



Investigating the Potential Association between Functional Dyspepsia and Oro-Dental Health

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ABSTRACT

Objectives: The purpose of this research is to examine the link between orodental condition and dyspeptic symptoms in patients with functional dyspepsia (FD) and uninvestigated dyspepsia (UD)

Materials and Methods: A cross-sectional study was conducted from February to July 2018, involving orodental examinations of 199 participants. The participants were divided into three groups: FD, UD, and a control group. FD diagnosis was made based on the Rome III criteria. Patients diagnosed with FD were assessed using the Glasgow Dyspepsia Severity Score. The orodental examination included the assessment of missing, decayed, and filled teeth, tooth mobility, erosion, and mucosal inflammation. Statistical analysis was performed using multivariate logistic regression.

Results: No significant association was observed between orodental health and functional dyspepsia. However, subgroup analysis revealed a significant association between decayed teeth, eating within 20 minutes, and oral mucosal inflammation with UD. Moreover, a significant statistical association was identified between lower levels of education and the presence of functional dyspepsia. No significant relationship was identified between the Glasgow Dyspepsia Severity Score, demographic data and orodental health.

Conclusions: This study identified a positive association between low educational status and FD, as well as a correlation between decayed teeth, oral mucosal inflammation, and eating habits (specifically eating faster than 20 minutes) with UD.

Keywords: Dyspepsia, tooth loss, mastication, tooth, oral hygiene.

Fonksiyonel Dispepsi ile Oro-Dental Sağlık Arasındaki Potansiyel İlişkinin Araştırılması

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ÖZ

Amaç: Fonksiyonel dispepsi (FD) ve araştırılmamış dispepsi (AD) ile orodental durum arasındaki ilişkiyi araştıran çalışmalar literatürde nadirdir. Bu çalışmada amacımız FD ile AD tanısı alan hastalarda dispepsi ile orodental durum ilişkisini araştırmaktır.

Gereç ve Yöntemler: Şubat-Temmuz 2018 arasında gerçekleştirilen kesitsel çalışmada 199 kişinin orodental muayenesi yapılmıştır. Katılımcılar FD, AD ve kontrol olmak üzere üç ana gruba bölünmüştür. FD tanısı Roma III kriterine göre konulmuştur. Fonksiyonel dispepsisi olan hastalarda semptom şiddetinin nesnel olarak değerlendirilmesi için Glasgow Dispepsi Şiddet Skalası uygulanmıştır. Orodental bakıda eksik, çürük ve restoratif tedavi uygulanmış diş sayısı ile diş mobilitesi, dental erozyon ve ağız içi mukozada izlenen inflamasyon değerlendirilmiştir. Orodental durum ile gastrointestinal hastalık arasındaki ilişkiyi değerlendirmek için çok değişkenli lojistik regresyon analizi kullanılmıştır.

Bulgular: Fonksiyonel dispepsi ile ağız ve diş sağlığı arasında herhangi bir ilişki saptanmamıştır. Alt grup analizinde çürük diş, 20 dakikadan hızlı yemek yeme ve oral mukozada izlenen inflamasyonla AD arasında anlamlı ilişki bulunmuştur. Eğitim durumunun düşük seviyede olmasıyla fonksiyonel dispepsi arasında istatistiksel olarak anlamlı bir ilişki saptanırken, Glasgow dispepsi şiddeti skoru ile demografik veriler ve orodental durum arasında istatistiksel anlamlı ilişki saptanmamıştır.

Sonuçlar: Bu çalışmada düşük eğitim düzeyi ile FD arasındaki pozitif ilişkinin yanı sıra çürük diş, oral mukozal inflamasyon ve 20 dk'dan hızlı yeme ile AD arasında ilişki saptadık.

Anahtar Kelimeler: Dispepsi, diş kaybı, çiğneme, diş, ağız hijyeni.

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Introduction

Historical records indicate that the concept of "Prima digestio fit in ore" — digestion beginning in the mouth — can be traced back to the ancient Roman period.¹ The

structures within the oral cavity, including the teeth, tongue, and salivary glands, play a crucial role in nutrient absorption and in converting ingested food into a

digestible, bioavailable form for the body.^{2,3} In particular, chewing enables the disintegration of solid foods, making them suitable for ingestion. Tooth loss is a leading cause of impaired chewing function.⁴ A study involving edentulous elderly individuals demonstrated that reduced chewing capacity negatively impacts food intake and increases the incidence of gastrointestinal diseases.⁵ The presence of gastritis and ulcers in individuals with compromised chewing function has long been recognized.^{6,7} However, current evidence regarding potential nutritional deficiencies and gastrointestinal disorders resulting from impaired chewing function remains inconsistent. Behr's review of 22 studies examining the relationship between tooth loss, chewing dysfunction, and general health found that only ten of these studies reported a significant association between dental and chewing function and overall health.⁸

