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Dental Caries Experience in Relation to Physical Salivary Characteristics Among Gastro Esophageal Reflux Disease Patients

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Research Article

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ABSTRACT

Background: Gastroesophageal Reflux Disease (GERD), a highly prevalent gastrointestinal disease, in which return of gastric content other than air to the mouth can, occurs. Much oral manifestation related to this disease including dental caries, dental erosion and changes in salivary flow rate and pH.

Materials and Methods: This is a cross-sectional study; all the patients participating in this study were attending the Gastroenterology and Hepatology Teaching Hospital in Baghdad who had endoscopically diagnosed with gastroesophageal reflux disease according to the Los Angeles (LA) classification, aged 20-40 years old and of both genders. Dental caries experience was implemented according to WHO (2013). Unstimulated saliva samples were collected for estimation of salivary flow rate and pH.

Results: From the whole sample (98%) of the patients were with caries. Dental caries experience (DT, DS, DMFT) mostly were higher among patients that do not take medication than those take medication with no statistically significant difference except (MS and DMFS) these results were statistically significant.

Salivary flow rate show mild reduction with increasing disease severity for both groups concerning medication. Also dental caries experience (DMFS, DMFT) had a significantly negative correlation with salivary flow rate and salivary pH among patients with gastroesophageal reflux disease.

Conclusion: The study shows that GERD had an effect on salivary flow rate and pH and in turn this could negatively affect dental caries experience which can be controlled by taking the appropriate medication and controlling disease severity.

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INTRODUCTION

Gastroesophageal reflux is the return of gastric contents other than air through or into the esophagus. Gastroesophageal Reflux Disease (GERD) attribute to reflux that produces many symptoms or results in damage or dysfunction to the esophageal mucosa or adjoining organs of the upper aerodigestive system and sometimes the lower respiratory tract [1]. According to the Los Angeles (LA) classification, GERD is divided into 4 grades based on the extent of mucosal breakage designated A through D. Grade A represent one (or more) mucosal breakage not longer than 5 mm that does not continue between the peak of two mucosal folds, grade B shows one (or more) mucosal breakage more than 5 mm long that does not continue between the peak of two mucosal folds, grade C shows one (or more) mucosal breakage that is continuous between the peaks of two or more mucosal folds but in which the involvement is less than 75% of the circumference and grade D shows one (or more) mucosal breakage in which the involvement of at least 75% of esophageal circumference can occur [2].

GERD is a very widespread condition whose consequences of are not only localized in the esophagus but also it has been frequently reported of multiple extra-esophageal involvement [3]. The classical symptoms of GERD are Heartburn, regurgitation and Dysphagia [4,5]. While GERD may cause a wide spectrum of conditions as an extra-esophageal symptoms, including, Noncardiac chest pain, Asthma, Posterior laryngitis, chronic cough, recurrent pneumonitis, dental erosion and disordered sleep [6]. Oral manifestations of GERD could involve dental erosion, dental caries, halitosis, burning sensation, xerostomia and erythema of the uvula and palatal mucosa [7].

Dental caries is the localized destruction of susceptible dental hard tissue *via* acidic byproducts which is produced by the bacterial fermentation of dietary carbohydrates [8]. Thereby, it is a bacterial-driven, usually chronic, site-specific, multifactorial, dynamic disease process caused by an imbalance in the physiologic equilibrium between the tooth mineral and the plaque fluid; that is, when the pH drops and causes net mineral loss over time [9].

Various contradictory results about gastroesophageal reflux disease and dental caries was found in multiple studies [10-13].

Saliva is the biological watery secretions of salivary glands in oral cavities of humans and animals [14]. Human saliva had several functions including: moistening and lubrication, taste and smell, digestion, oral and esophageal mucosa protection, wound healing factors and tooth protection [15]. A significant association between GERD, reduced salivary flow rate and the subjective sensation of “dry mouth” (xerostomia) has been found in several studies [16,17]. Salivary flow rate and pH was found to be lowered among GERD patients as compared to the controls [18].

MATERIALS AND METHODS

This is a cross-sectional study that was carried out after an authoritative approval from the Research Ethics Committee in College of Dentistry- University of Baghdad. The study sample consist of (100) Gastroesophageal Reflux Disease (GERD) patients, aged 20-40 years old and of both genders, (60) patients were taking medication for GERD (all types of PPIs and antacids). The patients were diagnosed by the specialist (Gastro Enterologist) as having any grade of GERD according to the Los Angeles (LA) classification. Only grade A and grade B were found during the time of the study that met with this study inclusion and exclusion criteria. All the patients who are attending to Gastroenterology and Hepatology Teaching Hospital in Baghdad who had endoscopically diagnosed with gastroesophageal reflux disease with no history of any other type of systemic disease were included. While patients having other types of systemic disease such as diabetes, cardiovascular disease, respiratory infection, metabolic syndrome, patients wearing appliances, patients taking medication for any other

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disease and smokers all were excluded.

