured or swelled due to the return of stomach acid fluids. Esophagus is located behind the heart, so the term “heart burn” is usually used to describe the condition (Shi et al., 1995). Most of the patients complained of heart burn at least once a month, and a few percent have more incidents even up to once a day. More than 36% of the United States adult population and its prevalence increases after the age of 40, and not only the adults, but also the children and infants, might suffer from the disease (Wienbeck and Bamert, 1989; Sonnenberg and El-Serag, 1999). Stomach produces hydro chloric (HCl) acid in order to digest the foods and the epithelial cells lining its internal surface are protected against this acid by extensive mucosal secretions. Esophageal epithelial cells lack this defensive mechanism and are prone to injury from the acid. In normal conditions, a muscular ring (sphincter) in the lowest end of the esophagus, located at the junction of the esophagus and the stomach, prevents acid from returning upwards. During swallowing, this sphincter is relax, allowing the food enter the stomach. But after swallowing, this sphincter closes the way to prevent the food from returning to the esophagus. In GERD, the sphincter is relaxed even during swallowing, so, stomach fluids containing strong acids, injure esophageal lining cells. Etiology of the problem relates to factors which help relaxing the described sphincter. It includes life style, tobacco or alcohol abuse, obesity, and also some drugs including calcium (Ca) channel blockers, theophilin, nitrates and antihistamines. In addition, some foods like fried foods, chocolates, onion and garlic, caffeinated drinks, acidic food, tomato, sour foods and mint can attribute to the disease. Habits such as high volumes of food intake especially just before sleeping, and diseases such as hiatal hernia, diabetes and pregnancy are also risk factors (Barham et al., 1995).

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Symptoms of GERD include heart burn, acid reflux, difficulty in swallowing (dysphasia) which often worsens after having a meal and lasts for 2 h, although sports or heavy activities do not start or worsen the situation, but sleeping and bending the body downwards will.

GERD has some oral and dental complications and the most common is increased dental erosion (Wienbeck and Bamert, 1989; Sonnenberg and El-Serag, 1999). Dental erosion is irreversible loss of enamel due to the chemical reactions not related to the bacterial actions (Sullivan and Kramer, 1983). Tooth enamel is the hardest substance in the whole body, but it can be dissolved chemically in a solution. Acids causing dental erosion may have originated from the inside of the body (like reflux or vomiting) or from the outside (like acidic drinks or fruits). Unlike attrition which occurs on specific locations, erosion affects all surfaces of the teeth and can lead to discoloration, tooth sensitivity, shortened or rounded teeth, fractured teeth, and even tooth loss.

Dentists often ask the patient's medical history and GERD is in concern because of its dental complications. With the cooperation of the dentist and the gastro-enterologist, in addition to identifying the disease, teeth could be maintained for a longer period of time by an appropriate treatment plan (Lazarchik and Filler, 1997).

## MATERIALS AND METHODS

This study was performed based on:

1. All the patients who were referred to the endoscopy center of the Namazi Hospital, and were visited by two dentists; questionnaire (Appendix 1) was filled by dentists.
2. Then, questionnaire (Appendix 2) was filled by the patient while being observed by an endoscopy center's specialist.
3. Endoscopy was performed for all the patients by a specialist.
4. Questionnaires (Appendices 1 and 2) were evaluated by two dentists and analyzed by a statistics specialist.

Current study evaluated the possible relation between the dental erosion and GERD. 140 patients from department of endoscopy, Shiraz Namazi Hospital were evaluated. Two separate questionnaires were designed for each subject. The first included personal information, oral hygiene, and dental evaluation. Dental evaluation was performed concerning caries, extracted teeth, restored teeth, replaced teeth and gingival bleeding done by two examiners with examiner agreement method. Dental radiographies were not taken and inter-proximal caries were excluded from the study. The second questionnaire included personal information and clinical data regarding reflux. The gastroenterologist after endoscopy, divided the patients into three groups – healthy (71 subjects), suspected to reflux (38 subjects), and having reflux (31 subjects).

After coding the questionnaires, data were transferred to the SPSS (statistical package for social science) software for analyze by chi-square test. Also, statistical analyses including cross tabulation test were done to compare the variants and discover the correlations. The statistical significance was defined as $P<0.05$.

## RESULTS

In the first group, 5 patients (7%) had dental erosion whereas the number of subjects having dental erosion in the second and third group was 2 (5.3%) and 7 (22.6%), respectively (Table1). Among the 3 groups, according to chi-square test, the P-value was less than 0.05 in group 3, indicating the statistical relationship between the reflux and dental erosion, meaning that if a patient has GERD, the risk of dental erosion will increase (Table 2 and Figure 1).