Functional dyspepsia (FD) is commonly defined as the sensation of epigastric pain or discomfort, often accompanied by symptoms such as nausea, vomiting, or burning, in the absence of any identifiable organic, systemic, or metabolic causes.^{9,10} The global prevalence of functional dyspepsia is estimated to range from 5% to 11%.^{11,12} The prevalence of dyspepsia is reported as 26% in the USA and 41% in the UK.^{13,14} The point prevalence of dyspepsia in Turkey was found to be 30.8% for the three-month period and 62% for the six-month period.¹⁵ In a study conducted in Turkey, the prevalence of dyspepsia was determined to be 39%.^{16,17} It should be noted that there is an organic cause in about 25% of patients with dyspepsia,¹² and about three-quarters of them have FD.¹⁸

There are publications indicating an association between irregular eating patterns, rapid eating, and an increased risk of functional dyspepsia (FD). However, only a limited number of studies have investigated the relationship between upper gastrointestinal disorders, including FD and gastroesophageal reflux disease (GERD), and tooth loss. In the literature, studies examining the association between oro-dental conditions and dyspepsia are scarce and yield conflicting results. Although a limited number of recent studies have explored the relationship between gastroesophageal reflux disease and dental erosion,¹⁹ as well as oral mucosal irregularities,²⁰ no study has comprehensively evaluated dyspeptic cases in relation to all these parameters.

The limited number of studies examining the relationship between oro-dental health and gastrointestinal disorders highlights a significant gap in the existing body of knowledge. In particular, the potential associations between relatively common gastrointestinal conditions such as functional dyspepsia, and oral health parameters—including chewing function, tooth loss, dental erosion, and oral mucosal diseases—have not been adequately elucidated. Moreover, comprehensive studies evaluating all of these parameters collectively are currently lacking in the literature. Therefore, a detailed investigation of oro-dental health impairments in individuals with dyspepsia may contribute to identifying potential risk factors for functional dyspepsia and

underscore the broader impact of preventive oral health services on general health. This study aims to address this gap by providing a multidimensional evaluation of the relationship between oral health status and functional dyspepsia.

Materials and Methods

Selection of Patients

The ethics approval was obtained from the ethics committee of the Ege University Faculty of Medicine on 28.08.2011 with protocol number 28.08.2011/05. This cross-sectional study was conducted with patients who presented to Ege University between December 2017 and July 2018. A total of 109 individuals were included in the control group, aged between 18 and 75, who met the following exclusion criteria: pregnancy, lactation, recent surgery within the past week, drug use known to induce dyspepsia, malignancy, diabetes mellitus, connective tissue diseases, gastroesophageal reflux disease, peptic ulcer, and alarm symptoms (involuntary weight loss, dysphagia, recurrent vomiting, hematemesis, melena). Participants in the control group were asked about symptoms such as stomach pain, burning, early satiety, and bloating, and all answered negatively. Additionally, 50 individuals who reported at least one of these symptoms were classified into the uninvestigated dyspepsia (UD) group. Forty patients, who underwent normal abdominal ultrasound and gastroscopy, were diagnosed with functional dyspepsia (FD) based on the Rome III criteria. A questionnaire assessing sociodemographic data, eating speed, and tooth brushing frequency was administered to all participants. All participants were examined by the same dentist, and their findings were recorded on the form. To determine the severity of dyspepsia in FD patients, the Glasgow Dyspepsia Severity Score was applied.

Oro-dental Examination

Participants were evaluated for filled, decayed, and missing teeth, as well as for dental erosion and oral mucosal inflammation. Dental erosion is defined as the loss of tooth structure caused by chemical factors, independent of bacterial involvement.^{21,22} The severity of dental erosion was classified using the Smith and Knight Dental Erosion Index, which rates the erosion severity on a scale from 0 to 4, with higher numbers indicating greater severity.²³ During the oral examination, inflammation of the oral mucosa was assessed in areas including the lingua, Buccal mucosa on both sides of the oral cavity, hard and soft palates, top and bottom vestibules, and the floor of the mouth. The presence of hyperemia, erosion, and ulcers was noted. The severity of mucosal inflammation was rated on a scale from 0 to 2, corresponding to normal, moderate, and severe inflammation.^{20,24,25}

