ORIGINAL ARTICLE

Association between Oral Tobacco Consumption and Dyspepsia

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Abstract

Background: Dyspepsia is a common gastrointestinal condition characterized by recurrent upper abdominal pain and discomfort, significantly impacting the quality of life and increasing healthcare burdens. While various factors such as infections, dietary habits, and psychological stress contribute to dyspepsia, emerging evidence suggests that oral tobacco consumption may also play a significant role.

Objective: To assess the association between oral tobacco consumption and dyspepsia among patients presenting at a tertiary care hospital in Karachi, Pakistan.

Methods: This case-control study was conducted from March to June 2024 at Mekran Medical College, Turbat, Baluchistan. A total of 150 adults aged 18-65 years were recruited, including 75 cases with confirmed dyspepsia, as determined by upper gastrointestinal endoscopy, and 75 controls without dyspeptic symptoms. Data on demographic information, tobacco use history, and other lifestyle factors were collected through structured questionnaires. Statistical analysis was performed using SPSS version 23.

Results: The mean of the patients was 38.89±7.5 years. Of 150 patients, 62 participants were males (41.3%) and 88 participants were females (58.7%). In univariate analysis, tobacco users were seen as likely to experience dyspepsia more compared to those who do not use tobacco (OR=4.57, 95% CI: 2.08-10.02, p=0.001). Even after adjusting for confounders such as age, gender, and socioeconomic status, oral tobacco users were significantly more likely to experience dyspepsia compared to non-users (aOR=3.9, 95% CI: 1.489-10.59, p=0.011).

Conclusion: The study found a significant association between oral tobacco consumption and dyspepsia.

Keywords: *Dyspepsia, oral tobacco consumption, gastrointestinal disorders, public health, Pakistan.*

INTRODUCTION

Dyspepsia is a prevalent condition defined as recurrent or persistent pain and discomfort in the upper abdomen, usually showing symptoms such as burping, bloating, and nausea [1]. This condition affects a substantial portion of the global population, leading to significant healthcare costs and diminished quality of life. The prevalence of dyspepsia is reported to be between 8% and 30% in Asia, while functional dyspepsia affects approximately 8% to 23% of individuals in the region [2].

Various factors can trigger dyspepsia, including gastrointestinal infections, dietary habits, and psychological stress [1, 2]. However, recent studies have identified oral tobacco consumption as a potential risk factor for gastrointestinal disorders [3-6]. In Southeast Asia, oral tobacco has been used in various forms including bidis or cigarettes, chewing khaini, gutka, surti, paan masala, and naswar [7, 8]. Despite its widespread use, the health implications of oral tobacco consumption are significant and multifaceted [9, 10].

The direct contact of oral tobacco with the gastric and oral mucosa leads to inflammation and local irritation [11]. This mode of consumption exposes consumers to a range of harmful chemicals. Nicotine, a major component of tobacco, has been shown to stimulate gastric acid secretion, which can exacerbate symptoms of dyspepsia by causing acid-related damage to the stomach lining. Additionally, nicotine may impair the normal motility of the gastrointestinal tract, leading to delayed gastric emptying and increased gastroesophageal reflux, both of which are commonly associated with dyspeptic symptoms [12, 13].

In South East Asia, Pakistan is one of the countries with a high prevalence of chewing tobacco habits. In Karachi, 12% of females and 21% of males are betel consumers, 7.3% of both use paan, 6.7% use betel nuts, 14.6% use naswar, 7.5% use gutka, and 17% chew tobacco [14]. The adverse health effects of tobacco have been well-documented, encompassing a range of conditions from cardiovascular diseases to various types of cancer [15]. Despite this, the impact of oral tobacco on digestive health, specifically dyspepsia, has not received comparable attention in Pakistan.

Hence, the current study aims to assess the association between oral tobacco consumption and dyspepsia in patients presenting at a tertiary care hospital in Karachi, Pakistan. This study will help healthcare providers in the effective management of dyspeptic symptoms and

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contribute to the broader understanding of the health impacts of oral tobacco use.

