

# GASTROESOPHAGEAL REFLEX DISEASE (GERD) AND DENTAL EROSION

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## ABSTRACT

*Gastroesophageal reflux (GER) is the passage of gastric contents into the esophagus, and GERD is defined as symptoms or complications of GER.*

*The most common extra oral manifestation of GERD is tooth surface loss, a progressive, irreversible loss of dental hard tissues due to a chemical process not involving bacteria. Dentists are often the first health care personnel to diagnose dental erosion in patients with gastroesophageal reflux disease (GERD)*

*Permanent incisors and first permanent molars of 210 patients having age 06 years and above were examined. Patients were asked to fill the questionnaire containing questions about previous history of gastroesophageal reflux disease. Community periodontal index & treatment need (CPITN) probe was run over labial, occlusal and lingual surfaces of incisors & molars, to check for loss of enamel surface. Out of 210 patients examined, 39 were (18.57%) having GERD. Out of 39 patients only one (2.56%) patient had less than one third of the enamel surface involved. 13(33.3%) patients should teeth between one third and two third of the surface involved. 14(35.9%) patients had more than two third surface involved and in 6(15.4%) patients, assessment was not possible.*

*Gastroesophageal reflux disease (GERD) is an increasingly common and potentially serious condition, with various extraesophageal adverse health effects that dental practitioners should be aware of. Clinicians should also be aware of the predisposing risk factors for GERD and its classical esophageal and extraesophageal symptoms and signs.*

*This study determined the GERD patients were at higher risk of developing dental erosion compared to the healthy individuals in a sample of Pakistani population.*

**Key Words:** *Tooth erosion, gastroesophageal reflex, Tooth wear index.*

## INTRODUCTION

Gastroesophageal reflux (GER) is defined as a normal, physiologic retrograde flow of gastric contents into the esophagus that occurs mostly postprandial (after meals) for around one hour per day.<sup>1,2</sup> A GER episode is diagnosed when esophageal pH drops below 4.0 for at least 30 seconds. GER does not produce gastric symptoms or mucosal damage, but can progress into a clinical disorder termed gastroesophageal reflux disease (GERD), usually characterized by symptoms of heartburn and acid regurgitation.<sup>3,4</sup>

The increasing prevalence of gastroesophageal reflux disease (GERD) in children and adults and of “silent refluxers” in particular, increases the responsibility of dentists to be alert to this potentially severe condition when observing unexplained instances of tooth erosion.<sup>5</sup> The prevalence of GERD in Pakistan is about

24% according to one study while another study shows that 48.4% of the total subjects involved were having GERD.<sup>6</sup>

Although gastroesophageal reflux is a normal physiologic occurrence, excessive gastric and duodenal regurgitation combined with a decrease in normal protective mechanisms, including an adequate production of saliva, may result in many esophageal and extra esophageal adverse conditions. Clinical appearance of dental erosion includes broad concavities on smooth surface enamel and increased incisal translucency, which can have undesirable esthetic implications.<sup>7,8</sup>

One of the study revealed that the prevalence of GERD in less than 20 years was 4.4%, which was approximately one-third of the rate in adults (11.6%).<sup>9</sup>

Erosion begins as superficial demineralization of the enamel, which can cause dissolution of the subsurface layers and eventual loss of tooth structure. Any acid with a pH below the critical pH of dental enamel (5.5) can dissolve the hydroxyapatite crystals in enamel. Gastric reflux has a pH of less than 2.0 and thus has the potential to cause dental erosion. In vitro exper-

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imental erosion has been shown to occur at an oral pH of less than 3.7. Loss of enamel can lead to dentin exposure and hypersensitivity, even progressing as far as pulp exposure in some extreme cases. The loss of tooth surface is disproportionate to the age of the subject, although dental erosion is acknowledged as a major cause of tooth wear in children.<sup>10,11,12</sup>

Risk factors for dental erosion may be divided into intrinsic and extrinsic types.<sup>13,14</sup> Intrinsic causes are associated with gastric acids, and may present intra-orally following vomiting, regurgitation, gastro-esophageal reflux disease (GERD) or rumination.<sup>3,4</sup> Direct contact of regurgitated gastric acid is considered to be the main mechanism of dental erosion in the patients with GERD.<sup>15</sup>

Tooth wear and GERD are two conditions that have been reported to be related. GERD is a common condition affecting approximately 60% of the population. Saliva has an important role in the clearance of acid in the esophagus. This is true both for healthy individuals and patients with GERD.<sup>16</sup>

The clinical diagnosis of dental erosion must distinguish acid-induced hard tissue loss from other forms of tooth wear, such as attrition, abrasion or abfraction. The diagnostic procedure aims to classify wear based on clinically observed morphological features.<sup>17</sup> A number of indices have been proposed to diagnose and quantify dental erosion, but there is a need for standardization of indices and for the development of practical diagnostic tools.<sup>7</sup>

The rationale of this study was to find out correlation between dental erosion and GERD. This study was designed to assess the prevalence and hence the extents of the problem of tooth wear in a group of patients presenting with symptoms of gastro-esophageal reflux disease to OPD of the Punjab dental hospital, Lahore. This study might be helpful in the assessment of GERD as possible risk factor in the development of dental erosion in our region.