Gastrointestinal Examination

Gastroscopy and abdominal ultrasonography were performed using the Olympus Exera 3 video endoscopy system for patients presenting with dyspepsia who met

the inclusion criteria for the study. Patients with normal findings were further assessed according to the Rome III criteria and diagnosed with functional dyspepsia (FD).¹²⁻¹⁶

Glasgow Dyspepsia Severity Scoring

In 1996, El-Omar and colleagues developed the Glasgow Dyspepsia Severity Score to assess the severity of dyspepsia.²⁶ The score consists of eight items: symptom frequency (maximum score 5), the impact of dyspepsia on normal activities (maximum score 2), number of workdays missed due to dyspepsia (maximum score 2), medical consultations (maximum score 2), number of home doctor visits (maximum score 2), number of tests conducted due to dyspepsia (maximum score 2), over-the-counter medication use (maximum score 2), and prescription medication use (maximum score 3). The score ranges from 0 to 20, with higher scores indicating more severe dyspepsia.²⁷ In the Turkish adaptation of the Glasgow Dyspepsia Severity Score, the number of emergency department visits was recorded instead of home doctor calls.¹⁶

Evaluation of Potential Variables

Participants provided self-reported data regarding their body weight and height. BMI (Body Mass Index) was determined by dividing a participant's weight in kilograms by the square of their height in meters. A BMI over 30 was classified as obesity. Additional information was obtained via a questionnaire, which included questions about age, gender, relationship status, education, smoking, alcohol use, frequency of tooth brushing (categorized as 0, 1–3, or >3 times per day), chronic diseases, and medications used. To assess eating speed, participants were asked how long it typically took them to finish an average meal. Eating speed was subsequently categorized into three groups: under 10 minutes, 10 to 20 minutes, and more than 20 minutes.

Statistical Analysis

In the statistical analysis, all variables were initially examined using frequency tables, and descriptive statistics for each continuous variable were calculated separately for the entire patient dataset and by group. The Shapiro-Wilk test was applied to assess the normality of continuous variables. The Mann-Whitney U test was used to evaluate differences between groups for numerical variables when parametric assumptions were not met, while the independent t-test was employed when parametric assumptions were satisfied. For comparisons of the means of three or more groups with non-normally distributed data, the Kruskal-Wallis test was used. Categorical variables were summarized as counts and percentages (%), whereas continuous variables were summarized by mean, median, standard deviation, range, minimum, and maximum values. The chi-square test was used to examine relationships between categorical variables. Spearman's rank correlation was used for correlation analysis. A significance level of 0.05 was set for

all comparisons. Statistical analyses were performed using IBM SPSS Version 21.0 software.

Results

The general characteristics of the participants are presented in Table 1. In the comparison of demographic data between participants with FD, UD, and those without dyspepsia, no statistically significant differences were observed between the three groups regarding gender, relationship status, education, smoking, alcohol use, and BMI.

In the subgroup analysis, educational status differed significantly between groups: 23.9% of the control group had completed primary school, while 45% of the FD group had only attended primary school. This suggests that lower educational status is a risk factor for the presence of functional dyspepsia ($p = 0.012$). The mean age was 41.8 ± 13.4 years for the FD group, 37.5 ± 10.9 years for the UD group, and 40.8 ± 13.1 years for the group without dyspepsia. No statistically significant age differences were found between the three groups.

The average Glasgow Dyspepsia Severity Score was 10.7 ± 3.3 , with a maximum score of 18 and a minimum score of 5. The relationship between dyspepsia severity scores and various variables was analyzed using appropriate statistical methods. The distribution of dyspepsia severity scores by gender and frequency of tooth brushing was evaluated using the Kruskal-Wallis test. Correlations with age, body mass index (BMI), and oro-dental examination findings (including the number of missing, decayed, or filled teeth; dental erosion; and oral mucosal inflammation) were assessed using the Spearman correlation test. Table 2 and Figure 1 presents the correlation analysis between the Glasgow dyspepsia severity score and the number of missing, filled, and decayed teeth, as well as dental erosion and oral mucosal inflammation. Associations with smoking and alcohol consumption were analyzed using the Mann-Whitney U test. The analysis revealed no statistically significant correlation between dyspepsia severity and age, gender, BMI, smoking, alcohol consumption, frequency of tooth brushing, number of missing, decayed, or filled teeth, dental erosion, or oral mucosal inflammation. Table 3 presents the comparison of the three groups according to the number of filled, decayed, and missing teeth. A statistically significant association was observed between decayed teeth and UD ($p = 0.029$).

Table 4 displays the relationship between dental erosion, oral mucosal inflammation, and the FD, UD, and non-dyspepsia groups. A significant association was found between oral mucosal inflammation and UD ($p = 0.007$).