METHODOLOGY

This research was designed as a case-control study conducted at the outpatient department of medicine, Mekran Medical College Turbat, Baluchistan, Pakistan from March 2024 to June 2024. The sample size was determined using the OpenEpi sample size calculator. Assuming a proportion of snuff users with dyspepsia at 34.5% [11], a 20% difference in the control group, an 80% power of the test, and a 95% confidence level, the study required 75 participants in each group (cases and controls).

This study was conducted after obtaining approval from the institutional review board (IRB No. 01/2024) of Mekran Medical College Turbat, Baluchistan, Pakistan. Verbal informed consent was obtained for all patients. Cases were defined as adults aged 18-65 years presenting with dyspeptic symptoms, confirmed by upper gastrointestinal endoscopy. Symptoms were assessed using a structured questionnaire based on the Rome IV diagnostic criteria, which defines functional dyspepsia as one or more of the following symptoms for at least 3 months with symptom onset at least 6 months prior: postprandial fullness, early satiation, epigastric pain, or burning in the absence of structural disease. Controls were adults aged 18-65 years presented without symptoms of dyspepsia. Individuals with a history of gastrointestinal surgery, those diagnosed with chronic gastrointestinal diseases unrelated to dyspepsia, or pregnant women were excluded from the study, due to potential confounding effects on gastrointestinal symptoms. Non-probability consecutive sampling technique was employed.

A structured questionnaire was used to gather data on demographic information, tobacco use history, and smoking history (**Supplementary File 1**). Participants who were current or former users of any kind of oral tobacco (defined as using at least once a day for six months or more) were classified as tobacco consumers. All collected data was securely stored and used exclusively for research purposes.

Statistical analysis was conducted using SPSS version 23. Age was summarized by calculating mean and standard deviation, while gender, residence, education level, monthly income, smoking status, and use of tobacco were described using frequencies and percentages. The chi-square test or Fisher's exact test was employed to compare tobacco usage between cases and controls. Odds ratios (OR) with 95% confidence intervals (CI) were used to measure the strength of the association between oral tobacco use and dyspepsia. Logistic regression was utilized to adjust for potential confounding factors including age, gender, residence, education, monthly income, and smoking status, with adjusted odds ratios (aOR) and their 95% confidence intervals also reported. A p-value of 0.05 or less was regarded as statistically significant.

RESULTS

The mean of the patients was 38.89±7.5 years. Of 150 patients, 62 participants were males (41.3%) and 88 participants were females (58.7%). About 90.7% of the patients were living in rural areas, 46.7% had no education till primary level, 56% had monthly income<20,000 PKR, and 18% were smokers (**Table 1**).

Table **2** compares the prevalence of dyspepsia between tobacco users and non-users. A significant association was observed between tobacco use and dyspepsia (p=0.001). Participants who use tobacco are more likely to experience dyspepsia compared to those who do not use tobacco.

Table **3** presents the results of univariate and multivariate logistic regression analyses for the association between various factors and dyspepsia. In the univariate analysis, age was not significantly associated with dyspepsia. Males had significantly lower odds of having dyspepsia compared to females (OR= 0.514, p=0.048). Urban residents had significantly higher odds of having dyspepsia compared to rural residents (OR=6.952, p=0.013). Secondary education was associated with significantly lower odds of dyspepsia compared to

Table 1: Baseline characteristics of study variables.

Variable	Cases n(%)	Controls n(%)	Total n(%)	p-value
Age (years)	38.40 (7.3)	39.39 (7.7)	38.89(7.5)	0.420
Gender				
Male	25 (33.3)	37 (49.3)	62(41.3)	0.047*
Female	50 (66.7)	38 (50.7)	88(58.7)	
Residence				
Urban	12 (16)	2 (2.7)	14(9.3)	0.005*
Rural	63 (84)	73 (97.3)	136(90.7)	
Education				
Primary	44 (58.7)	26 (34.7)	70 (46.7)	0.012*
Secondary	19 (25.3)	28 (37.3)	47 (31.3)	
Higher	12 (16)	21 (28)	33 (22)	
Income				
<20,000 PKR	50 (66.7)	34 (45.3)	84 (56)	0.019*
20,000-50,000 PKR	21 (28)	30 (40)	51 (34)	
>50,000 PKR	4 (5.3)	11 (14.7)	15 (10)	
Smoking				
Yes	19 (25.3)	8 (10.7)	27 (18)	0.019*
No	56 (74.7)	67 (89.3)	123 (82)	

Data presented as Mean (SD) or n (%)
*Significant at a 5% level of significance

Table 2: Comparison between tobacco use and cases/controls.

