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ASSESSMENT AND CO- RELATION OF SALIVARY PARAMETERS WITH DENTAL EROSION AND CARIES IN GASTROESOPHAGEAL REFLUX DISORDER PATIENTS – A HOSPITAL BASED STUDY.

Oral Medicine

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ABSTRACT

Gastroesophageal Reflux disorder (GERD) is a common disorder found in 60% of population. This study aims to investigate the salivary parameters and occurrence of caries, erosion and periodontal disease in GERD patients

Objectives: Evaluation and co-relation of the salivary parameters, dental erosion and caries in GERD patients.

Methods: The study included 60 patients and they were divided into 2 groups of 30 each. Group 1 –individuals with GERD, Group 2- healthy individuals. The salivary parameters (Salivary flow, pH, buffering capacity) were evaluated in Basic Science Research laboratory and the dental erosion rate was assessed. The dental changes were examined and were co-related.

Results: Unpaired t test was used for group comparison. Chi square Test was for evaluation of quantitative variables. The salivary pH in Group 1 was 6.70 and in Group 2 was 7.07. The salivary buffering capacity was comparable in Group 1 and Group 2 which was 5.50 and 5.06 respectively. Mean DMFT score was 4.73 and 9.25 respectively. 63.34% of Group 1 patients had Grade 1 erosion and periodontal problems. The co-relation between salivary pH and buffering capacity was estimated by Karl pearson's co-efficient.

Conclusion: The present study revealed a reduced salivary pH and no significant reduction in salivary buffering capacity and salivary flow rate in GERD patients. Caries rate was less and dental erosion rate was higher in these patients. There is a significant association between GERD, tooth erosion and dental caries.

KEYWORDS

Saliva, Tooth erosion, Dental caries, Gastroesophageal reflux disorder, salivary pH, salivary buffering capacity

Introduction:

The Gastroesophageal Reflux Disease (GERD) develops when gastric contents passes to the esophagus and causes the onset of annoying symptoms and complications.[1] Patients may experience reflux symptoms daily (4-7%), weekly (20%) or monthly (44%). It is a disease of medical and social importance and hinders the patient's quality of life.

Saliva plays a significant role in homeostasis by clearance of acid in the esophagus. Saliva is also a very important diagnostic tool. Salivary analysis has many advantages viz. it is a non-invasive and cost-effective diagnostic method, easy storage and transportation of samples, can be collected by individuals with limited training, fewer compliance problems, practical and safe and no risk of contamination[1]. GERD patients suffer from oral conditions that range from pruritus and burning on the oral mucosa, tooth sensitivity, aphthae, sour taste, tooth erosion and decrease in the vertical dimension of occlusion.[2] Studies on the oral health of patients with chronic reflux have shown a prevalence of dental erosion and a small number of caries in individuals with GERD as compared to control groups. [1-3] Silva et al[4] studied patients with GERD and reported that saliva is an important dental erosion modifier. Alterations in both pH and salivary volume were found in patients with GERD. Erosion causes loss of dental hard tissues. The prevalence of erosion in patients with bulimia is as high as 69%.[4] Studies from Finland and Switzerland show prevalence of tooth erosion in GERD patients of 5% and 16% respectively.[4] The dissolution of dental structures in erosion and caries starts at a pH lower than 5.5 referred to as critical pH. Reduction in salivary pH and alteration in buffering capacity and viscosity directly influence the severity of oral lesions.

A significant difference in the salivary parameters and rate of erosion, and caries has been observed in patients with Gastroesophageal reflux disorder when compared with normal controls. Salivary parameters and oral manifestations may aid in the diagnosis of GERD. Information on these findings in the Indian population is scarce. Therefore this study was conducted to investigate changes in the oral cavity in Indian patients with GERD.

Methodology

30 subjects of either sex who reported to the Department of Gastroenterology with GERD disorder were included in the study after obtaining an informed consent. Ethical clearance was obtained from the ethical committee for the conduct of the study. Patients were included in the study if they were diagnosed with GERD by clinical and endoscopic examination and willing to participate in the study. Endoscopy was considered in those patients who had symptoms suggestive of complicated disease (eg, dysphagia, unintentional weight loss, hematemesis) or those with multiple risk factors for Barrett's esophagus (BE). In the present study following are the indications of endoscopy in GERD patients. - GERD symptoms that are persistent or progressive despite appropriate medical therapy, dysphagia or odynophagia, involuntary weight loss >5%, evidence of GI bleeding or anemia, finding of a mass, stricture, or ulcer on imaging studies, screening for Barrett's esophagus in selected patients (as clinically indicated), persistent vomiting (7-10 days), evaluation of patients before or with recurrent symptoms after endoscopic or surgical antireflux procedures.