No significant differences in eating speed were observed between the three groups. However, when eating speed was categorized as fast or slow eaters (with a threshold of 20 minutes), the subgroup analysis (Table 5) revealed that fast eating was a significant risk factor for UD ($p = 0.043$).

Table 1. Distribution of FD, UD and control group according to demographic data

Individual Characteristics	FD n (%)	UD n (%)	Dyspepsia (-) n (%)	p*	chi square
Number of Cases	40 (20.1)	50(25.1)	109 (54.8)		
Gender					
Female	25 (62.5)	27 (54.0)	56 (51.4)	0.482	1.461
Male	15 (37.5)	23 (46.0)	53 (48.6)		
Education					
Primary School	18 (45.0)	12 (24.0)	26 (23.9)	0.067	11.766
Secondary School	6 (15.0)	6 (12.0)	8 (7.3)		
High School	4 (10.0)	12 (24.0)	29 (26.6)		
University	12 (30.0)	20 (40.0)	46 (42.2)		
Marriage					
Single	7 (17.5)	10 (20.0)	29 (26.6)	0.393	4.094
Married	31 (77.5)	40 (80.0)	76 (69.7)		
Widow	2 (5.0)	0 (0)	4 (3.7)		
Smoke (+)	11 (27.5)	13 (26.0)	35 (32.1)	0.696	0.724
Smoke (-)	29 (72.5)	37 (74.0)	74 (67.9)		
Alcohol (+)	5 (12.5)	13 (26.0)	21 (19.3)	0.274	2.587
Alcohol (-)	35 (87.5)	37 (74.0)	88 (80.7)		
BMI					
Underweight	1 (2.5)	3 (6.0)	0 (0.0)	0.267	12.279
Normal	17 (42.5)	19 (38.0)	41 (37.6)		
Overweight	13 (32.5)	20 (40.0)	52 (47.7)		
Obese	9 (22.5)	8 (16.0)	16 (14.7)		

*p < 0.05 was considered significant. When comparing the demographic data of the FD, UD, and non-dyspeptic groups, no statistically significant differences were found between the three groups in terms of gender, marital status, education level, smoking, alcohol consumption, and BMI.

Table 2. Correlation analysis between the dyspepsia severity score and the orodental examination findings

	p	r
Missing teeth	0.928	.015
Filling teeth	0.292	-.171
Decayed teeth	0.856	-.030
Dental erosion	0.376	-.144
Oral mucosal inflammation	0.323	-.160

r: Spearman's rank correlation coefficient

*p < 0.05 was considered significant. The table presents the correlation analysis between the Glasgow Dyspepsia Severity Score and the number of missing, filled, and decayed teeth, as well as dental erosion and oral mucosal inflammation. No statistically significant associations were found between dyspepsia severity and the number of missing, decayed, or filled teeth, dental erosion, or oral mucosal inflammation.

Table 3. Distribution of FD, UD and control group according to DMF data

	FD Mean \pm SD	UD Mean \pm SD	Dyspepsia (-) Mean \pm SD	p*
Decayed teeth	1.03 \pm 1.593	1.94 \pm 1.789	1.59 \pm 2.632	0.029*
Filling teeth	5.98 \pm 6.908	4.96 \pm 4.544	4.89 \pm 5.156	0.884
Missing teeth	5.05 \pm 4.489	4.90 \pm 3.898	4.67 \pm 4.554	0.776
n	40	50	109	

Kruskal

Wallis

test

SD: Standard Deviation

*p < 0.05 was considered significant.

The comparison of the three groups based on the number of filled, decayed, and missing teeth is presented. A statistically significant relationship was found between decayed teeth and the UD group (p=0.029).