Tobacco	Dyspepsia		p-value
	Yes n(%)	No n(%)	
Yes	33 (75)	11 (25)	0.001*
No	42 (39.6)	64 (60.4)	

Data presented as n (%)
*Significant at a 5% level of significance

Table 3: Association of patients' features with dyspepsia (n=150).

Variables	Univariate Analysis			Multivariable Analysis		
	OR	95% CI	p-value	aOR	95% CI	p-value
Age (in years)	1.02	0.97-1.06	0.421	-	-	-
Gender						
Female	Reference Category			Reference Category		
Male	0.51	0.26-0.99	0.048*	0.20	0.08-0.51	0.001*
Residence						
Rural	Reference Category			Reference Category		
Urban	6.95	1.49-32.25	0.013*	22.77	3.71-139.64	0.001*
Education						
No-Primary	Reference category			Reference category		
Secondary	0.40	0.18-0.86	0.018*	0.26	0.09-0.73	0.010*
Higher	0.34	0.14-0.79	0.013*	0.43	0.15-1.24	0.119
Monthly Income						
<20,000 PKR	Reference Category			Reference Category		
20,000-50,000 PKR	0.48	0.24-0.97	0.040*	0.30	0.12-0.74	0.011*
>50,000 PKR	0.25	0.07-0.84	0.025*	0.69	0.13-2.78	0.611
Smoking Status						
No	Reference Category			Reference Category		
Yes	2.84	1.15-6.98	0.023*	2.26	0.63-8.05	0.210
Tobacco Use						
No	Reference Category			Reference Category		
Yes	4.57	2.08-10.02	0.001*	3.97	1.48-10.59	0.011*

CI: Confidence interval, OR: Odds ratio, aOR: Adjusted odds ratio, *Significant at p<0.05

primary education (OR=0.40, p=0.018), and higher education was also associated with lower odds (OR=0.34, p=0.013). A monthly income of 20,000-50,000 PKR was associated with lower odds of dyspepsia compared to an income of less than 20,000 PKR (OR=0.476, p=0.040), while an income greater than 50,000 PKR also showed a significant association (OR=0.247, p=0.025). Smoking was associated with higher odds of dyspepsia (OR=2.84, p=0.023), and tobacco use was significantly associated with higher odds of dyspepsia (OR=4.57, p=0.001).

In the multivariate analysis, age remained non-significant. Males continued to have significantly lower odds of dyspepsia compared to females (aOR=0.201, p=0.001). Urban residents had significantly higher odds of dyspepsia compared to rural residents (aOR=22.77, p=0.001). Secondary education remained significantly associated with lower odds of dyspepsia (aOR=0.26, p=0.010), while higher education was not significantly associated (aOR=0.43, p=0.119). A monthly income of 20,000-50,000 PKR was still significantly associated with lower odds of dyspepsia (aOR=0.30, p=0.011), but an income greater than 50,000 PKR lost its significance (aOR=0.69, p=0.611). The association between smoking and dyspepsia was not significant in the multivariate analysis (aOR=2.256, p=0.210), whereas tobacco use remained significantly associated with higher odds of dyspepsia (aOR=3.97, p=0.011).

DISCUSSION

This study aimed to assess the relationship between oral tobacco consumption and dyspepsia, revealing a strong statistical association between the two. A key finding was the high prevalence of dyspeptic symptoms among oral tobacco users, supported by a strong statistical association (p=0.001). This highlights the role of oral tobacco in gastrointestinal distress, aligning with existing literature indicating nicotine's impact on gastric functions, such as acid secretion and motility impairments which contribute to dyspepsia and gastroesophageal reflux [16-19].

The biological mechanisms underlying this association are multifactorial. Nicotine, a principal active compound in oral tobacco, has been shown to increase gastric acid secretion *via* direct stimulation of the vagus nerve and parietal cells [20]. This excessive acid production can irritate the gastric mucosa, leading to symptoms characteristic of dyspepsia such as epigastric pain and burning [1, 21]. Moreover, nicotine reduces lower esophageal sphincter pressure and delays gastric emptying, promoting acid reflux and bloating; both key features of dyspepsia [22]. Chronic exposure to tobacco-specific nitrosamines and other harmful constituents also leads to local mucosal inflammation and impaired gastrointestinal motility, contributing further to symptom persistence [23].