Patients were excluded if they were medically compromised, suffered from salivary gland disorders, had a long term drug history affecting the salivary gland function and those who needed surgery for gastrointestinal disorders.

The patients were divided into two groups of 30 each into Group 1 (Patients diagnosed with GERD who were diagnosed by clinical examination and endoscopy) and Group 2 (Healthy individuals aged 18 years of age or above)

Collection of Samples

Unstimulated whole saliva was collected in vials by asking the patient to spit into a sterile container by saliva spit method. The collected saliva was transported on ice packs to Basic Science Research Centre (BSRC) for the analysis of salivary parameters, namely

1. Salivary pH by pH meter (figure1)
2. Salivary buffering capacity by use of 2-octanol (figure2)

Calculation of salivary pH

Salivary pH was evaluated using litmus papers which were dipped into the vials containing saliva sample and final pH was evaluated by pH meter (Figure 1) and (Table 1)

Calculation of Saliva Buffering Capacity

The unstimulated saliva was collected for 5 minutes and it was mixed by inverting the tube twice. 1 ml of saliva was transferred to 3 ml HCl 0.0033 mol per litre for unstimulated saliva) and for preventing the foaming, one drop of 2-octanol was added. Mixing was done for 20 minutes which removed Carbon dioxide. The final buffering capacity in the saliva was evaluated based on C. Alves et al method [5]

Grading of Erosion was done using Eccles and Jenkins Erosion Grading Scale[1] which is described as follows:-
Rating of Erosion based on Severity

- Grade 0 -No involvement of surface
- Grade 1 -Loss of enamel surface features; no dentin involvement
- Grade 2 -Exposure of dentin on less than 1/3 of surface
- Grade 3 -Exposure of dentin on more than 1/3 of surface

Caries rate was analyzed by DMFT (Decayed Missing Filling Tooth) Index by means of an explorer and mouth mirror

Results

Normality of pH, buffering capacity and DMFT scores in GERD and control groups were statistically evaluated by Kolmogorov-Smirnov Test and it was assessed that p- value was statistically significant in pH of GERD group. Comparison of pH scores in GERD and control group was assessed by unpaired t test and the mean was 6.70 ± 0.53 in Group 1 and mean was 7.07 with a ± 0.37 in Group 2. The buffering capacity was also assessed in the groups by unpaired t test. The mean value was 5.50 ± 1.14 in Group 1 and mean value was 5.06 ± 1.53 in Group 2 and it was found that there was no statistical significance.

The mean values of DMFT were 4.73 ± 3.31 in Group 1 and mean value was 9.23 ± 3.35 in Group 2 with a statistically significant p –value of 0.0013 in Group 1 (Table 2).

The erosion rate was statistically analzed by Chi square test. 63% patients had Grade I erosion in Group I and 40% patients had Grade 1 erosion in Group 2. (Graph 1) Co-relation between salivary pH and buffering capacity was assessed by Karl Pearson's co-efficient which is shown in Graph 2 and Table 3. The unstimulated salivary flow rate in GERD group and control group showed no statistically significant results with a mean of 0.25 in GERD group and with a mean of 0.24 in control group. Group 1 and Group 2 were assessed and it was found that 63.33% of GERD patients had periodontal problems and 30% of Group 2 had periodontal problems.

Discussion

Regurgitation of gastric acid into the oral cavity has been correlated with tooth erosion in number of studies. Several studies have explored the relationship between tooth erosion and gastric regurgitation. Cunha[1] et al have reported reduced caries rate and no change in salivary buffering capacity which was comparable to the present study. Correa and Ersin[8] et al reported an inverse relationship between caries and GERD.

The present study revealed a reduced salivary pH and no significant reduction in salivary buffering capacity. (Table 2) Caries rate was reduced and dental erosion rate was higher and these findings were comparable to other similar studies.[1,2, 3] These findings suggest that there is a significant association between salivary parameters, tooth erosion and dental caries in GERD patients. We did not find studies that explored the prevalence of periodontal problems and xerostomia in GERD patients. In the present study, it was found that 63.3% had periodontal problems in Group 1 and in 30% of Group 2 patients periodontal findings were present. In studies of salivary pH and buffering capacity in GERD, Correa, Cunha et al reported salivary pH 6.45-7.86 in GERD patients and 6.47- 8.69 in control group, salivary buffering capacity in GERD -2.42-2.47 and in controls- 2.18-6.40 which was comparable to the present study. They also revealed an increase in dental erosion Grade 1 and Grade 2 and a decrease in caries rate in GERD.[1] Jarvinen and Muermann et al reported the prevalence of dental erosion in GERD patients of 20%-55%. [10] A positive association between salivary pH and GERD has also been reported by Cunha et al. [1] Pindborg et al. Lussi et al. and Sognnaes et al [1]also reported a positive association between salivary pH and GERD. Gábris et al [11] reported that larger salivary microbiota was associated with an increased rate of dental caries and there was no significant difference in salivary pH and salivary flow rate in GERD patients. In their study salivary buffering capacity was reduced in individuals with GERD compared to controls; Bacterial count (Lactobacilli and Streptococci) was lesser in patients with GERD than in controls. However in our study the salivary flow (unstimulated) and salivary buffering capacity in patients in patients with GERD did not differ much from those observed in controls which is different from their findings. Salivary pH was decreased in GERD patients in our study. The DMFT score was reduced in GERD patients compared to controls and erosion rate was higher in our study. Therefore, there is a correlation between salivary parameters, caries and erosion in GERD patients in our study.