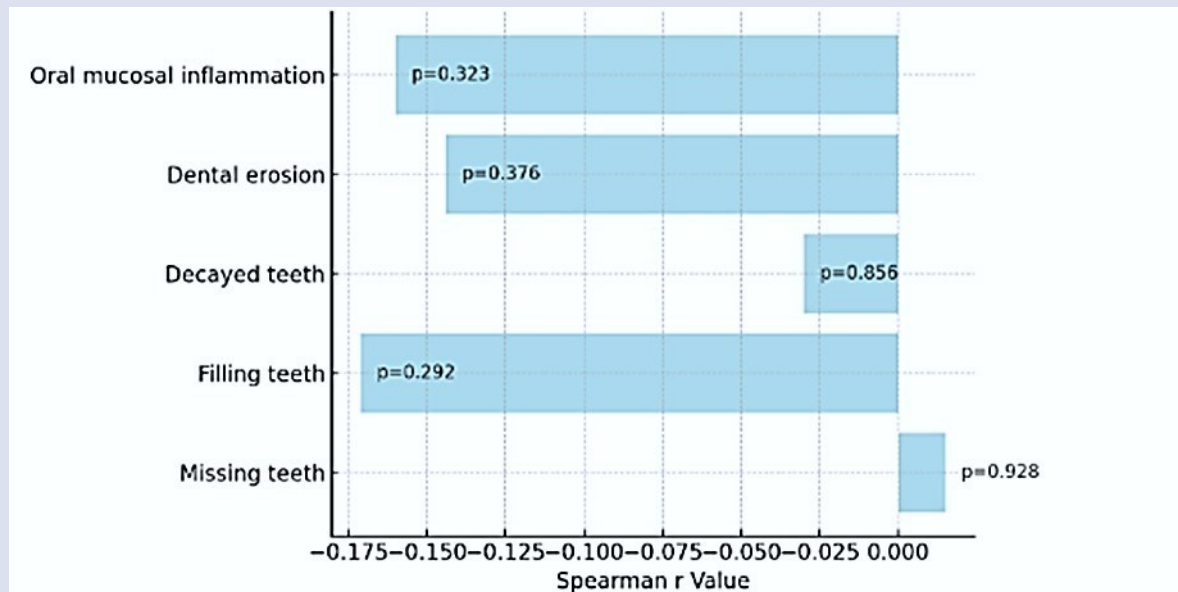


Figure 1. Shows the correlation analysis between the dyspepsia severity score and the findings from the orodental examination.

Table 4. Distribution of FD, UD and control group according to oral mucosal inflammation and dental erosion data

	FD n (%)	UD n (%)	Dyspepsia (-) n (%)	P*	chi quare
Oral mucosal inflammation					
0	13 (32.5)	8 (16.0)	38 (34.9)	0.007	14.153
1	22 (55.0)	42 (84.0)	64 (58.7)		
2	5 (12.5)	0 (0.0)	7 (6.4)		
Dental erosion					
0	20 (50.0)	20 (40.0)	51 (46.8)	0.696	5.564
1	15 (37.5)	25 (50)	45 (41.3)		
2	3 (7.5)	3 (6.0)	11 (10.1)		
3	2 (5.0)	2 (4)	1 (0.9)		
4	0 (0)	0 (0)	1 (0.9)		

*p < 0.05 was considered significant.

A significant relationship was found between oral mucosal inflammation and the UD group (p = 0.007).

Table 5: Distribution Of FD, UD and control group according to eating fast data

Eating Fast	FD n (%)	UD n(%)	Dyspepsia (-) n (%)
Under 20 min	1 (5.6)	11 (23.4)	6 (8.7)
20 min and more	17 (94.4)	36 (76.6)	63 (91.3)

p:0.043 ki-square:6.311.

In the UD group, a meal duration of less than 20 minutes was identified as a risk factor (p:0.043).

Discussion

Despite the widely held belief that digestion begins in the mouth,⁵ supported by numerous dental studies suggesting a correlation between oral health and gastrointestinal disorders, the complexities of this relationship require further investigation.^{3,7,8} A review of available online resources reveals a consensus among both dental professionals and the general public, in our country and internationally, regarding the existence of a direct link between oral health and digestive system diseases. Dyspepsia, a prevalent symptom of digestive

disorders, significantly impacts quality of life. To assess the severity of dyspepsia, the Glasgow Dyspepsia Severity Score was developed by El-Omar et al. with higher scores indicating more severe dyspepsia.^{13,27} To date, there are no studies in the literature directly comparing the Glasgow Dyspepsia Severity Score with dental health data. In our study, no statistically significant associations were found between dyspepsia severity and variables such as age, gender, BMI, smoking, alcohol consumption, frequency of tooth brushing, dental erosion, oral mucosal inflammation, or the number of missing, decayed, or filled teeth. This lack of association suggests that commonly

presumed lifestyle or oral health factors may not play a direct or measurable role in the severity of dyspeptic symptoms. It also implies that dyspepsia may be influenced more by intrinsic gastrointestinal or psychosomatic factors rather than external demographic or oral health-related variables.

It has been demonstrated that reduced chewing function can affect food intake and contribute to an increased prevalence of gastrointestinal diseases.⁵ Tooth loss is the most common cause of impaired chewing function.²⁸⁻³⁰ Adibi et al.³¹ investigated the relationship between functional dyspepsia (FD) and tooth loss. While no significant relationship was found between tooth loss and FD, a notable association was observed between tooth loss and early satiety, a key component of FD. While Adibi's study focused on middle-aged adults, our research included a broader age range (18 to 75 years). In contrast, Hattori et al.³² reported that the reduction in food grinding efficiency due to missing teeth does not significantly impact gastrointestinal digestive function. Although the current study is limited by its small sample size and the inclusion of primarily young, healthy males, it benefits from a diverse age range and patient population.

