

## ASSESSMENT OF THE POSSIBLE RELATIONSHIP BETWEEN DENTAL/ PERIODONTAL CONDITIONS AND SELF-REPORTED REFLUX SYMPTOM INDEX SCORES. A PRELIMINARY STUDY

*Dental/Periodontal Durum ve Hasta Tarafından Beyan Edilmiş Reflü Semptom İndeksi Skorları  
Arasındaki Olası İlişkinin Değerlendirilmesi. Bir Pilot Çalışma*

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### ABSTRACT

**Objective:** Gastroesophageal reflux disease and laryngopharyngeal reflux are common public health problems, which are known to effect oral cavity. Subjective assessment of symptom severity in patients with gastroesophageal reflux and laryngopharyngeal reflux can be made with self-reported "Reflux Symptom Index". In this study, possible relation of dental and periodontal conditions with Reflux Symptom Index scores was evaluated.

**Material and Methods:** This study was performed with 135 dental outpatients (52 female and 83 male; aged between 18-63 years). Demographic and clinical variables were procured and Reflux Symptom Index (a nine item and 45-point scale questionnaire) scores were evaluated. Dental and periodontal conditions were assessed with DMFT (decayed, missing, filled teeth) index and Community Periodontal Index scores. Patients were divided into two subgroups according to their RSI values (Reflux Symptom Index  $\leq 13$ ; normal and Reflux Symptom Index  $>13$ ; abnormal) and differences were statistically investigated.

**Results:** Reflux Symptom Index subgroups showed significant difference in all intraoral parameters except decayed teeth number ( $p<0.05$ ). In addition, Reflux Symptom Index scores did not show constant correlations with DMFT and Community Periodontal Index scores ( $p>0.05$ ).

**Conclusion:** Self-reported Reflux Symptom Index merits further investigation before declaring dental and periodontal conclusions in patients with gastroesophageal reflux disease and laryngopharyngeal reflux.

**Keywords:** Gastroesophageal reflux, laryngopharyngeal reflux, dental caries, periodontal disease, questionnaires

### ÖZ

**Amaç:** Oral kaviteyi etkilediği bilinen gastroözofageal reflü hastalığı ve larengofarengal reflü genel toplum sağlığı problemidir. Gastroözofageal reflü ve larengofarengal reflü hastalarında semptom şiddetinin subjektif olarak değerlendirilmesi hasta tarafından beyan edilen "Reflü Semptom İndeksi" ile yapılabilir. Bu çalışmada, dental ve periodontal durumların Reflü Semptom İndeksi skorları ile olası ilişkisi değerlendirildi.

**Gereç ve Yöntemler:** Bu çalışma, ayakta tedavi gören 135 hasta (52 kadın 83 erkek, yaşları 18-63 yıl) ile gerçekleştirildi. Demografik ve klinik değişkenler alındı ve Reflü Semptom İndeksi (dokuz madde ve 45 puanlı anket) skorları değerlendirildi. Dental ve periodontal durumlar DMFT (çürük-kayıp-dolgulu diş) indeksi ve Toplum Periodontal İndeks skorları ile değerlendirildi. Hastalar Reflü Semptom İndeksi değerlerine göre (Reflü Semptom İndeksi  $\leq 13$ , normal ve Reflü Semptom İndeksi  $>13$ ; anormal) iki alt gruba ayrıldı ve istatistiksel farklılıklar araştırıldı.

**Bulgular:** Reflü Semptom İndeksi alt grupları çürük diş sayısı hariç tüm intraoral parametrelerde anlamlı farklılık gösterdi ( $p<0.05$ ). Buna ek olarak Reflü Semptom İndeksi skorları DMFT ve Toplum Periodontal İndeks skorları ile sabit korelasyon göstermedi ( $p>0.05$ ).

**Sonuç:** Gastroözofageal reflü ve larengofarengal reflü hastaların dental ve periodontal durum sonuçları bildirilmeden önce hasta tarafından beyan edilmiş Reflü Semptom İndeksi hakkında daha fazla araştırma yapılması gerekir.