## METHODOLOGY

All the cases were randomly selected from OPD of the Punjab Dental Hospital, Lahore, Pakistan. An informed consent was obtained. Patients or parents were asked to fill a questionnaire regarding signs and symptoms of GERD. The demographic information like name, age, sex, address was recorded. Intra oral examination was performed clinically in a standardized manner using a dental unit head light for positive signs of dental erosion. Confounding variables like gender, socioeconomic status, bruxism, congenital anomalies (Chronological Hypoplasia etc) and extrinsic risk factors for dental erosion were controlled by matching.

A special investigation was carried out by using CPITN probe that was run over the tooth to check for loss of enamel surface. All this information was collected through a specially designed proforma. Patients were divided into three groups. Group I (06 to 12 years), Group II (13 to 18 years), Group III (19 to 90 years). The teeth examined include permanent incisors and first permanent molars.

Labial and lingual surfaces were examined for incisors while buccal, occlusal & lingual surfaces on molars. All restored surfaces were excluded. A score 9 was only recorded if the assessment could not be possible due to calculus or heavy restoration. The cervical, buccal/labial, occlusal/incisal and lingual/palatal surfaces of each tooth were examined in the same order for each patient and data was recorded.

The erosion index used was based upon that from the 1993 survey of children's dental health with erosion being diagnosed on the basis of visual examination and the use of CPITN probe<sup>7</sup> which was run over the tooth surface to check for the loss of enamel surface characteristics.

Codes for Tooth Wear Index are as follows:<sup>20,7</sup>

<b>Depth: 0</b>	<b>Normal</b>
1	Loss of enamel surface characteristics
2	Loss of enamel exposing dentin
3	Loss of enamel and dentin exposing pulp
9	Assessment could not be possible
<b>Area: 0</b>	<b>Normal</b>
1	Less than one third of surface involved
2	Between one and two thirds of surface involved
3	More than two thirds of surface involved
9	Assessment could not be possible

The collected information was entered in SPSS version 15.0 and analyzed. Descriptive statistics were calculated. The variables analyzed include demographic (age, sex), GERD and Tooth Wear Index. The age was presented as Mean  $\pm$  SD. Sex, GERD and Tooth Wear Index were presented as percentages. The Tooth Wear Index was measured on the basis of depth and area.  $P \leq 0.05$  was taken as significant.

## RESULTS

The age of the subjects ranged from 6 to 90 years. Most of the cases were around age 18 years (44.7%). The Mean age was  $19.28 \pm 12.85$  (Table 1).

There were 93 males (44.3%) and 117 females (55.7%). The distribution of cases according to Gender is shown in Fig 1. Out of 210 patients, 39 (18.57%) patients

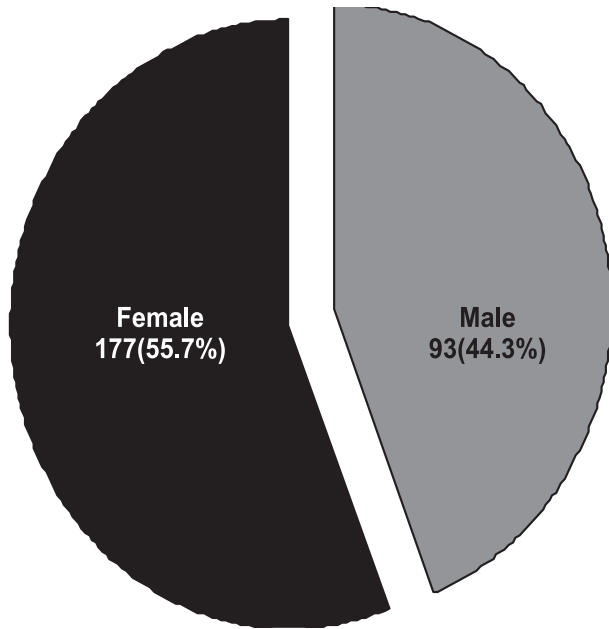


Fig 1: Percent distribution of gender

TABLE 1: DISTRIBUTION OF CASES ACCORDING TO AGE WITH MEAN & STANDARD DEVIATION

Age (Years)	Number	Percentage
10 or less	47	22.3
11 – 19	94	44.7
20 – 29	34	16.1
30 – 39	16	7.60
40 – 49	8	3.80
50- 59	6	2.85
60- 90	5	2.38
Total	210	100

