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Evaluation of dyspepsia symptom severity in pediatric patients: association with endoscopic and pathological findings

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ABSTRACT

Aims: There is diagnostic difficulty in distinguishing between organic and functional causes of dyspepsia, which is characterized by a variety of gastrointestinal symptoms. This study aimed to evaluate the correlation between dyspeptic complaints, clinical symptoms, endoscopic findings, and pathology results in pediatric patients.

Methods: A total of 159 children aged 8-17 years with dyspeptic complaints underwent upper gastrointestinal endoscopy (UGE). The Dyspepsia Symptom Severity Index (DSSI), comprising three parts (dysmotility-like, reflux-like, and ulcer-like symptoms) and 19 questions, was used to assess symptom severity. Endoscopic procedures were performed under general anesthesia, and biopsy samples were obtained.

Results: The study included 159 patients with a median age of 15 years (ranging from 8 to 17 years). Among them, 38 (29.1%) were male and 121 (76.9%) were female. DSSI scores were calculated for each subgroup and the total score. When assessing the relationship between chronic diseases and DSSI scores, no significant association was found (p=0.48). However, smoking showed a significant correlation with DSSI scores (p=0.01 for dysmotility-like, p=0.02 for reflux-like, and p<0.01 for ulcer-like symptoms). Gender differences were observed in DSSI scores, with girls exhibiting significantly higher median scores for dysmotility-like findings compared to boys (p=0.02). Endoscopy findings also correlated with DSSI scores, with significantly higher scores in patients with ulcers (p<0.01). Pathological findings such as esophagitis were found to have significant associations with reflux-like symptoms (p=0.04), and crypt hyperplasia was associated with ulcer-like symptoms (p=0.04) in patients with DSSI subgroup scores. However, no significant differences were found between pathology findings and dyspepsia severity, significant associations were observed between UGE findings (such as ulcers, pangastritis, erosional areas, and fragility) and ulcer-like symptoms.

Conclusion: The study found significant links between dyspepsia severity and endoscopic results, stressing the need for reliable symptom scales for pediatric patients. It also highlights smoking as a factor in dyspepsia severity in children. Further research is needed to evaluate endoscopy's effectiveness in distinguishing between organic and functional dyspepsia. The study points out the limited understanding and consensus on diagnosing and managing dyspepsia in children, calling for the development of validated symptom scales and further research into cost-effective management strategies.

Keywords: Dyspepsia, pediatric patients, symptom severity, endoscopy, pathology findings

INTRODUCTION

Dyspepsia is characterized by various interconnected symptoms such as abdominal pain, distension, postprandial fullness, early satiety, anorexia, nausea, belching, and regurgitation. However, these dyspeptic complaints are non-specific and insufficient to distinguish between organic and functional gastrointestinal causes.[1]

Currently, there is no consensus on the diagnosis and management of functional dyspepsia (FD) in children. While some scales have been developed to assess the severity of dyspeptic symptoms in adults and differentiate between functional and organic dyspepsia (OD),[2,3] the reliability and validity of these dyspepsia symptom scales are not yet fully established.[4] Moreover, there is no universally accepted dyspepsia symptom scale specifically designed for children and adolescents. The validity and reliability of the existing dyspepsia symptom scale for this age group are lower compared to adults.[5,6] Additionally, the data on the cost-effective method of using endoscopy based on the score results, which is

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commonly employed in adults, are limited for pediatric and adolescent populations.[7,8]

Early and accurate diagnosis through upper gastrointestinal system endoscopy (UGE) is crucial in order to prevent unnecessary treatments. Several studies have compared clinical findings with endoscopic findings in children who underwent UGE during childhood.[9,10] However, the number of studies comparing dyspepsia symptom scales with endoscopy findings is relatively limited. Most of these studies have focused on evaluating the reliability and utility of scales for distinguishing between organic and functional dyspepsia in children.[4]

The aim of our study is to assess the correlation between complaints and clinical symptoms in pediatric patients who presented with dyspeptic complaints at our hospital and underwent UGE, as well as the UGE findings. With the data we collected, we aim to evaluate the effectiveness of the Dyspepsia Symptom Severity Index (DSSI) scores used in this study in distinguishing functional and organic dyspepsia and the relationship between these scores and upper gastrointestinal tract problems.