**Anahtar Kelimeler:** Gastroözofageal reflü, laringofarinjiyal reflü, diş çürükleri, periodontal hastalık, anketler

†: The local ethical committee approved the study protocol and informed consent was obtained from all participants. (Date: 26 Dec 2011, No: 03/05). A part of this study was presented as a poster at 2013 FDI Annual World Dental Congress, 28-31 August 2013, Istanbul, Turkey.



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## INTRODUCTION

“Gastroesophageal reflux” (GER) is defined as movement of gastric content into esophagus. GER is classified as physiologic, symptomatic or “gastroesophageal reflux disease” (GERD). In addition, an important cluster of patients may exhibit “laryngopharyngeal reflux” (LPR) (1). Physiologic reflux episodes typically occur postprandially, are short-lived, asymptomatic, and rarely occur during sleep. Pathologic reflux is associated with symptoms or mucosal injury, often including nocturnal episodes. In general, the term GERD is applied to patients with symptoms suggestive of reflux or complications thereof, but not necessarily with esophageal inflammation. Reflux esophagitis describes a subset of patients with symptoms of GERD who also have endoscopic or histopathologic evidence of esophageal inflammation. In summary, according to the Montreal Classification, GERD is defined in patients with symptoms suggestive of reflux of stomach contents causing complications. However, symptoms do not necessarily include esophageal inflammation, but extraesophageal symptoms may be observed (2).

Reflux related conditions or symptoms create common public health problems that may impair the quality of life and or prompt to long-term complications. Heartburn and regurgitation are the typical symptoms of GER. However, atypical and extra esophageal symptoms including non-cardiac chest pain, hoarseness, chronic cough, reflux laryngitis, sore throat, dysphagia, globus sensation and halitosis have also been observed. In addition, systemic alterations such as asthma, idiopathic pulmonary fibrosis, pharyngitis and chronic sinusitis have been discussed as related with GER, GERD and or LPR (3-5).

Di Fede et al. (6) have suggested that oral findings such as xerostomia, burning sensation, halitosis and mucosal erythema are frequent in patients with GERD. Dental erosion, caries and periodontal status of the patients with reflux are other highlighted research points.

Dental erosion is defined as wearing of the tooth surface(s) in time, owing to acid exposure from intrinsic or extrinsic sources. According to the literature, GER is one of the relevant factors in formation of dental erosion (7-10). In many instances, the role and effect of GER in saliva characteristics and formation of dental erosion was extensively studied (11-13). Possible relationship between GER and dental erosion/caries associating with different clinical conditions (such as respiratory problems) was also investigated (7, 9, 14, 15). Along with dental erosion, the interrelationship between GER and periodontal status/tissues was assessed far less (8, 16).

RSI has been especially used in evaluating the interaction between extra esophageal symptoms or findings and reflux in LPR patients representing ear, nose and throat symptoms (17). Reflux symptom index (RSI) has been advocated as a promising questionnaire method showing the self-reported state of GER (18-21). In contrast, Park et al. have indicated RSI as a less valid diagnostic tool for LPR when used independently (22).

Currently, relationship between GER and dental/periodontal problems is waiting for further investigation. In addition, use of RSI in the assessment of GER associated with dental/periodontal conditions merits basic and further evaluation. Thus, the aim of this study was to evaluate the possible role of RSI in the assessment of dental and periodontal variables in a general dental population.

## MATERIALS AND METHODS

A cross-sectional study was designed. Subjects were available from the Periodontology department. Individuals with age<18 or intellectual disability, pregnant or breastfeeding, requiring antibiotic prophylaxis for periodontal probing, having acute lower and upper respiratory tract infection, and those who did not sign the informed consent or illiterate were excluded. The local ethical committee approved the

study protocol and informed consent was obtained from all participants.