WH0 (2013) criteria for estimation of dental caries experience was implemented by Decayed Missed Filled surfaces (DMFS) and Teeth (DMFT) index, using a plain mouth mirror and Community Periodontal Index (CPI) probe [19].

According to the University of Southern California School of Dentistry, unstimulated saliva samples were collected by passive drooling of saliva for five minutes in graduated test tubes [20]. Before starting the collection of saliva samples, information from the patients should be taken that insures they did not eat or drink anything in the last hour before the examination (water is excluded). Then rinsing the mouth with distilled (deionized) water and then the patient was told to relax for five minutes before starting the collection. Movement during the procedure should be minimized especially mouth movement. The patient is told to swallow to empty the mouth from saliva and then start the timing with slight opening of the mouth to allow the saliva to drool into the graduated tube and with forward inclination of the head. Finally after five minutes, the patients asked to collect all the remaining saliva in the mouth and spit it into the tube and this action should be done quickly. Then the flow rate was calculated by dividing the volume of whole saliva collected in milliliter (ml) on the time of collection in minute (min) [21].

Measurement of salivary pH was done by the use of digital pH meter which was immersed in the saliva sample tube, waiting for 30 second to get a stable reading then recording it.

RESULTS

From the whole sample (98%) of the patient were with caries.

Table 1 illustrated a descriptive statistics of caries experience (DMFT) and its component (Decayed Teeth (DT), Missed Teeth (MT), Filled Teeth (FT)) among patients did take medication and patients who did not take medication by GERD severity. It reveals that in grade A, grade B and in the total sample the (DT, MT and DMFT) in patients that did not take medication was higher than patients who took medication while (FT) was higher in patients who took medication than in patients that did not take medication. All with no statistically significant difference except in (MT and DMFT) of the total sample.

Table 1. Descriptive and statistical test of caries experience by teeth among medication by GERD severity.

GERD severity		medication					
		Yes		NO			
		Mean	± SE	Mean	± SE	T	P value^
A	DT	5.59	0.567	6.15	0.782	0.582	0.564
	MT	1.53	0.344	3.90	1.209	1.886	0.073
	FT	2.50	0.441	1.70	0.493	1.210	0.233
	DMFT	9.62	0.704	11.75	1.427	1.340	0.191
B	DT	5.46	0.547	7.10	0.817	1.666	0.105
	MT	1.73	0.537	3.00	1.056	1.071	0.293
	FT	1.88	0.577	1.60	0.494	0.375	0.710
	DMFT	9.08	0.877	11.70	1.466	1.536	0.134
Total	DT	5.53	0.396	6.63	0.564	1.585	0.117
	MT	1.62	0.301	3.45	0.796	2.155	0. 036*
	FT	2.23	0.353	1.65	0.344	1.183	0.240

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	DMFT	9.38	0.547	11.73	1.010	2.039	0.046*
^=not significant at p>0.05.,*=significant at p<0.05.							

Table 2 shows that by groups and in the total, although subjects who do not take medication mostly have more caries experience by surface than those who take medication but with no statistically significant difference except in group A in (MS) and in the total in (MS and DMFS), these results are significant.

Table 2. Descriptive and statistical test of caries experience by surfaces among medication by GERD severity.

GERD severity		medication					
		Yes		NO			
		Mean	± SE	Mean	± SE	T	P value^
A	DS	7.91	1.135	8.95	1.603	0.540	0.592
	MS	7.59	1.713	19.25	5.873	2.330	0.024*
	FS	4.44	1.021	4.00	1.273	0.267	0.790
	DMFS	19.94	2.248	32.20	7.375	1.933	0.059
B	DS	7.88	.988	10.85	1.895	1.479	0.146
	MS	8.58	2.653	15.00	5.282	1.163	0.251
	FS	3.27	.939	4.55	2.169	0.588	0.560
	DMFS	19.73	2.961	30.40	6.459	1.621	0.112
Total	DS	7.900	0.766	9.900	1.235	1.453	0.149
	MS	8.017	1.492	17.125	3.913	2.478	0.015*
	FS	3.933	0.706	4.275	1.242	0.257	0.798
	DMFS	19.850	1.792	31.300	4.841	2.537	0.013*
^=not significant at p>0.05.,*=significant at p<0.05.							