## DISCUSSION

Acid have destructive effects on the tooth structure and can be originated from intrinsic or extrinsic sources. If the acid contacts the tooth for a longer period than the tolerance of the enamel, enamel will be demineralized and the process is called dental erosion. Dentists discovered long ago that children suffering from reflux and recurrent vomits have this lesion and this has been observed in adults too. In a study by Ersin et al. (2006) on GERD effect on dental erosion, caries and saliva on 38 children, it was found that in the patients having GERD, incidence of erosion, salivary yeast and MS colonization was apparently higher than the normal population, in agreement with current study on adult subjects. Dental Practice Education Research Unit (2003) in a recommended oral care program has stated that patients with dental erosion of intrinsic origin often suffer from GERD and are under treatment, suggesting these lesions should be treated. David (2006) believes that GERD can occur at any age and might cause erosion of the enamel because of hydrochloric acid contact with the enamel when the stomach contents return into the mouth. Family Gentle Dental Care (2008) has also agreed to our findings. American Dental Association (2008) named some factors which start or worsen dental erosion: drinks, GERD and maintaining aspirin and vitamin C tablets in the mouth for long periods of time. According to Moazzez (2005), acid reflux in GERD patients can lead to erosion, and gum chewing which increases swallowing cycles, can help empty esophagus and thus reduce acidic postprandial esophageal reflux. In spite of most dentists who believe GERD as the major etiologic factor in formation of dental erosion, results from studies are difficult to compare because of scoring system, samples, and examiners. Males have more dental erosions than the females and maxillary anterior teeth are the mostly affected teeth (Academy of General Dentistry [AGD impact], 2007).

Imfeld (1996) has suggested the prevention of dental erosion by reducing acidic foods consumption, increasing saliva, fluoride administration, having foods with buffering activity, not to use materials and instruments which may erode the teeth and finally, appropriate restorations. Chu et al. (2002) have also evaluated treatment modalities for erosion with regard to the clinical and material considera-tion in order to achieve healthy, esthetic and functional teeth. Yip et al. (2002) have showed that erosion in the

**Table 1.** Reflux* erosion cross tabulation.

| Reflux | | Erosion | | Total |
|---|---|---|---|---|
| | | 0 | 1 | |
| Group 1 | Count | 66 | 5 | 71 |
| | % within reflux | 93.0 | 7.0 | 100.0 |
| | % within erosion | 52.4 | 35.7 | 50.7 |
| | % of total | 47.1 | 3.6 | 50.7 |
| | Residual | 2.1 | -2.1 | - |
| Group 2 | Count | 36 | 2 | 38 |
| | % within reflux | 94.7 | 5.3 | 100.0 |
| | % within erosion | 28.6 | 14.3 | 27.1 |
| | % of total | 25.7 | 1.4 | 27.1 |
| | Residual | 1.8 | -1.8 | - |
| Group 3 | Count | 24 | 7 | 31 |
| | % within reflux | 77.4 | 22.6 | 100.0 |
| | % within erosion | 19.0 | 50.0 | 22.1 |
| | % of total | 17.1 | 5.0 | 22.1 |
| | Residual | -3.9 | 3.9 | - |
| Total | Count | 126 | 14 | 140 |
| | % within reflux | 90.0 | 10.0 | 100.0 |
| | % within erosion | 100.0 | 100.0 | 100.0 |
| | % of total | 90.0 | 10.0 | 100.0 |

Group 1: healthy; Group 2: suspected to reflux; Group 3: having reflux.

**Table 2.** Chi-square tests.

| Variable | Value | df | Asymp. Sig. (2-sided) | Exact Sig. (2-sided) | Exact Sig. (1-sided) |
|---|---|---|---|---|---|
| Pearson chi-square | 7.002[a] | 1 | 0.008 | - | - |
| Continuity correction[b] | 5.322 | 1 | 0.021 | - | - |
| Likelihood ratio | 5.929 | 1 | 0.015 | - | - |
| Fisher's exact test | - | - | - | 0.015 | 0.015 |
| Linear-by-linear association | 6.952 | 1 | 0.008 | - | - |
| No. of valid cases[b] | 140 | - | - | - | - |

[a]1 cell (25.0%) that have expected count less than 5. The minimum expected count is 3.10; [b]Computed only for a 2×2 table.

United States is less common than the United Kingdom and Europe, and is a major factor in tooth destruction in young population. They discovered acidic foods and reflux from the stomach as primary etiologic factors for emphasizing on prevention rather than treatment.

## Conclusion

This study was performed to evaluate oral manifestations, especially dental erosion in relation to GERD in Shiraz Namazi Hospital to which many patients are referred from