Carretero et al.⁵ also reported a strong correlation between the number of antagonist teeth and chewing performance, but found only an association between chewing performance and functional dyspepsia. This suggests that the rate of food breakdown may be a more critical factor for dyspepsia patients than the number of antagonist teeth. In the current study, the number of missing teeth in the FD group was 5.05 ± 4.48 , compared to 4.67 ± 4.55 in the control group, with no statistically significant difference observed between the two groups. This finding indicates that tooth loss, a potential marker of long-term oral health status, may not be distinctly associated with the presence of functional dyspepsia. Although tooth loss is often linked to nutritional compromise or systemic inflammation, our results suggest that it may not serve as a reliable indicator of gastrointestinal functional disorders like FD.

Several studies have demonstrated an association between dietary behaviors, such as irregular eating patterns and fast eating, and an increased risk of chronic uninvestigated dyspepsia (UD). Keshteli et al.³³ found a link between moderate-to-fast eating speeds and chronic UD in a study involving 4,763 Iranian adults. In our study, a statistically significant relationship was found between eating within less than 20 minutes and UD ($p = 0.043$). Few studies have examined the relationship between FD and eating speed. A study involving young women found no significant difference in eating time between FD patients and controls.³⁴ However, our study differs from others by including both genders. In our cohort, 6% of the FD group ($n = 24$) finished an average meal in 10–20 minutes, while 61.5% of the control group ($n = 67$) did the same. No meaningful connection was observed between meal timing and FD ($p = 0.686$).

Dental erosion, primarily caused by vomiting, regurgitation, or the consumption of acidic foods, has

been identified as one of the extraesophageal symptoms of gastroesophageal reflux disease (GERD) in the Montreal Definition and Classification of GERD.²⁰ However, in our study, no relationship was found between UD and dental erosion. A significant relationship has been reported between dental erosion and functional dyspepsia in patients with a history of eating disorders.³⁵ No other studies investigating the link between dental erosion and FD exist in the literature. Our findings suggest that acidic attacks do not play a significant role in this context.

Tooth brushing plays an important role in maintaining oral hygiene, and poor oral hygiene is a common cause of chronic periodontitis. The potential overlap in symptoms between reflux and functional dyspepsia may complicate the diagnosis. GERD can lead to poor oral hygiene due to the upward migration of gastric contents.^{22,36} In our study, the frequency of tooth brushing was assessed as an indicator of oral hygiene, but no relationship was found between tooth brushing frequency and functional dyspepsia. This suggests that general oral hygiene practices, at least as reflected by brushing habits, may not have a measurable impact on the presence of FD. It is possible that more specific oral health parameters, such as periodontal status or microbial composition, might be more relevant in evaluating potential links with gastrointestinal functional disorders.

Oral mucosal inflammation, assessed in areas such as the tongue, bilateral buccal mucosa, hard and soft palate, upper and lower vestibules, and the oral floor, was characterized by hyperemia, erosion, and ulcer presence. Diseases like pyostomatitis vegetans, associated with conditions such as ulcerative colitis, are known to cause significant changes in oral mucosa. A correlation between oral mucosal inflammation and GERD has also been reported.^{20,24,25} However, no studies in the literature have investigated the relationship between FD, UD, and oral mucosal inflammation. In our study, no significant relationship was found between the severity of oral mucosal inflammation and FD. However, a notable correlation was found between oral mucosal inflammation and UD ($p = 0.007$).

Zahedi et al.³⁷ reported no relationship between the DMFT index and gastric histopathology, suggesting that the slower decolonization of bacteria in the teeth, compared to the periodontium, may explain this lack of association. Our study also found no statistically significant differences in the number of decayed teeth between the FD group (1.0 ± 1.5) and the control group (1.5 ± 2.6). However, subgroup analysis revealed a significant association between uninvestigated dyspepsia (UD) and the number of decayed teeth ($p = 0.029$), suggesting that individuals with undiagnosed or less managed gastrointestinal complaints may exhibit poorer oral health. Furthermore, while the average number of filled teeth was higher in the FD group (5.9 ± 6.9) compared to the control group (4.8 ± 5.1), this difference was not statistically significant. These findings imply that although overall dental caries experience (as measured by decayed or filled teeth) may not distinguish FD patients

from healthy individuals, certain subtypes of dyspepsia might be linked to untreated dental issues, possibly due to lifestyle factors or healthcare accessibility.