In line with previous studies, our results reinforce the notion that tobacco use negatively impacts gastrointestinal health. For instance, Bilgili explored the relationship between smoking and gastrointestinal histopathologies, like Helicobacter pylori (HP) infection and intestinal metaplasia, both common in smokers [2]. Their findings showed elevated rates of HP and intestinal changes among smokers compared to non-smokers, suggesting that tobacco smoking, like oral consumption,

significantly impacts gastrointestinal health. However, our study specifically focuses on oral tobacco, which has been less examined in existing literature, thereby filling a critical research gap.

Further insights are drawn from broader studies on tobacco impacts. For instance, the study on smoking's systemic effects detailed its role in various malignancies and chronic conditions, extending to the gastrointestinal system where smoking exacerbates conditions like dyspepsia and peptic ulcers [21, 24, 25]. This aligns with our observations of exacerbated dyspeptic symptoms linked to oral tobacco.

Another parallel can be drawn with the research on dietary habits in patients with functional dyspepsia, which emphasized the role of diet in managing symptoms [26, 27]. While our study did not focus on diet, the findings suggest that lifestyle modifications, including tobacco cessation, could significantly alleviate dyspeptic symptoms, a theme also highlighted by investigations into the health impacts of quitting smoking.

Hence, the robust associations observed in our study between oral tobacco use and dyspepsia contribute to the growing body of evidence on the negative impacts of tobacco on gastrointestinal health. These findings should guide public health policies and patient education, emphasizing the gastrointestinal risks associated with tobacco use and the benefits of cessation. The consistent evidence across studies highlights the potential of targeted interventions in tobacco cessation to significantly improve gastrointestinal health and reduce the clinical and economic burdens of dyspepsia.

This study has several limitations that should be considered when interpreting the findings. First, the modest sample size may limit the generalizability of the results to the broader population. The case-control design also restricts the ability to establish causal relationships. Additionally, reliance on self-reported data introduces the possibility of recall bias. A key limitation is the lack of information on the temporal relationship between the onset of dyspeptic symptoms and the initiation of tobacco use; an important factor in assessing causality. The study also did not evaluate the duration or intensity of tobacco use in detail, which could influence the severity of gastrointestinal effects; prolonged exposure to nicotine and other tobacco-related compounds may increase the risk of mucosal damage and exacerbate symptoms. Furthermore, unmeasured confounders such as dietary habits, alcohol consumption, and the use of non-steroidal anti-inflammatory drugs (NSAIDs) were not accounted for, potentially affecting the observed associations.

Future research should address these gaps by employing larger, more diverse samples and longitudinal study designs to better assess causality and dose-response relationships. Incorporating comprehensive lifestyle assessments; including diet, alcohol use, and medication history; would also enhance analytical accuracy. Public health efforts should focus on developing targeted interventions for tobacco cessation and educational programs to raise awareness of the gastrointestinal risks of oral tobacco use. Additionally, stronger regulatory policies on smokeless tobacco products could play a significant role in mitigating these health risks.

CONCLUSION

The study found a strong association between oral tobacco consumption and dyspepsia. These findings suggest that oral tobacco use may be a significant risk factor for dyspepsia, highlighting the need for targeted public health interventions and educational programs to reduce oral tobacco consumption and manage dyspeptic symptoms effectively.

ETHICS APPROVAL

This study was conducted after obtaining approval from the institutional review board (IRB No. 01/2024) of Mekran Medical College Turbat, Baluchistan, Pakistan. All procedures performed in studies involving human participants followed the ethical standards of the institutional and/ or national research committee and the Helsinki Declaration.

CONSENT FOR PUBLICATION

Verbal informed consent was obtained from study participants.

AVAILABILITY OF DATA

Upon a reasonable request, the corresponding author will provide the data.