Limitations

Dietary habits like intake of carbonated beverages, tobacco usage may have an effect on dental erosion. We did not consider these factors for dental erosion. Bias could be present due to confounding factors like use of tobacco and dietary practices.

Conclusion

This study reveals that saliva plays an important role in analysis of parameters for GERD. Tooth erosion and dental caries have a significant impact on oral health status and quality of life. Patients with known history of GERD should be referred for dental treatment and if dental changes are seen in undiagnosed cases of GERD, then the dentist should be able to identify dental changes and refer the patients for treatment of GERD.

Therefore these patients with GERD require periodic oral checks and management of dental changes due to acid regurgitation. In light of oral changes in GERD patients, these patients would require a detailed examination for proper diagnosis of oral changes. In addition to dental treatments they will also require counselling in dietary modifications to prevent further damage to teeth.

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TABLES AND GRAPHS

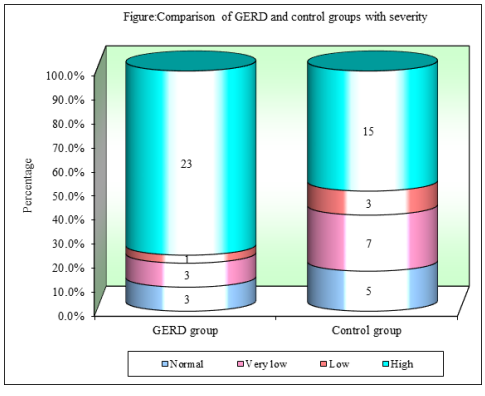
Table 1 – Evaluation of salivary pH

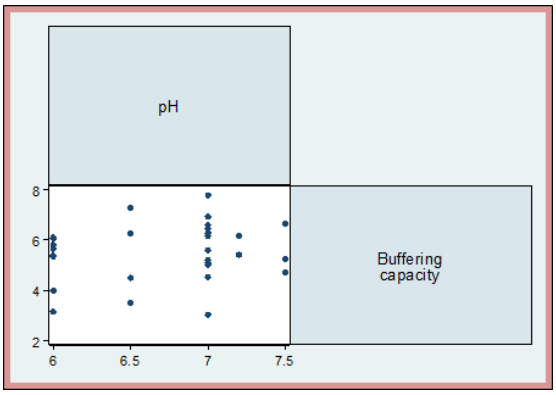
Final pH Value	Evaluation
More than 4.75	High
4.25-4.75	Normal
3.50-4.24	Low
Less than 3.5	Very low

Table 2: Salivary and dental characteristics in cases and controls

Parameters	Salivary pH	Salivary buffering capacity	Dental erosion	Dental caries Mean DMFT
GERD	6.7±0.53	5.50 ±1.14	63.34% Grade 1	4.73
CONTROLS	7.07±0.37	5.06 ± 1.53	30% Grade 2	9.23

Graph 1- Comparison of Group 1 and Group 2 with severity of Dental Erosion





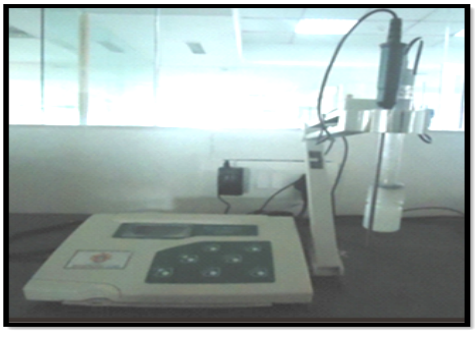
Graph 2- The Graph shows a co-relation between and pH and buffering capacity by Karl Pearson's coefficient with a statistically significant p- value of 0.0013 in GERD group. Figure 2

Groups	Correlation between pH with Buffering capacity			
	N	r-value	t-value	p-level
GERD group	30	0.5596	3.5727	0.0013*
Control group	30	0.1775	0.9545	0.3480
Total	60	0.2485	1.9539	0.0555

Table 3: Correlation between pH and buffering capacity by Karl Pearson's correlation
*p<0.05

Figure 1- pH meter

Figure 2- Calculation of salivary buffering capacity by 2-octanol



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