This study has several limitations. First, functional dyspepsia is a condition that is difficult to diagnose clinically, as its symptoms overlap with many other gastrointestinal disorders and it is not often considered among the primary differential diagnoses. This may lead to reliance on subjective clinical judgment and the potential for diagnostic variability. Furthermore, the limited and unequal sample size in both the study and control groups may have restricted the statistical power of the analysis and reduced the generalizability of the findings. Future studies involving larger and more diverse populations are needed to enhance the accuracy and reliability of the results.

Conclusions

This research represents one of the scarce cross-sectional investigations in the literature that assesses the association between oral and dental health and dyspepsia by employing different oro-dental parameters. In our study, after excluding organic pathologies, patients diagnosed with functional dyspepsia (FD) were objectively assessed using standardized scoring systems for both dyspepsia and oral and dental health. Additionally, the same parameters were applied for validation in the uninvestigated dyspepsia (UD) group. The results of the present study revealed a statistically significant association between oral mucosal inflammation, eating faster than 20 minutes, and UD. However, no significant relationship was found between the number of missing teeth, eating speed, oral mucosal inflammation, dental erosion, decayed and filled teeth, and the severity of FD.

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Conflicts of Interest Statement

The authors declared that they have no conflict of interest.

References

- Proff P. Malocclusion, mastication and the gastrointestinal system. *J Orofac Orthop* 2010;71:96-107.
- Biesalski HK. Ernährung. In: Schmidt RF, Lang F (eds). *Physiologie des Menschen mit Pathophysiologie*. Berlin-Heidelberg: Springer; 2007;Kap 37.
- Vaupel P. Funktionen des Magen-Darm-Kanals. In: Schmidt RF, Lang F (eds). *Physiologie des Menschen mit Pathophysiologie*. Berlin-Heidelberg: Springer; 2007;Kap 38.
- N'Gom PI, Woda A. Influence of impaired mastication on nutrition. *J Prosthet Dent* 2002;87:667-673.
- Carretero D, Sánchez-Ayala A, Rodríguez A, Lagravère MO, Gonçalves TMSV, Garcia RC. Relationship between non-ulcerative functional dyspepsia, occlusal pairs, and masticatory performance in partially edentulous elderly persons. *Gerodontology* 2011;28:296-301.
- Sierpinska T, Golebiewska M, Dlugosz J, Kemon A, Laszewicz W. Connection between masticatory efficiency and pathomorphologic changes in gastric mucosa. *Quintessence Int* 2007;38:31-37.
- Kumar A, Almotairy N, Merzo JJ, Wendin K, Rothenberg E, Grigoriadis A, Sandborgh-Englund G, Trulsson M. Chewing and its influence on swallowing, gastrointestinal and nutrition-related factors: a systematic review. *Crit Rev Food Sci Nutr* 2023;63:11987-12017.
- Behr M. Braucht der Mensch Zähne? *Dtsch Zahnärztl Z* 2003;58:393-400.
- Mahadeva S, Goh KL. Epidemiology of functional dyspepsia: A global perspective. *World J Gastroenterol* 2006;12:2661-2666.
- Tack J, Talley NJ, Camilleri M, Holtmann G, Hu P, Malagelada JR, Stanghellini V. Functional gastroduodenal disorders. *Gastroenterology* 2006;130:1466-1479.
- Ford AC, Marwaha A, Sood R, Moayyedi P. Global prevalence of, and risk factors for, uninvestigated dyspepsia: A meta-analysis. *Gut* 2015;64:1049-1057.
- Talley NJ, Ford AC. Functional dyspepsia. *N Engl J Med* 2015;373:1853-1863.
- Choung RS, Locke GR, Schleck CD, Zinsmeister AR, Talley NJ. Do distinct dyspepsia subgroups exist in the community? A population-based study. *Am J Gastroenterol* 2007;102:1983-1989.
- Lee K, Kwon CI, Yeniova AÖ, Koyanagi A, Jacob L, Smith L, Lee SW, Rahmati M, Shin JY, Shin JI, Cho W, Yon DK. Global prevalence of functional dyspepsia according to Rome criteria, 1990-2020: a systematic review and meta-analysis. *Sci Rep* 2024;14:4172.
- Özden A, Çetinkaya H, Dumlu G. Ankara'da toplumun değişik kesimlerinde dispepsi görülme sıklığı. *Türk J Gastroenterol* 1996;6:121-124.
- Coşkun A. Hepatobiliyer hastalıklarda *Helicobacter pylori*, üst gastrointestinal sistem endoskopik bulguları ve tümör markörlerinin değerlendirilmesi. YÖK Tez No: 479929, Tıpta Uzmanlık Tezi, Türkçe, 2005.
- Özaydın N, Türkyılmaz S, Cali S. TURHEP Turkey *Helicobacter Pylori* Prevalence Survey, 2003 Survey Report. İstanbul: Eray Basım Hizm Tic Ltd Şti. 2007, pp.74
- Özden A. Dispepsi (Dyspepsia). *Güncel Gastroenteroloji* 2016;4:272-282.
- Li W, Liu J, Chen S, Wang Y, Zhang Z. Prevalence of dental erosion among people with gastroesophageal reflux disease in China. *J Prosthet Dent* 2017;117:48-54.
- Watanabe M, Nakatani E, Yoshikawa H, Kanno T, Nariai Y, Yoshino A, Vieth M, Kinoshita Y, Sekine J. Oral soft tissue disorders are associated with gastroesophageal reflux disease: Retrospective study. *BMC Gastroenterol* 2017;17:92.
- O'Sullivan E, Milosevic A. UK National Clinical Guidelines in Paediatric Dentistry: diagnosis, prevention and management of dental erosion. *Int J Paediatr Dent* 2008;18(Suppl 1):29-38.
- Tuğut F, Doğan D, Polat T. Gastroözofagal reflü hastalığı olan bireylerdeki diş erozyon sıklığının araştırılması. *Cumhuriyet Dent J* 2009;12:29-32.
- Smith BG, Knight JK. An index for measuring the wear of teeth. *Br Dent J* 1984;156:435-438.
- 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;91:301-310.
- Ranjitkar S, Smales RJ, Kaidonis JA. Oral manifestations of gastroesophageal reflux disease. *J Gastroenterol Hepatol* 2012;27:21-27.
- el-Omar EM, Banerjee S, Wirz A, McColl KE. The Glasgow Dyspepsia Severity Score—a tool for the global measurement of dyspepsia. *Eur J Gastroenterol Hepatol* 1996;8:967-976.
- McColl K, Murray L, El-Omar E, Dickson A, El-Nujumi A, Wirz A, Kelman A, Penny C, Knill-Jones R, Hilditch T. Symptomatic benefit