Age, gender, and smoking history recordings were collected. Clinical evaluation included a thorough dental and medical history of the patients, Decay, Missing and Filled Tooth (DMFT) index and Community Periodontal Index (CPI) (23). DMFT index was used to record the caries lesions (D), missing teeth (M) and number of restorations and fillings (F) per patient. Caries was assumed positive only when an accurate cavity, softening in the basal surface or walls of the caries space or undermining in the enamel was detected after probing. 'Filled tooth' part of the index indicated number of teeth having partially or completely restored due to caries. Clinical periodontal assessment was carried out by using CPI scores were classified as follows: 0 = healthy, 1 = gingival bleeding, 2 = dental calculus, 3 = shallow pocket depths (~ 4-5 mm), and 4 = deep pockets ( $\geq 6$  mm). For each sextant of a mouth, one of the foregoing scores was given according to probing value of one tooth that was selected as index tooth and probing value was determined by measuring distance from margin of the gingiva to base of gingival crevice.

#### Self-Reported Assessment of Reflux

Different reflux symptom characteristics and history were evaluated with previously studied version of self-reported RSI questionnaire (17) that was used in clinical studies involving Turkish population (20, 24-26). Values fewer than 10 were considered clinically insignificant, greater than 13 considered as abnormal and greater than 19 defined presence of LPR (17, 27, 28). Thus, patients were sub-grouped according to RSI scores (Group a as normal;  $RSI \leq 13$ , Group b as abnormal;  $RSI > 13$ ).

#### Statistical analysis

A computer program (SPSS 11.5, SPSS Inc., Chicago, IL, USA) was used for all statistical analyses. First missing data, frequency and descriptive analysis were

performed. Then, age and gender analysis was carried out. Normally distributed data was evaluated with student t-test; if not Mann-Whitney U test was performed. Correlation between RSI and oral parameters (DMFT and CPI) was evaluated by Pearson correlation coefficient.  $p < 0.05$  was regarded as significant.

## RESULTS

Although 143 participants filled the questionnaires, data of 8 individuals (6 ♀-2 ♂) were excluded from analysis due to significant shortcomings (e.g. age, incomplete marking of systemic health status and RSI questionnaire) in the self-reported surveys.

Evaluated parameters and their standard deviations were presented in Table 1. Mean age for all participants was  $32.68 \pm 9.40$  (range: 18-63). Smoking was noted in 40% (54/135) of all participants and their smoking frequency was  $14.29 \pm 8.64$  cigarettes/day. Mean RSI score was  $10.31 \pm 8.9$  (min: 0, max: 35) and scores were higher than 13 in 42 (31.1%) participants. Group evaluations revealed that smokers in  $RSI \leq 13$  group were 31/93 (33.3%) and  $RSI > 13$  group 23/42 (54.7%). Mean DMFT scores were  $8.12 \pm 5.27$  (range: 0-30) and mean CPI scores were  $1.49 \pm 1.38$  (range: 0-4).

Except main oral parameters, bruxism was a remarkable finding in dental examination. The rate of bruxism was 26/135 (19.25%) in the surveyed individuals (data not shown). According to subgroup analysis, age was similar ( $p > 0.05$ ), CPI and DMFT scores were statistically higher in  $RSI > 13$  subgroup ( $p < 0.05$ ). In detail, D values were similar for both subgroups ( $p > 0.05$ ). M presented higher, F presented lower mean values in  $RSI > 13$  subgroup ( $p < 0.05$ ) (Table 1).

RSI scores did not show any correlation with mean DMFT, M, F, and CPI scores ( $p > 0.05$ ). However, a significant correlation was detected between D value and RSI scores (Table 2) in  $RSI \leq 13$  sub-group ( $p < 0.05$ ).