METHODS

This study was produced from the thesis study conducted in 2015. Institutional approval was obtained. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. This study involved 159 pediatric patients aged 8-17 years who visited the Pediatric Gastroenterology outpatient clinic at the Ministry of Health Ankara Training and Research Hospital, Department of Pediatrics, for dyspeptic complaints and subsequently underwent UGE.

The patient group consisted of children who presented at the pediatric gastroenterology outpatient clinic with continuous or intermittent upper gastrointestinal system complaints persisting for at least two months, including symptoms such as epigastric pain, discomfort in the upper abdomen, burning sensation in the chest, sour taste in the mouth, halitosis, belching, nausea, and rapid satiety. Exclusion criteria for the study included a previous diagnosis of organic or systemic disease, peptic ulcer, gastroesophageal reflux (GER) disease, and *Helicobacter pylori (H. pylori)* infection; neurological disorders; elevated transaminase levels and amylase-lipase levels; positive stool test results for parasites or giardia antigen; recent antibiotic or anti-secretory drug use for dyspeptic complaints within the last month; and previous treatment for similar complaints at other medical facilities.

In addition to sociodemographic questions, all participating children and their parents were asked about cigarette and alcohol use, as well as existing diseases. The patients were also questioned regarding hoarseness, rapid weight loss, abdominal pain accompanied by fever, history of jaundice, dysphagia, hematemesis, and melena. DSSI was performed on all patients at the time of admission.

The DSSI consists of three parts: dysmotility-like symptoms, reflux-like symptoms, and ulcer-like symptoms, with a total of 19 questions (Figure). Dysmotility-like symptoms include belching, bloating, postprandial fullness, inability to finish meals, abdominal discomfort, abdominal bloating, pre-meal nausea, post-meal nausea, and morning sickness. Reflux-like symptoms include bitter water in the mouth, chest burning, and stomach burning. Ulcer-like symptoms include abdominal pain after meals, before meals, or at night. Patients were asked to rate the severity of each symptom on a scale from 0 to 4 (0=no symptoms, 1=mild, 2=moderate, 3=severe, 4=very severe). Average scores between 0 and 4 were calculated for each part (dysmotility-like, reflux-like, and ulcer-like), as well as a total mean score for DSSI by averaging the three parts.[11,12]

Dysmotility-like
1.Frequent burping or belching
2. Bloating
3.Feeling full after meals
4.Inability to finish normal-sized meals
5.Abdominal (belly) discomfort, without pain, after meals
6. Abdominal (belly) distension (feels as though you need to loosen your clothes)
7.Nausea before meals
8.Nausea after meals
9.Nausea when you wake up in the morning
10.Retching (heaving as if to vomit, with little result)
11.Vomiting

Refluxlike
12.Burping with bitter tasting fluid in throat
13. Regurgitation of bitter fluid into your mouth (reflux) during the day
14. Regurgitation (reflux) at night
15. Burning feeling in your chest (heartburn)
16.Burning feeling in your stomach

Ulcerlike
17. Abdominal (belly) ache or pain right after meals
18.Abdominal (belly) pain before meals or when hungry
19. Abdominal (belly) pain at night

Figure. Dispepsia Symptom Severity Index

The endoscopic procedures for the study participants were conducted in the operating room under general anesthesia. Biopsy samples were taken from the stomach (corpus, antrum, and pylorus), lower esophagus, and duodenum during the upper gastrointestinal endoscopy. The Pentax EPM 3500 device was used for the endoscopic examinations.

