

**A case control study to evaluate the prevalence of dental erosion in patients with gastroesophageal reflux disease.**

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**Abstract**

**Background:** GERD is an involuntary muscle relaxing of the upper esophageal sphincter, which allows refluxed acid to move upward through the esophagus into the oral cavity. This refluxed acid content, composed of acid, pepsin, bile salts, and trypsin could damage the oral tissues that are not adapted to its harmful potential.

**Aim:** To study the prevalence of dental erosion in patients with gastroesophageal reflux disease

**Settings and Design:** The samples of this study were selected from the endoscopy center in Chidambaram.

**Method and Material:** The samples were divided into two groups. Group A consisted of 15 subjects diagnosed of having gastroesophageal reflux disease selected from the outpatients who visited the private endoscopy center.

Group B (control group) consists of 15 age and sex matched asymptomatic individuals diagnosed as not having gastroesophageal reflux disease by upper gastroesophageal endoscopy. Upper gastroesophageal endoscopy and thorough intra oral examination was done and recorded on a standard performa.

**Statistical Analysis:** Prevalence of dental erosion in group A and B was estimated and compared. Correlation of the progression of dental erosion with increasing severity of gastroesophageal reflux disease was done using chi-square test.

**Result:** The correlation of the severity of dental erosion in increasing severity of GERD (0.4373) was not significant. Therefore, there is no association between the severity of dental erosion in increasing severity of GERD

**Conclusion:** Patients affected with gastroesophageal reflux disease have an increased prevalence of dental erosion.

**Keywords:** Dental Erosion, Gastroesophageal Reflux, Prevalence

### **Introduction**

Acids when introduced into the oral cavity from intrinsic or extrinsic sources causes dissolution of mineralized tooth structure. Extrinsic causes include the intake of acidic beverages and medications or environmental acids. Intrinsic causes include gastric acids regurgitated into the esophagus and mouth in gastroesophageal reflux disease and excessive vomiting related to eating disorders.

Dental erosion is one among the common oral manifestation of gastro oesophageal reflux disease (GERD), which is characterized by irreversible loss of dental hard tissue by a chemical process that does not involve bacteria.<sup>1</sup>

In adults, GERD is a highly prevalent disease with rates ranging from 21% to 56% in different countries. Pyrosis and regurgitation associated with an acid or bitter taste in mouth are the typical symptoms of GERD whereas the atypical symptoms include chest pain, chronic hiccup, sore throat, hoarseness, chronic cough, otitis media, asthma, recurrent pneumonia, reflux laryngitis, globus sensation and dental erosion<sup>2</sup>

The degree of dental erosion in GERD patients depends upon how long the disease has been present, the frequency and quantity of regurgitation. Other causes of erosion such as dietary acids should also be considered.<sup>3</sup> Several factors such as frequent vomiting associated with alcoholism, bulimia, intake of medications like aspirin, chewable vitamin C tablets are known to contribute to enamel erosion. Dental erosion occurs at a pH of approximately 5.5, which is on the acidic side of the neutral point, and may vary depending on the concentrations of calcium and phosphate ions with the

saliva.<sup>4</sup> If wear from other factors such as attrition is occurring at the same time as the erosion, the tooth wear will be increased. Regressive changes like erosion, attrition and abrasion are synergistic and can be responsible for the lose of tooth structure.

During the reflux, acid attacks affects the palatal surfaces of the upper incisor teeth first and later on if the condition persists erosion occurs on the occlusal surfaces of the posterior teeth in both arches. Erosion of the labial or buccal surfaces results from an even more prolonged period of acid reflux. The force of the regurgitation passes the acid from the pharynx into the oral cavity and propels the gastric fluid forward causing damage to the palatal surfaces of the maxillary teeth. It can also be suggested that the palatal surfaces are relatively remote from the major salivary glands and tongue can involve in the process by maintaining contact of the gastric fluid against palatal surfaces of the teeth. In early stages, lower teeth are mostly not affected as tongue provides protection to them. In more severe cases however, the protection from the tongue is overwhelmed and the pattern of erosion may be more widespread, usually with the occlusal and buccal surfaces of the lower teeth being eroded next.<sup>5</sup>

Dental erosion has been reported with varying prevalence's in different general population and may be as high as 42%.<sup>6</sup> It is difficult to compare prevalence studies because of the different indices used in various studies and also because of the different teeth assessed in the sample.<sup>5</sup> Only a handful of studies were conducted in the past to access the prevalence of dental erosion in GERD patients, probably due to difficulty in getting the samples. To the best of my search, no such studies were reported from India. The results of previous studies were also variable which can either be due to low sample size or due to bias in sample selection.