**Table 1.** Evaluated demographic and oral values for all and RSI sub-grouped patients

	All participants		RSI ≤13		RSI >13		p
	N: 135		N: 93		N: 42		
	Mean ± SD	(min-max)	Mean ± SD	(min-max)	Mean ± SD	(min-max)	
Age (year)	32.68±9.40	18-63	32.95±9.68	18-63	32.09±8.85	19-51	0.624
Female/Male ratio	52/83	38.5-61.5%	34/59	36.6-63.4%	18/24	42.9-57.1%	
RSI	10.31±8.9	0-35	5.16±4.30	0-13	21.73±4.94	14-35	
DMFT	8.12±5.27	0-30	7.32±5.58	0-30	9.90±4.03	2-20	0.008*
D	2.19±3.24	0-14	1.87±3.05	0-13	2.90±3.58	0-14	0.087
M	3.06 ±3.22	0-14	2.13±2.68	0-14	5.11±3.40	0-13	0.0001*
F	2.86±3.73	0-27	3.31±4.14	0-27	1.88±2.37	0-9	0.039*
CPI	1.49±1.38	0-4	1.12±1.34	0-4	2.30±1.11	0-4	0.0001*
<b>SCORES</b>	<b>CPI (%)</b>		<b>CPI (%)</b>		<b>CPI (%)</b>		
0	33.3		46.2		4.8		
1	21.5		23.7		16.7		
2	19.2		9.7		40.5		
3	14.1		11.8		19.0		
4	11.9		8.6		19.0		

Significant: p&lt;0.05

Abbreviations: RSI: Reflux Symptom Index; S.D: standard deviation; min: minimum; max: maximum; DMFT: Decay, Missing and Filled Tooth Index; D: Decay; M: Missing; F: Filled; CPI: Community Periodontal Index

**Table 2.** Correlations between RSI subgroups and evaluated oral parameters

	Correlations			
	RSI			
	RSI ≤ 13		RSI > 13	
	r	p	R	p
DMFT	0.078	0.456	-0.082	0.606
D	0.376	0.0001*	0.058	0.717
M	-0.040	0.700	-0.133	0.402
F	-0.145	0.165	-0.036	0.821
CPI	0.081	0.442	-0.016	0.920

Significant: p&lt;0.05

Abbreviations: RSI: Reflux Symptom Index; DMFT: Decay, Missing and Filled Tooth Index; D: Decay; M: Missing; F: Filled; CPI: Community Periodontal Index

## DISCUSSION

GER and reflux related disorders including GERD and LPR are common community problems. Both GER and LPR are accused of altering the dental health. However, effectiveness of a single and practical method documenting the relationship between these clinical entities has not been described for intraoral conditions, yet. The present study aimed to explore the clinical convenience of RSI in the population whose dental/periodontal status was assessed.

Several discussions exist that systemic disorders such as diabetes mellitus, metabolic syndrome, cardiovascular diseases, adverse pregnancy outcomes, pulmonary infection, rheumatoid arthritis and so forth may alter dental and periodontal status (29). In collected works it was shown that GERD, inflammatory bowel diseases (such as Crohns disease ulcerative colitis), malabsorption conditions and syndromes like Peutz-Jegher Syndrome and Gardner syndrome are the gastrointestinal problems to potentially affect the oral cavity (30, 31). GER defines the reflux of gastrointestinal secretions mainly the gastric acid into esophagus and even into the oral cavity. Accordingly, several authors indicated the occurrence of intraoral problems such as dental erosion and caries formation (7, 8, 14). Although dental erosion was detected as the most frequent extraesophageal manifestation of GERD, dental caries is a less studied but a potentially complicating variable. Muñoz et al. compared the prevalence of dental lesions in GERD and healthy patients (8). Conclusively, they proposed that caries distribution was similar in GERD and control groups. This result resembles results of our study in which the number of decayed tooth ("D" component) was similar in patients with low and high RSI values. However in our study, the number of missing tooth ("M" component) was significantly higher ( $p<0.05$ ) and the number of filled tooth ("F" component) was lower ( $p<0.05$ ) in RSI>13 subgroup compared to RSI≤13. As an explanation that was

indicated previously on a population-based study (32), the increasing number of missing tooth might have reduced the chewing efficacy and therefore contributed to GER formation. Moreover, the opposite reducing effect can be considered with the repair of the decayed teeth by fillings.