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None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORS' CONTRIBUTION

1. Waqar Azeem Taj: Concept of study, methodology, final review of manuscript
2. Zafar Abdul Nabi: Concept of study, monitoring of the project, final review of manuscript
3. Hafeez Ullah: Initial drafting, methodology, Final review
4. Ravi Raj: Data analysis, final manuscript and edit, final review
5. Abdul Latif: Data review and cleaning, literature search, discussion writing, final review
6. Asma Abdul Razzak: Literature review, primarily analysis, manuscript writing, final review

SUPPLEMENTARY MATERIAL

Supplementary material is available on the journal's website.

REFERENCES

1. Francis P, Zavala SR. Functional dyspepsia. [Updated 2024 Jun 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing 2024. Available from: https://www.ncbi.nlm.nih.gov/books/NBK554563/
2. Bilgili M. The relationship between smoking and gastric histopathology in patients presented to the emergency department with dyspeptic complaints and underwent endoscopic examination. East J Med 2021; 26(2): 316-21.
3. Ghoshal UC, Singh R, Rai SJ. Prevalence and risk factors of gastroesophageal reflux disease in a rural Indian population. Indian J Gastroenterol 2021; 40: 56-64.
4. Olecki E, Ssentongo P, Keeney L, Perez-Holguin R, Stahl K, Wong W, *et al.* Risk factors for dyspepsia in Sub-Saharan Africa: A community-based study and multivariable predictive model. PennState J Med 2021; 2: 1-7.
5. Caballero-Mateos AM, López-Hidalgo JL, Torres-Parejo Ú, Hernández-González JM, Quintero-Fuentes MD, Caballero-Plasencia AM, *et al.* Risk factors for functional dyspepsia, erosive and non-erosive gastroesophageal reflux disease: A cross-sectional study. Gastroenterol Hepatol 2023; 46(7): 542-52.
6. Das AK, Choudhury A, Swain S, Routray D, Nath P, Singh SP. Epidemiology, risk factors, and endoscopic evaluation of dyspepsia in the rural community of Odisha, India: A community-based cross-sectional study. Res Square 2023; Preprint: 1-11.
DOI: https://doi.org/10.21203/rs.3.rs-3172540/v1
7. Ali R, Loney T, Al-Houqani M, Blair I, Aziz F, Al Dhaheri S, *et al.* Cigarette smoking and smokeless tobacco use among male South Asian migrants in the United Arab Emirates: A cross-sectional study. BMC Pub Health 2020; 20(1): 815.
DOI: https://doi.org/10.1186/s12889-020-08942-9
8. Azeem N, Sarfraz Z, Sarfraz A, Hange N, Sarfraz M, Cherrez-Ojeda I. Vaping and smokeless tobacco control in South Asia: A policy review. Ann Med Surg 2022; 81: 104285.
DOI: https://doi.org/10.1016/j.amsu.2022.104285
9. Sreeramareddy CT, Pradhan PMS, Mir IA, Sin S. Smoking and smokeless tobacco use in nine South and Southeast Asian countries: prevalence estimates and social determinants from Demographic and Health Surveys. Popul Health Metr 2014; 12(1): 22.
DOI: https://doi.org/10.1186/s12963-014-0022-0
10. Tomar SL, Hecht SS, Jaspers I, Gregory RL, Stepanov I. Oral health effects of combusted and smokeless tobacco products. Adv Dent Res 2019; 30(1): 4-10.
DOI: https://doi.org/10.1177/0022034519872480
11. Aro P, Ronkainen J, Storskrubb T, Vieth M, Engstrand L, Johansson SE, *et al.* Use of tobacco products and gastrointestinal morbidity: An endoscopic population-based study (the Kalixanda study). Eur J Epidemiol 2010; 25(10): 741-50.
DOI: https://doi.org/10.1007/s10654-010-9495-8
12. Mahyoub MA, Al-Qurmoti S, Rai AA, Abbas M, Jebril M, Alnaggar M, *et al.* Adverse physiological effects of smoking cessation on the gastrointestinal tract: A review. Medicine (Baltimore) 2023; 102(38): e35124.
DOI: https://doi.org/10.1097/md.0000000000035124