Hence, in this study an attempt is made to evaluate the prevalence of dental erosion in patients affected with Gastroesophageal reflux disease.

### Materials and Methods

This study was conducted during the period of 2008 to 2010 in the Department of Oral Medicine and Radiology, Rajah Muthiah Dental College and Hospital, Annamalai University, in collaboration with a private endoscopy center in Chidambaram to evaluate the prevalence of dental erosion in patients with gastro esophageal reflux disease.

The samples of this study were selected from a private endoscopy center in Chidambaram. The samples were divided into two groups. Group A consisted of 15 subjects diagnosed of having gastroesophageal reflux disease selected from the outpatients who visited the private endoscopy center. Group B (control group) consists of 15 age and sex matched asymptomatic individuals diagnosed as not having gastroesophageal reflux disease by upper gastroesophageal endoscopy.

Patients selected for the study were explained in detail about the condition affecting their oral cavity. A formal informed written consent was obtained from all the patients. Only those patients who agreed for endoscopy and intraoral examination were selected to participate in the study. Subjects diagnosed of having gastroesophageal reflux disease undergoing gastroesophageal endoscopy were included in the study and those with eating disorders were excluded from the study.

A detailed case history of the patient with emphasis on their complaints related to gastro oesophageal reflux disease was taken. Upper gastroesophageal endoscopy and thorough intra oral examination was done and recorded on a standard performa.

Patients were instructed to avoid food for 6hrs before procedure. Endoscopy unit used in this study is Olympus Evis CLV- U40 endoscopy machine. Upper gastroesophageal endoscopy was performed in all the patients agreed for the study. The endoscopy was performed with the patient in left lateral position. The gastroscope was passed through the mouth guard and systematic examination of the whole length of esophagus, the entire stomach and upper duodenum was carried out. The geometry of the gastroesophageal valve was assessed with the endoscope. The presence and appearance of the gastroesophageal flap valve was graded as I through IV according to the classification of Hill et al.<sup>7</sup>

- Grade I: Presence of a prominent fold of tissue closely approximated to the shaft of the endoscope and extending 3–4 cm along the lesser curve at the entrance of the esophagus into the stomach.
- Grade II: In cases where there was a less prominent fold of tissue with occasional periods of opening and rapid closing around the endoscope with respiration.
- Grade III: Patients without a prominent fold where the endoscope was not tightly gripped by the tissues.
- Grade IV: Patients with a large hiatal hernia and essentially no fold where the lumen of the esophagus gaped open, allowing the squamous epithelium to be viewed from below.

Patient underwent upper gastroesophageal endoscopy were subjected to intra oral examination to assess the presence, absence and severity of dental erosion. Dental erosion was accessed with Eccles and Jenkins<sup>8</sup> dental erosion scale which grades the presence and absence of dental erosion as grade zero to three.

- Grade 0: No involvement
- Grade 1: Loss of surface features giving a smooth, glazed appearance (no involvement of the dentin)

- Grade 2: Involvement of the dentin for less than one third of the tooth surface
- Grade 3: Involvement of the dentin for more than one third of the tooth surface

The data obtained were statistically analyzed. Prevalence of dental erosion in group A and B was estimated and the prevalence of dental erosion among group A and group B were compared. The progression of dental erosion with increasing severity of gastroesophageal reflux disease was correlated and statistically analyzed using chi-square test.

### Results

Majority of the respondents in the group A were above 30 years (80%). Majority of patient's included in the study were males in Group A (53.3%) and Group B (73%).