Periodontal disease is a localized infection involving tooth-supporting tissues with formation of periodontal pocket that offers a suitable niche for the colonization of anaerobic bacteria. It is a multifactorial disease originates with the interactions between microorganisms inside dental plaque deposits and a certain extent of environmental factors and susceptible host. Periodontal status of GERD patients was examined in limited number of studies. Katunarić et al. pronounced that patients with esophagogastric passage insufficiency have an unfavourable oral hygiene compared to control subjects (33). As a result, pathological changes of gingiva in those patients with esophagogastric passage insufficiency were more prominent. Recently Song et al. also suggested that GERD could be a risk factor for chronic periodontitis (15). However, Muñoz et al. showed similar plaque index scores in patients with GERD and in the controls (8). In this study, no difference was observed in terms of periodontal health determinants (bleeding index and gingival recession) between study and control groups ( $p>0.05$ ). Moreover, CPI values of RSI subgroups were significantly different from each other in our evaluation (RSI>13 subgroup exhibited statistically higher values) ( $p<0.05$ ) but no correlation could be determined between CPI and RSI scores in both groups and subgroups ( $p>0.05$ ).

In the literature, different indices aiming to assess the presence of reflux conditions exist. Among these, a laryngoscopic based (8- item; minimum range 0- maximum range: 26) clinical severity scale - Reflux Finding Score (RFS) - an eight-item validated clinical severity scale, was developed by Belafsky et al. (34). RFS was introduced as a means of standardization for

LPR diagnosis and have a potential to introduce laryngeal findings within reflux. Based on this scale, patients with scores higher than seven accepted to have LPR., The RFS is a semi-objective measure of findings on laryngoscopic examination with good inter- and intra-observer reproducibility that may be used to document findings at initial diagnosis and to evaluate treatment response. A combination of the RFS and RSI (have been used to diagnose patients and monitor response to therapy with proton pump inhibitors. One study of 104 symptomatic Taiwanese patients found a positive predictive value of 80% for pharyngeal acid reflux (diagnosis based upon 24-hour pH monitoring, endoscopic findings, and the RFS) in patients who had a combination of the following risk factors: classic reflux symptoms, hiatal hernia, and obesity (35). However, RFS index requires laryngoscopic examination, which limits its chair-side use in a general dental outpatient population. As a novel alternative, RSI was selected in the present study. This index was developed by the same author and has been advocated and validated in terms of its usefulness in reflux related studies (17). According to the literature, values of the index fewer than 10 were considered 'clinically insignificant', between 13 and 19 'abnormal' and higher than 19 'LPR positive' (17, 27, 28). RSI and RFS indices were found to be correlated in a LPR patient based study (36). In addition, Ramzy et al. indicated that RSI and RFS are significantly correlated with GERD severity (21). However, some others have advised that RSI should not be used as an individual questionnaire of diagnosing reflux-associated symptoms (18). For a definitive diagnosis a through clinical examination and diagnostic procedures (such as reflux monitoring, endoscopy etc.) should be considered. In addition, alongside of its advantages, the index has a potential to be affected negatively from several factors such as acute upper respiratory tract infections and vocal cord paralysis (37)]. Thus, existence of an acute disorder (such as acute sinusitis)

was selected as an exclusion criterion in this cross-sectional preliminary study. This latter may gain importance especially when evaluating asymptomatic reflux patients. False considerations may result with delay of appropriate treatment and management. Moreover, in the present study, 40% of the participants were smokers. The relationship between smoking and periodontal disease is a well-known phenomenon (38) and this factor can be considered as a limitation. Owing to the preliminary design of the study the groups were unavoidably prone to the confounding effects of several variables such as smoking etc. Therefore, further well-designed large-scale studies are needed to dispose this limitation.

As a conclusion, results of this preliminary study suggested that use of RSI index in general dental/periodontal patient population has a limited value in assessment of the relationship between gastrointestinal and dental/periodontal condition. This limit may be due to native nature of the complex local and systemic interactions in the process of dental and periodontal conditions. The authors of this current study believe that routine usage of RSI scores in order to determine an association of reflux in dental and periodontal clinics in the general population should not be advocated before a clear data has been achieved. Thus, further clinical trials evaluating the efficiency of this index in larger populations by supporting the survey with additional parameters are needed.