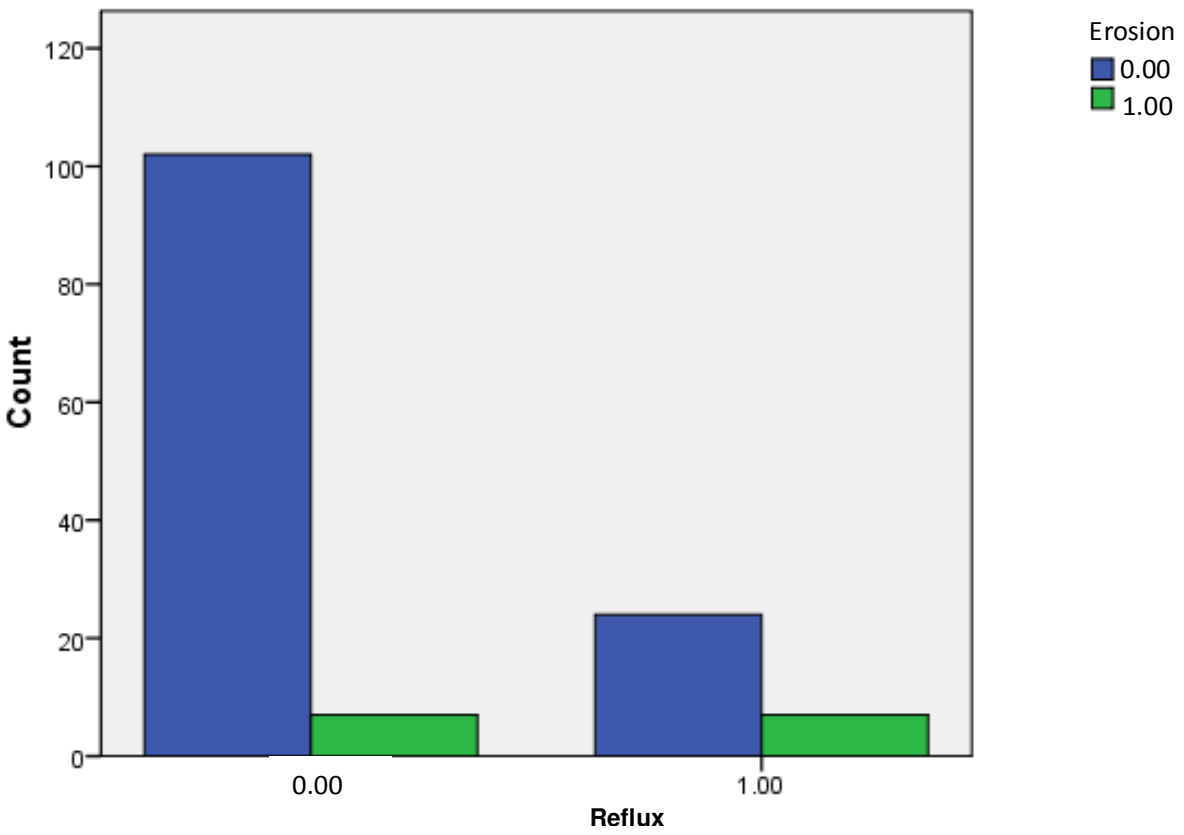


**Figure 1.** Chi-square bar chart.

local and neighboring cities. In this study, 22.6% of subjects with GERD also had dental erosion, and with p value of less than 0.05, a statistical relationship was found between GERD and dental erosion.

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**Appendix 1**

First Name: Last Name: Date of birth:

Age: occupation: Degree of education: Place of birth:

1. How many times you brush your teeth during a day?

One time □ two times □ sometimes □ I don't brush my teeth □

2. How many times do you use mouthwash during a week?

One time □ two times □ sometimes □ I don't use mouthwash □

3. How many times do you go to a dentist during a year?

One time □ two times □ more than two times □ never □

4. Have you ever been under radiotherapy?

Yes □ No □

5. Which drugs do you consume?

| | | |
|---|---|---|
| Caries: | NO □ | Yes □ |
| Erosion: | NO □ | Yes □ |
| Filling: | NO □ | Yes □ |
| Extraction: | NO □ | Yes □ |
| Partial: | | |
| Denture crown: | NO □ | Yes □ |
| Bleeding while brushing: | NO □ | Yes □ |
| Smoker: | NO □ | Yes □ |
| Drink coke: | NO □ | Yes □ |
| Systemic disease: | NO □ | Yes □ |

**Appendix 2**

Name and last name…… Cod: ……

| |
|---|
| 1. Sex: 1- Male □ 2- Female □ |
| 2. Age: …….. date of birth |
| 3. Marital status 1- unmarried □ 2- married □ |
| 4. Address: |
| 5. Do you suffer regurgitation (Heart burn)? 1- Yes □ 2- No □ |
| 5/1. If yes, for how long?<br>Months…… years…….. |
| 5/2. If yes, how many times?<br>1. Once and more daily 2. 3 to 6 times a week 3. Once or twice a week<br>4. Once or more a month 5. Less than once a month |
| 5/3. If yes, fill the questionnaire: |

| Complaint | Negative | Positive | | |
|---|---|---|---|---|
| | | Mild | Moderate | Severe |
| Heart burn | | | | |
| Acid reflux | | | | |
| Food reflux | | | | |
| Heart burn without cardiac involvement | | | | |
| Problem in swallowing | | | | |
| Odynophagial | | | | |
| Diurnal | | | | |
| Vomiting | | | | |
| Nocturnal apnea | | | | |
| Chronic sore throat | | | | |
| Nocturnal coughing | | | | |
| Nocturnal dyspnea | | | | |
| Whizzing | | | | |

Mild: There is no need for treatment; Moderate: Treatment is required but daily activities are not affected; Severe: Permanent treatment is required, daily activities are inhibited.