Considering the GERD grading among participants, 13.3 % patients belonged to GERD grade 1, 13.3 % belonged to Grade 2, 26.7 % to Grade 3 and 46.7 % to Grade 4 whereas all participants in Group B exhibited normal Endoscopy study(**Table 1**)

**Table 2** shows the prevalence of dental erosion among the participants. 66.7% patients of Group A exhibited Grade 0 erosion, 13.3% Grade 1, 13.3% Grade 2 and 6.7% patients exhibited Grade 3 whereas 93.3 % of patients in Group B exhibited Grade 0 erosion and 6.7% exhibited Grade 1 erosion

The correlation of the severity of dental erosion in increasing severity of GERD is statistically analyzed using chi-square test. The obtained P value (0.4373) was not significant. Therefore there is no association between the severity of dental erosion in increasing severity of GERD

### Discussion

Dental erosion is a regressive change which should be considered important while taking into account about the long term health of the dentition. The predisposing factors considered include endogenous factors such as the acids regurgitated in patients suffering from gastroesophageal

reflux disease and also in patients with bulimia; and exogenous chemical factors from low pH substances, like citrus fruits. The health of the dentition will be compromised for the entire lifetime because of early erosive damage to the permanent and might require extensive intervention. Therefore, the early diagnosis of the tooth wear and its underlying predisposing factors is of great importance.

Only few studies have been conducted to evaluate the prevalence of dental erosion in patients with GERD. The results obtained from these studies are variable and can be attributed to different indices adopted in different studies and due to bias in the sample selection.

In our study we selected the patients who came for upper gastroesophageal endoscopy to a private endoscopy clinic in Chidambaram. 15 patients who are diagnosed to have gastroesophageal reflux disease were included as subjects (Group A). Control group (Group B) included 15 patients who had a normal endoscopy report. Patients with eating disorders were excluded from the study.

In this study the mean age of the patients in study group was 41 years. Majority of the patients belonged to the age group of above 30 years (80%). Few previous studies also showed similar age distribution among GERD patients. Notable among them are studies by Schroeder et al (49 years)<sup>8</sup>, Maria Alves et al (37.1 years)<sup>2</sup> and Adeleke et al (38 years)<sup>9</sup>

In our study 53.3% of subjects in group A were male and 46.7% were females. This gender distribution was in agreement with Adeleke et al<sup>9</sup> and Micheal .A. Siegel.<sup>10</sup> But a study conducted by Schroeder et al<sup>8</sup> showed definite female predilection (73.3% females and 26.7% males). Where as in a study conducted by Maria Alves et al<sup>2</sup> 64.5% of subjects were male and 35.4% of subjects were females. This variation in gender distribution may be due to smaller sample size or geographic variations.

Different diagnostic methods were adopted for diagnosis and grading of GERD in different studies. In our study we followed gastroesophageal endoscopy and the grading criterion used was Hills criteria<sup>7</sup>. In a study conducted by Schroeder et al<sup>8</sup>, the diagnostic method followed is 24-hour pH testing. Where as in a study conducted by Maria Alves et al<sup>2</sup> the diagnostic method used was gastroesophageal endoscopy and the grading criterion used was Savary and Millers criteria. Thus, there was lack of uniformity in the GERD grading of different studies.

GERD grading in study group was as following, 13.3% of patients had grade I, 13.3% of patients had grade II, 26.7% of patients had grade III and 46.7% of patients had grade IV. Among control group all the patients showed normal study.

In our study dental erosion grading system followed was Eccles and Jenkins tooth wear index. The same index has been followed by Schroeder et al<sup>8</sup>. Whereas in other studies such as Moazzez Rebecca et al<sup>11</sup> and Geng-Ru Wang et al<sup>12</sup> the index adopted was smith and knight tooth wear index. In our study, among the study group, 66.7% had grade 0 dental erosion, 13.3% had grade 1 dental erosion, 13.3% had grade 2 dental erosion and 6.7% had grade 3 dental erosion. Among the control group 93.3% had grade 0 dental erosion and 6.7% had grade 1 dental erosion. Thus our study showed prevalence of 33.3% erosion in the study group. Among the control group the prevalence was 6.7%. There was statistically significant difference (P value: 0.000) in the prevalence of dental erosion between two groups. In a study conducted by Schroeder et al<sup>8</sup>, 40% of subjects had dental erosion which was high when compared to our study. This difference may be because of the age factor. Mean age of patients in our study is 41 where as in Schroeder et al<sup>8</sup>, study the mean age was 49.