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## REFERENCES

1. Mosca F, Rossillo V, Leone CA. Manifestations of gastro-pharyngo-laryngeal reflux disease. *Acta Otorhinolaryngol Ital.* 2006; 26(5): 247-51.
2. Vakil N, van Zanten SV, Kahrilas P, Dent J, Jones R; Global Consensus Group. The Montreal definition and classification of gastroesophageal reflux disease: a global evidence-based consensus. *Am J Gastroenterol.* 2006; 101(8): 1900-20.
3. DeVault KR. Extraesophageal symptoms of GERD. *Cleve Clin J Med.* 2003; 70(5): 20-32.
4. Richter JE. Review article: extraesophageal manifestations of gastro-oesophageal reflux disease. *Aliment Pharmacol Ther.* 2005; 22(1): 70-80.
5. Napierkowski J, Wong RK. Extraesophageal manifestations of GERD. *Am J Med Sci.* 2003; 326(5): 285-99.
6. Di Fede O, Di Liberto C, Occhipinti G, et al. Oral manifestations in patients with gastro-oesophageal reflux disease: a single-center case-control study. *J Oral Pathol Med.* 2008; 37(6): 336-40.
7. Ersin NK, Oncag O, Tumgor G, Aydogdu S, Hilmioglu S. Oral and dental manifestations of gastroesophageal reflux disease in children: a preliminary study. *Pediatr Dent.* 2006; 28(3): 279-84.
8. Muñoz JV, Herreros B, Sanchiz V, et al. Dental and periodontal lesions in patients with gastro-oesophageal reflux disease. *Dig Liver Dis.* 2003; 35(7): 461-7.
9. Linnett V, Seow WK, Connor F, Shepherd R. Oral health of children with gastro-esophageal reflux disease: a controlled study. *Aust Dent J.* 2002; 47(2):156-62.
10. Marsicano JA, de Moura-Grec PG, Bonato RC, Sales-Peres Mde C, Sales-Peres A, Sales-Peres SH. Gastroesophageal reflux, dental erosion, and halitosis in epidemiological surveys: a systematic review. *Eur J Gastroenterol Hepatol.* 2013; 25(2):135-41.
11. Corrêa MC, Lerco MM, Cunha Mde L, Henry MA. Salivary parameters and teeth erosions in patients with gastroesophageal reflux disease. *Arq Gastroenterol.* 2012; 49(3): 214-8.
12. Yoshikawa H, Furuta K, Ueno M, et al. Oral symptoms including dental erosion in gastroesophageal reflux disease are associated with decreased salivary flow volume and swallowing function. *J Gastroenterol.* 2012; 47(4): 412-20.
13. Filipi K, Halackova Z, Filipi V. Oral health status, salivary factors and microbial analysis in patients with active gastro-oesophageal reflux disease. *Int Dent J.* 2011; 61(4): 231-7.
14. Wang GR, Zhang H, Wang ZG, Jiang GS, Guo CH. Relationship between dental erosion and respiratory symptoms in patients with gastro-oesophageal reflux disease. *J Dent.* 2010; 38(11): 892-8.
15. Song JY, Kim HH, Cho EJ, Kim TY. The relationship between gastroesophageal reflux disease and chronic periodontitis. *Gut Liver.* 2014; 8(1): 35-40.
16. Silva MA, Damante JH, Stipp AC, Tolentino MM, Carlotto PR, Fleury RN. Gastroesophageal reflux disease: New oral findings. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2001; 91(3): 301-10.
17. Belafsky PC, Postma GN, Koufman JA. Validity and Reliability of the Reflux Symptom Index. *J Voice.* 2002; 16(2): 274-7.
18. Zucato B, Behlau MS. Laryngopharyngeal Reflux Symptoms Index: Relation with the