The data from the study were analyzed using the 'SPSS 15.0' statistical program. Statistical analyses included Kruskal-Wallis and Chi-Square tests. Results with p-values less than 0.05 were considered statistically significant.

RESULTS

The median age of the 159 patients included in the study was 15 years (ranging from 8 to 17 years). Among the participants, 29.1% were male (38), while 76.9% were female (121). Smoking history was reported by 22.6% (36) of the patients. Of the 36 patients who reported smoking, 39% (14) were female, and 61% (22) were male.

Upper gastrointestinal system endoscopy was performed on all patients included in the study. There were no complications related to general anesthesia. Macroscopically, erythematous gastritis was observed in 95% (151) of the patients, nodular gastritis in 21% (34), and erosive gastritis in 20% (33). Additionally, edema was present in 61% (98) of the patients, mucosal fragility in 4.4% (7), lower esophageal sphincter laxity in 6.9% (11), and z-line irregularity in 7.5% (12). Ulcer findings were observed in 13.2% (21) of the patients. In the duodenal examinations, flattening of the folds was observed in 6.9% (18) of the patients. Antral gastritis was found in 84.3% (134) of the patients included in the study, pangastritis in 10.1% (16), and alkaline reflux gastritis in 7.5% (12). Among the patients, 36.4% (58) had one or more of the following macroscopic findings: nodularity, ulcer, and erosional area.

The responses of the patients to the DSSI were calculated for each subgroup as well as the total score (Table 1).

Table 1. Data of subgroups and total values obtained by DSSI

	Mean	Median	SD	Min	Max
Dysmotility-like symptoms	0.8	0.90	0.40	0.18	1.91
Refluxlike symptoms	0.99	1.00	0.67	0	2.40
Ulcerlike symptoms	1.04	1.00	0.70	0	3.00
Total score	1.01	0.96	0.43	0.22	2.37

DSSI: Dyspepsia Symptom Severity Index, SD: Standard deviation, Min: Minimum, Max: Maximum

When evaluating the relationship between the patients' existing chronic diseases and the total score of DSSI, no statistically significant relationship was found (p=0.48). However, a statistically significant correlation was observed between smoking and the DSSI, including total score, dysmotility-like, reflux-like, and ulcer-like findings (respectvly, p=0.01, 0.02, <0.01, <0.01).

Gender was also assessed in relation to the subgroup and total scores obtained with the DSSI. It was found that the median score for dysmotility-like findings was significantly higher in girls compared to boys (p=0.02). However, no statistically significant difference was observed between girls and boys in other parameters (p>0.05).

Furthermore, a comparison was made between the endoscopy findings of the patients and the total score of DSSI. It was found that the DSSI total score was significantly higher in patients with ulcers detected during UGE (p<0.01). However, there was no statistically significant difference in DSSI total score concerning antral gastritis, pangastritis, alkaline reflux gastritis, nodularity, hyperemia, edema, LES laxity, erosional area, and flattening of pleats observed in UGE (Table 2).

Table 2. Comparison of DSSI total score and endoscopy findings

		DSSI total score-median		
Upper gastrointestinal tract sign	n	Yes	None	p
Antral gastritis	134	0.99	0.89	0.72
Pangastritis	16	1.17	0.95	0.90
Alkaline reflux gastritis	12	1.07	1.08	0.73
Ulcer	21	1.42	0.90	<0.01
Nodularity	34	0.89	0.99	0.74
Hyperemia	95	0.99	0.78	0.09
LES laxity	11	0.84	0.97	0.77
Erosional area	33	0.95	0.97	0.38
Flattening of pleats	18	0.70	0.99	0.16
Edema	98	0.99	0.96	0.27
Fragility	7	1.36	0.95	0.15

DSSI: Dyspepsia Symptom Severity Index, LES: Lower esophageal sphincter

The pathology findings of the patients were compared to the total score of DSSI. The study examined whether there were any statistically significant differences between *H. pylori* infection, esophagitis, duodenitis, and crypt hyperplasia in relation to GER. However, no significant differences were detected (p>0.05).