Prevalence of dental erosion in GERD was assessed by various authors around the globe. However, on literature review we could not find any such studies reported from India. In a study conducted by Schroeder et al<sup>8</sup> the prevalence rate was 40%. Whereas Jarvinen et al<sup>13</sup>, studied the prevalence of dental erosion in 109 patients with gastrointestinal symptoms and found that 7 of 35 patients (20%) with GERD has dental erosion.

In a study conducted by Adeleke et al<sup>9</sup>, the prevalence of dental erosion was 16% (20 subjects out of 125 had dental erosion). In this study the tooth wear index used was Smith and Knight whereas in our study we adopted Eccles and Jenkins tooth wear index. The different indices used in both studies and the low sample size in our study can be a reason for the variation in prevalence rates of dental erosion.

Studies by various authors showed varying prevalence of dental erosion ranging from 16 % to 40%. The wide variation among results can be explained by several factors, such as the frequency of regurgitation, the duration of GERD and friction caused by the tongue. According to Hellström et al, Ruff et al, and Stafne et al the clinical manifestation of dental erosion occurs only when the acid comes in contact with the teeth several times a week for at least 1 to 2 years.

In our study we correlated the severity of dental erosion in increasing severity of GERD using chi- square test. There was no statistically significant correlation between these parameters(p value of 0.4373). In a study conducted by Geng – Ru Wang et al<sup>12</sup>, the authors concluded that dental erosion is more prevalent in patients with frequent symptoms of GERD than those with infrequent or without symptoms.

The lack of correlation seen between severity of dental erosion and increasing severity of GERD in this study



may be due to uneven number of patients in each GERD grades.

Almost all the previously conducted studies have concluded that there is a significant increase in prevalence of dental erosion in GERD patients whereas association between GERD and other factors such as altered pH, buffering capacity and salivary flow was not found to be significant.<sup>2,8</sup> Hence we excluded parameters like altered pH, buffering capacity and salivary flow from our study.

There are two limitations, which we observe in this study. First is the sample size, which is inadequate for a prevalence study and the other is the lack of uniformity of patients in different GERD grading.

Figure 1: Severe dental erosion in the maxillary arch of a GERD patient



Figure 2: Severe dental erosion in the mandibular arch of a GERD patient



Table 1: Frequency of GERD Grading among participants

GERD Grading		N	Percentage
Group A	Grade I	2	13.3
	Grade II	2	13.3
	Grade III	4	26.7
	Grade IV	7	46.7
	Total	15	100.0
Group B	Grade I	0	0
	Grade II	0	0
	Grade III	0	0
	Grade IV	0	0
	Normal study	15	100.0

Table 2: Prevalence of dental erosion Grading among participants

Dental Erosion Grading		N	Percentage
Group A	Grade 0 (Normal)	10	66.7
	Grade 1	2	13.3
	Grade 2	2	13.3
	Grade 3	1	6.7
	Total	15	100.0
Group B	Grade 0 (Normal)	14	93.3
	Grade 1	1	6.7
	Grade 2	0	0
	Grade 3	0	0
	Total	15	100.0

Table 3: Correlation of the severity of dental erosion in increasing severity of GERD (Group A)

Dental erosion grading							P-value
Gerd grading		Grade 0	Grade 1	Grade 2	Grade 3	Total	P>0.01
	Grade i	2	0	0	0	2	
	Grade ii	1	0	0	1	2	
	Grade iii	2	1	1	0	4	
	Grade iv	5	1	1	0	7	
	Total	10	2	2	1	15	

## Conclusion

Prevalence of Dental erosion in GERD group was 33.3% and that in control group was 6.7%. The difference in prevalence was statistically significant (P value: 0.000). There was no statistically significant correlation between severity of dental erosion and increasing severity of GERD (P value: 0.4373). Lack of correlation seen between severity of dental erosion and increasing severity of GERD in this study may be due to uneven number of patients in each GERD grades. Thus patients affected with gastroesophageal reflux disease have an increased prevalence of dental erosion. Hence dental erosion can be used as a diagnostic indicator for gastroesophageal reflux disease

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