Mean Age, SD. 19.28 ± 12.85 Years

TABLE 2: DISTRIBUTION OF DEPTH OF EROSION IN PERMANENT INCISORS AND GERD

Depth of erosion in permanent incisor	GERD present	GERD absent	Total
Normal	00	00	00
Loss of enamel surface characteristics	12	105	116
Loss of enamel exposing dentin	27	64	91
Loss of enamel & dentin exposing pulp	00	00	00
Assessment could not be made	00	02	02
Total	39	171	210

P value is 0.004

TABLE 3. DISTRIBUTION OF AREA OF EROSION IN FIRST PERMANENT MOLAR AND GERD

Area of ersion in first permanent molar	GERD Present	GERD Absent	Total
Normal	05	47	52
Less than one third surface involved	01	19	20
Between one third & two third surface involved	13	55	68
More than two third surface involved	14	19	33
Assessment could not be made	06	31	37
Total	39	171	210

P value is 0.001

TABLE 4: DISTRIBUTION OF DEPTH OF EROSION IN PERMANENT INCISORS & AGE OF THE PATIENT HAVING GERD, N=39

Depth of erosion in permanent incisor	Age of the patient		
	6-12 years	13-18 years	19-50 years
Normal	00	00	00
Loss of enamel surface characteristics	02	05	05
Loss of enamel exposing dentin	01	15	11
Loss of enamel & dentin exposing pulp	00	00	00
Assessment could not be possible	00	00	00
Total	03	20	16

The study was carried out during the morning and afternoon. It was not feasible within the confines of the study to assess salivary flow rate and buffering capacity in patients. Dental erosion occurs once the acid comes in contact with the teeth.

It has been reported that the prevalence of dental erosion in patients with GERD varies from 5.00% to 65% which was comparable to the present study having a prevalence of 18.9%.<sup>23-25</sup>

GERD is a common condition, estimated to affect 7% of the adult population on a daily basis and 36% at least one time a month which is comparable to this study showing 51.3% cases in adult population in six months data. Several studies have reported erosion of primary and permanent teeth in children with GERD,

were diagnosed as having GERD. Patients were asked to fill the questionnaire containing questions about previous history of gastroesophageal reflex disease.

Community periodontal index & treatment need (CPITN) probe was run over labial and lingual surfaces of incisors and buccal, lingual, occlusal surfaces of molars to check for loss of enamel surface. According to the depth of erosion, out of 39 patients with GERD, 12 (30.7%) patients have loss of surface characteristics and 27 (69.2%) have loss of enamel exposing dentin Table 2.

According to the area of erosion, out of 39 patients having GERD, only 1 (2.56%) patient has less than one third of the enamel surface involved. 13 (33.3%) patients have teeth between one third and two third of the surface involved. 14 (35.9%) patients have more than two third surface involved and in 6 (15.4%) patients, assessment was not possible due to calculus & heavy restorations Table 3.

Age wise distribution shows that out of 39 patients having GERD, in group I 3 (7.7%) patients were having signs of dental erosion. In group II 20 (51.3%) were having signs of dental erosion. In group III 16 (41%) were having loss of enamel surface characteristics Table 4.

## DISCUSSION

The level and assessment of tooth wear is interpreted differently around the world. Subtle differences in the diagnosis and the assessment mean that the prevalence data may not be entirely comparable across different countries. This difference would have clinical significance, especially if some countries diagnose cervical wear as erosion and others diagnose the same lesion as abrasion or abfraction. Therefore, comparing data from reflux patients with or without tooth wear may present conflicting results. The association of gastro esophageal reflux disease (GERD) with dental erosion has been established in a number of studies in adults.<sup>18,19</sup>

The results from the present study indicate that patients with symptoms of GERD have more tooth wear than subjects without symptoms. Palatal tooth wear has been associated with dental erosion caused by GERD and therefore these results indicate that tooth wear in this group of patients was caused by regurgitated gastric acid.

The tooth wear index used in this study has been shown to be reasonably reproducible in large studies, but can be less predictable in smaller studies, where judgment differences may be overemphasized.<sup>20</sup> The role of reflux in erosion has been recognized for some time, but the medical symptoms associated with reflux are the most important reason for patients seeking medical advice.<sup>21,22</sup>

though not to the extent of that in adult patients, comparable to the present study in which 7.7% of group.

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GERD is a common condition, estimated to affect 7% of the adult population on a daily basis and 36% at least one time a month which is comparable to this study showing 51.3% cases in adult population in six months data. Several studies have reported erosion of primary and permanent teeth in children with GERD, though not to the extent of that in adult patients, comparable to the present study in which 7.7% of group I patients were having dental erosion.<sup>26</sup> This may be in part due to careful avoidance of acidic foods and beverages on the part of the parents. There is a high incidence of GERD in children with cerebral palsy, which coupled with the tendency for bruxism, places them at particular risk for tooth wear.<sup>27-30</sup>

## CONCLUSION

Dental erosion and GERD are related and good collaboration between dental professionals and gastroenterologists are of utmost importance for the diagnosis and prevention of both conditions.

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