Table 3 illustrates salivary flow rate and pH among medication by GERD severity. In regard to salivary flow rate (SFR) results found that in grade A higher flow rate among patient who did not take medication and in grade B and in total higher flow rate was found in patients who did take medication than those who did not with statistically no significant difference.

In regard to pH results found that in grade A and in total pH was higher among patient who did take medication than those who did not and in grade B higher pH was found in patients who did not take medication with no statistically significant difference.

Table 3. Descriptive and statistical test of salivary Flow rate and PH among medication by GERD severity.

GERD severity		Medication				T	P value
		Yes		NO			
		Mean	± SE	Mean	± SE		
A	SFR	0.509	0.049	0.545	0.057	0.469	0.641
	PH	6.688	0.062	6.54	0.105	10.298	0.2
B	SFR	0.51	0.059	0.383	0.056	1.532	0.133

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	PH	6.569	0.092	6.6	0.071	0.255	0.8
Total	SFR	0.509	0.037	0.464	0.042	0.8	0.426
	PH	6.637	0.053	6.57	0.063	0.802	0.425
^=not significant at p>0.05							

Table 4 Regarding taking medications, the significant correlations are in both groups only DMFS and DMFT, in subjects who take medications, only MT and MS, while in subjects who don't take medications, only DT and DS, about PH, significant correlations are in both groups only DMFS and DMFT, in subjects who take medications, only MT, MS and Fs, lastly subjects who don't take medications, only DS; while other correlations are negative weak not significant.

Table 4. correlation between medication, dental caries experience and salivary flow rate and pH.

VARS.	SFR				PH			
	Yes		NO		Yes		NO	
	r	p	R	p	r	p	r	P
DT	-0.138	0.293	-0.412	0.008	-0.036	0.785	-0.285	0.075
MT	-0.285	0.027	-0.260	0.105	-0.288	0.026	-0.289	0.071
FT	-0.085	0.521	-0.029	0.857	-0.250	0.054	0.024	0.885
DMFT	-0.311	0.016	-0.445	0.004	-0.345	0.007	-0.379	0.016
DS	-0.128	0.329	-0.481	0.002	-0.097	0.460	-0.350	0.027
MS	-0.288	0.026	-0.261	0.104	-0.287	0.026	-0.292	0.067
FS	-0.068	0.603	-0.140	0.389	-0.265	0.041	-0.021	0.899
DMFS	-0.321	0.012	-0.369	0.019	-0.385	0.002	-0.331	0.037
*=significant atp<0.05, ^=not significant atp>0.05.								

DISCUSSION

Patients diagnosed with GERD using upper Gastrointestinal (GI) endoscopy were included in this study because upper GI endoscopy is counted as the gold standard for confirming GERD [22].

The relation between changes in the oral cavity and systemic health has been widely established [23,24]. Because the oral cavity is a part of the gastrointestinal system, oral disorders can be a manifestation of gastrointestinal disease [25]. Several studies have found that patients with GERD are more prone to dental caries than the healthy population [26,27].

This study found that patients who did not take medication had significantly higher dental caries experience than those who took medication, this might be related to the use of antacid, which used by GERD patients [28]. Furthermore it was demonstrated that the use of PPI can restore normal oral pH and even salivary flow in GERD patients and this confirm with the results found in this study. Also salivary flow rate is significantly reduced in patients with GERD [29].

As far as a recent study found that salivary microbiome of GERD patients who use PPI was quite similar to that of negative controls without the disease that did not use PPI. This would imply that there is at least some benefit in the oral cavity with the use of those drugs in people with GERD.

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Also in this study a negative correlation was found between salivary flow rate and pH with dental caries experience in both patients who took medication and whom did not [30]. This could be due to the additive effects of direct acid injury, low salivary buffering capacity, and increased opportunistic bacterial populations, all of which contribute to a substantial increase in tooth decay and loss. Indeed saliva is an essential defense mechanism from acid exposure exists in the oral cavity: the amount and quality of saliva provide protection *via* acid clearance and neutralization.

CONCLUSION

The study shows that GERD had an effect on salivary flow rate and pH and in turn this could negatively affect dental caries experience which can be controlled by taking the appropriate medication and controlling disease severity.