- Main Symptoms of Gastroesophageal reflux, Voice Usage Level and Voice Screening. *Rev Cefac*. 2012; 14(6): 1197-1203.
19. Habermann W, Schmid C, Neumann K, Devaney T, Hammer HF. Reflux symptom index and reflux finding score in otolaryngologic practice. *J Voice*. 2012; 26(3): 123-7.
20. Naiboglu B, Durmus R, Tek A, Toros SZ, Egeli E. Do the laryngopharyngeal symptoms and signs ameliorate by empiric treatment in patients with suspected laryngopharyngeal reflux? *Auris Nasus Larynx*. 2011; 38(5): 622-7.
21. Ramzy I, El Shazly M, Marzaban R, Elbaz T, Safwat M, Latif B. Laryngopharyngeal Reflux in Gastroesophageal Reflux Disease: Does “Silent Laryngopharyngeal Reflux” Really Exist? *Open Journal of Gastroenterology*. 2014; 4(3): 130-40.
22. Park KH, Choi SM, Kwon SU, Yoon SW, Kim SU. Diagnosis of laryngopharyngeal reflux among globus patients. *Otolaryngol Head Neck Surg*. 2006; 134(1):81-5.
23. World Health Organization. *Oral Health Surveys: Basic Methods*. 4th ed. UK: World Health Organization; 1997.
24. Ogut F, Ersin S, Engin EZ, et al. The effect of laparoscopic Nissen fundoplication on laryngeal findings and voice quality. *Surg Endosc*. 2007; 21(4): 549-54.
25. Korkmaz M, Tarhan E, Unal H, Selcuk H, Yilmaz U, Ozluoglu L. Esophageal mucosal sensitivity: possible links with clinical presentations in patients with erosive esophagitis and laryngopharyngeal reflux. *Dig Dis Sci*. 2007; 52(2): 451-6.
26. Hayat E, Börekeci S, Gemicioglu B. Reflux, Allergic Rhinitis, and Sleep Disorders with Asthma Control and Quality of Life. *J Clin Anal Med*. 2014; 5(6): 453-6.
27. Belafsky PC, Postma GN, Koufman JA. Laryngopharyngeal reflux symptoms improve before changes in physical findings. *Laryngoscope*. 2011; 111(6): 979-81.
28. Catania RA, Kavac SM, Roth JS, et al. Laparoscopic Nissen fundoplication effectively relieves symptoms in patients with laryngopharyngeal reflux. *Gastrointest Surg*. 2007; 11(12): 1579-87.
29. Pizzo G, Guiglia R, Lo Russo L, Campisi G. Dentistry and internal medicine: from the focal infection theory to the periodontal medicine concept. *Eur J Intern Med*. 2010; 21(6): 496-502.
30. Logan RM. Links between oral and gastrointestinal health. *Curr Opin Support Palliat Care*. 2010; 4(1): 31-5.
31. Daley TD, Armstrong JE. Oral manifestations of gastrointestinal diseases. *Can J Gastroenterol*. 2007; 21(4): 241-4.
32. Nouraie M, Radmard AR, Zaer-Rezaii H, Razjouyan H, Nasser-Moghaddam S, Malekzadeh R. Hygiene could affect GERD prevalence independently: a population-based study in Tehran. *Am J Gastroenterol*. 2007; 102(7): 1353-60.
33. Katunarić M, Jukić S, Staudt-Skaljac G, Mehulić K, Komar D. Some periodontological parameters in patients with oesophagogastric passage insufficiency. *Coll Antropol*. 1998; 22: 199-203.
34. Belafsky PC, Postma GN, Koufman JA. The validity and reliability of the reflux finding score (RFS). *Laryngoscope*. 2001; 111(8): 1313-7.



35. Lien HC, Wang CC, Hsu JY, et al. Classical reflux symptoms, hiatus hernia and overweight independently predict pharyngeal acid exposure in patients with suspected reflux laryngitis. *Aliment Pharmacol Ther.* 2011; 33(1): 89-98.
36. Mesallam TA, Stemple JC, Sobeih TM, Elluru RG. Reflux symptom index versus reflux finding score. *Ann Otol Rhinol Laryngol.* 2007; 116(6): 436-40.
37. Belafsky PC, Rees CJ. Laryngopharyngeal reflux: the value of otolaryngology examination. *Curr Gastroenterol Rep.* 2008; 10(3): 278-82.
38. Holde GE, Oscarson N, Trovik TA, Tillberg A, Jönsson B. Periodontitis Prevalence and Severity in Adults: A Cross-Sectional Study in Norwegian Circumpolar Communities. *J Periodontol.* 2017; 3: 1-17.