- from eradicating *Helicobacter pylori* infection in patients with nonulcer dyspepsia. *N Engl J Med* 1998;339:1869-1874.
28. Zhu Y, Hollis JH. Tooth loss and its association with dietary intake and diet quality in American adults. *J Dent* 2014;42:1428-1435.
29. Jabr CL, Oliveira LP, Pero AC, de Assis Mollo Júnior F, Filho JNA. Masticatory performance, self-perception of oral health, oral health-related quality of life and nutritional status of completely edentulous elderly patients submitted to different rehabilitation treatments: A cross-sectional study. *J Oral Rehabil* 2024;51:724-732.
30. Miura H, Araki Y, Umenai T. Chewing activity and activities of daily living in the elderly. *J Oral Rehabil* 1997;24:630-634.
31. Adibi P, Keshteli AH, Saneei M, Saneei P, Savabi O, Esmailzadeh A. Relationship between tooth loss, functional dyspepsia, and gastro-esophageal reflux disorder among Isfahani adults. *Arch Iran Med* 2016;19:123-130.
32. Hattori Y, Mito Y, Watanabe M. Gastric emptying rate in subjects with experimentally shortened dental arches: A pilot study. *J Oral Rehabil* 2008;35:392-397.
33. Keshteli AH, Feizi A, Esmailzadeh A, Zaribaf F, Feinle-Bisset C, Talley NJ, Adibi P. Patterns of dietary behaviours identified by latent class analysis are associated with chronic uninvestigated dyspepsia. *Br J Nutr* 2015;113:803-812.
34. Sinn DH, Shin DH, Lim SW, Kim KM, Son HJ, Kim JJ, Rhee JC, Rhee PL. The speed of eating and functional dyspepsia in young women. *Gut Liver* 2010;4:173-178.
35. Bruno V, Amato M, Catapano S, Iovino P. Dental erosion in patients seeking treatment for gastrointestinal complaints: A case series. *J Med Case Rep* 2015;9:250.
36. Song JY, Kim HH, Cho EJ, Kim TY. The relationship between gastroesophageal reflux disease and chronic periodontitis. *Gut Liver* 2014;8:280-287.
37. Zahedi L, Jafari E, Torabi Parizi M, Shafieipour S, Abbasi MH, Moghadam SD, Zahedi MJ. The Association between Oral Hygiene and Gastric Pathology in Patients with Dyspepsia: a Cross-Sectional Study in Southeast Iran. *Middle East J Dig Dis* 2017;9:33-38.