13. Bile KM, Shaikh JA, Afridi HU, Khan Y. Smokeless tobacco use in Pakistan and its association with oropharyngeal cancer. East Mediterr Health J 2010; 16(Suppl): S24-30.
14. Committee on the Public Health Implications of Raising the Minimum Age for Purchasing Tobacco Products; Board on Population Health and Public Health Practice; Institute of Medicine; Bonnie RJ, Stratton K, Kwan LY, Eds. Public Health Implications of Raising the Minimum Age of Legal Access to Tobacco Products. Washington (DC): National Academies Press (US) 2015; The Effects of Tobacco Use on Health. Available from: https://www.ncbi.nlm.nih.gov/books/NBK310413/.
15. Chaturvedi P, Mishra A, Datta S, Sinukumar S, Joshi P, Garg A. Harmful effects of nicotine. Indian J Med Paediatr Oncol 2015; 36(1): 24-31.
DOI: https://doi.org/10.4103/0971-5851.151771
16. Bode C, Bode JC. Alcohol's role in gastrointestinal tract disorders. Alcohol Health Res World 1997; 21(1): 76-83.
17. Kadota K, Takeshima F, Inoue K, Takamori K, Yoshioka S, Nakayama S, *et al.* Effects of smoking cessation on gastric emptying in smokers. J Clin Gastroenterol 2010; 44(4): e71-5.
DOI: https://doi.org/10.1097/MCG.0b013e3181be9a0f
18. Sublette MG, Cross TL, Korcarz CE, Hansen KM, Murga-Garrido SM, Hazen SL, *et al.* Effects of smoking and smoking cessation on the intestinal microbiota. J Clinl Med 2020; 9(9): 2963.
DOI: https://doi.org/10.3390/jcm9092963
19. Menshov VA, Trofimov AV, Zagurskaya AV, Berdnikova NG, Yablonskaya OI, Platonova AG. Influence of nicotine from diverse delivery tools on the autonomic nervous and hormonal systems. Biomedicines 2022; 10(1): 121.
DOI: https://doi.org/10.3390/biomedicines10010121
20. Malik TF, Gnanapandithan K, Singh K. Peptic Ulcer Disease. [Updated 2023 Jun 5]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan. Available from: https://www.ncbi.nlm.nih.gov/books/NBK534792/
21. Azer SA, Hashmi MF, Reddivari AKR. Gastroesophageal Reflux Disease (GERD) [Updated 2024 May 1]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan. Available from: https://www.ncbi.nlm.nih.gov/books/NBK554462/
22. Addissouky TA, El Sayed IET, Ali MMA, Wang Y, El Baz A, Elarabany N, *et al.* Oxidative stress and inflammation: Elucidating mechanisms of smoking-attributable pathology for therapeutic targeting. Bull Natl Res Cent 2024; 48(1): 16.
DOI: https://doi.org/10.1186/s42269-024-01174-6
23. Li LF, Chan RLY, Lu L, Shen J, Zhang L, Wu WKK, *et al.* Cigarette smoking and gastrointestinal diseases: the causal relationship and underlying molecular mechanisms (Review). Int J Mol Med 2014; 34(2): 372-80.
DOI: https://doi.org/10.3892/ijmm.2014.1786
24. Papoutsopoulou S, Satsangi J, Campbell BJ, Probert CS. Review article: Impact of cigarette smoking on intestinal inflammation—direct and indirect mechanisms. Aliment Pharmacol Ther 2020; 51(12): 1268-85.
DOI: https://doi.org/10.1111/apt.15774
25. Cooke ZM, Resciniti SM, Wright BJ, Hale MW, Yao CK, Tuck CJ, *et al.* Association between dietary factors, symptoms, and psychological factors in adults with dyspepsia: A cross-sectional study. Neurogastroenterol Motil 2023; 35(12): e14684.
DOI: https://doi.org/10.1111/nmo.14684
26. Pilichiewicz AN, Horowitz M, Holtmann GJ, Talley NJ, Feinle-Bisset C. Relationship between symptoms and dietary patterns in patients with functional dyspepsia. Clin Gastroenterol Hepatol 2009; 7(3): 317-22.
DOI: https://doi.org/10.1016/j.cgh.2008.09.007
27. Çolak H, Güneş FE, Özen Alahdab Y, Karakoyun B. Investigation of eating habits in patients with functional dyspepsia. Turk J Gastroenterol 2022; 33(8): 673-81.
DOI: https://doi.org/10.5152/tjg.2022.21502