CONFLICTS OF THE INTEREST

No conflicts of the interest

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REFERENCES

1. Hauser S, et al. Mayo clinic gastroenterology and hepatology board review. (5th edition). Oxford University Press, New York, United States. 2014;432.
2. Lundell L, et al. Endoscopic assessment of oesophagitis: clinical and functional correlates and further validation of the Los Angeles classification. Gut. 1999;45:172-80.
3. Ramachandran A, et al. Incidence and pattern of dental erosion in gastroesophageal reflux disease patients. J Pharm Bioallied Sci. 2017;9:138-141.
4. Vakil N, et al. The Montreal definition and classification of gastroesophageal reflux disease: a global evidence-based consensus. Am J Gastroenterol. 2006;101:1900-1920.
5. Nagpal AP, et al. Retrospective evaluation of patients of gastroesophageal reflux disease treated with laparoscopic Nissen's fundoplication. J Minim Access Surg. 2010;6:42-45.
6. Vaezi MF, et al. Extraesophageal symptoms and diseases attributed to GERD: where is the pendulum swinging now? Clin Gastroenterol Hepatol. 2018;16:1018-1029.
7. Romano C, et al. Gastroesophageal reflux disease and oral manifestations. Ital J Pediatr. 2014;40:73.
8. Linnett V, et al. Oral health of children with gastro-esophageal reflux disease: a controlled study. Aust Dent J. 2002;47:156-162.
9. Munoz J, et al. Dental and periodontal lesions in patients with gastro-oesophageal reflux disease. Dig Liver Dis.

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p-ISSN: 2322-0090

2003;35:461-467.

10. Ersin NK, et al. Oral and dental manifestations of gastroesophageal reflux disease in children: a preliminary study. Pediatr Dent. 2006;28:279-284.
11. Simpalean D, et al. The frequency of dental caries in adult patients with gastroesophageal reflux disease. Acta Medica Marisiensis. 2015;61:124-127
12. Dawes C, et al. The functions of human saliva: A review sponsored by the World Workshop on Oral Medicine VI. Arch Oral Biol. 2015;60:863-874.
13. Di Fede O, et al. Oral manifestations in patients with gastro-oesophageal reflux disease: a single-center case–control study. J Oral Pathol Med. 2008;37:336-340.
14. Campisi G, et al. Saliva variations in gastro-oesophageal reflux disease. J Dent. 2008;36:268-271.
15. Sujatha S, et al. Oral pH in gastroesophageal reflux disease. Indian J Gastroenterol. 2016;35:186-189.
16. WHO. Oral health surveys: basic methods. World Health Organization. 2013.
17. Navazesh M, et al. Measuring salivary flow: challenges and opportunities. J Am Dent Assoc. 2008;139:35-40.
18. Vaezi MF, et al. Assessing old and new diagnostic tests for gastroesophageal reflux disease. Gastroenterol. 2018;154:289-301.
19. Chi AC, et al. Oral manifestations of systemic disease. Am Fam Physician. 2010;82:1381-1388.
20. Majorana A, et al. Oral mucosal lesions in children from 0 to 12 years old: ten years' experience. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2010;110:13-18.
21. Mantegazza C, et al. Oral manifestations of gastrointestinal diseases in children. Part 3: Ulcerative. Eur J Paediatr Dent. 2016;17:248-250.
22. Correa MCCSF, et al. Salivary parameters and teeth erosions in patients with gastroesophageal reflux disease. Arq Gastroenterol. 2012;49:214-218.
23. Watanabe M, et al. Oral soft tissue disorders are associated with gastroesophageal reflux disease: retrospective study. BMC gastroenterol. 2017;17:1-10.
24. Picos A, et al. Factors associated with dental erosions in gastroesophageal reflux disease: a cross-sectional study in patients with heartburn. Med Pharm Rep. 2020;93:23.
25. Eckley CA, et al. Comparative study of salivary pH and volume in adults with chronic laryngopharyngitis by gastroesophageal reflux disease before and after treatment. Braz J Otorhinolaryngol. 2006;72:55-60.
26. Caruso AA, et al. Relationship between gastroesophageal reflux disease and Ph nose and salivary: proposal of a simple method outpatient in patients adults. Open Med (Wars). 2016;11:381-386.
27. Kawar N, et al. Salivary microbiome with gastroesophageal reflux disease and treatment. Sci Rep. 2021;11:1-8.
28. Ranjitkar S, et al. Gastroesophageal reflux disease and tooth erosion. Int J Dent. 2012;2012.
29. Ahmad MS, et al. The impact of hypo salivation on Quality of life (QoL) and oral health in the aging population of Al Madinah Al Munawarrah. Int J Environ Res Public Health. 2017;14:445.
30. Filipi K, et al. Oral health status, salivary factors and microbial analysis in patients with active gastro-oesophageal reflux disease. Int Dent J. 2011;61:231-237.