When comparing antral pathologies with the DSSI total score, no statistically significant difference was observed. (p>0.05).

The study also evaluated the relationship between the median score of DSSI subgroups (dysmotility, reflux, and ulcer-like findings) and UGE findings (Table 3). The median score for dysmotility-like findings was 1.18 in patients with ulcers detected during UGE, compared to 0.90 in patients without ulcers. This difference was found to be statistically significant (p=0.01).

Furthermore, in patients with pangastritis observed during UGE, the median score for ulcer-like findings was 1.18, compared to 0.90 in patients without ulcer-like findings. This difference was statistically significant (p=0.009). In patients with ulcers detected during UGE, the median score for ulcer-like findings was 2.00, compared to 1.00 in patients without ulcers. This difference was also found to be statistically significant (p=0.001). Additionally, in patients with erosional areas observed during UGE, the median score for ulcer-like findings was 1.66, compared to 1.00 in patients without ulcer-like findings. This difference was statistically significant (p=0.008). Similarly, the median score for ulcer-like findings was 1.66 in patients with fragility observed during UGE, compared to 1.00 in patients without fragility. This difference was statistically significant (p=0.008).

The study examined the relationship between the scores of dysmotility-like, reflux-like, and ulcer-like findings in patients and the pathology findings (Table 4). It was found that the median score for reflux-like findings was 1.10 in patients with esophagitis detected in the pathological findings of biopsies performed during UGE, compared to 0.90 in patients without esophagitis. This difference was statistically significant (p=0.04). Additionally, the median score for ulcer-like findings was 1.66 in patients with crypt hyperplasia observed in the pathological findings of biopsies performed during UGE, compared to 1.00 in patients without crypt hyperplasia. This difference was also statistically significant (p=0.04).

Table 3. Comparison of dysmotility-like, reflux-like, and ulcer-like findings with endoscopy signs

		Dysmotility-like symptoms, median			Refluxlike symptoms, median			Ulcerlike symptoms, median		
UGE signs	n	Yes	None	p	Yes	None	p	Yes	None	p
Antral gastritis	134	0.90	0.90	0.18	1.00	0.80	0.39	1.00	1.00	0.23
Pangastritis	16	0.90	0.90	0.59	0.90	1.00	0.89	1.66	1.00	0.009
Alkaline reflux gastritis	12	0.90	0.90	0.93	1.10	1.00	0.29	0.66	1.00	0.25
Ulcer	21	1.18	0.90	0.01	1.00	1.00	0.31	2.00	1.00	<0.001
Nodularity	34	0.90	0.90	0.84	1.00	1.00	0.93	0.83	1.00	0.60
Hyperemia	95	0.90	1.00	0.44	1.00	1.00	0.48	1.00	0.62	0.05
LES laxity	11	0.81	0.90	0.34	0.67	1.00	0.85	1.00	1.00	0.89
Erosional area	33	0.90	0.90	0.98	0.80	1.00	0.27	1.66	1.00	0.008
Flattening of pleats	18	0.90	0.90	0.51	0.40	1.00	0.15	0.66	1.00	0.39
Edema	98	0.95	0.90	0.32	1.00	1.00	0.92	1.00	1.00	0.38
Fragility	7	0.90	0.90	0.55	0.80	1.00	0.91	1.66	1.00	0.008

UGE: Upper gastrointestinal system endoscopy findings, LES: Lower esophageal sphincter

Table 4. Comparison of dysmotility-like, refluxlike, and ulcerlike findings with pathology signs

		Dysmotility-like symptoms-median			Refluxlike symptoms-median			Ulcerlike symptoms-median		
Pathology signs	n	Yes	None	p	Yes	None	p	Yes	None	p
Helicobacter pylori infection	94	0.90	0.90	0.89	1.00	1.00	0.53	1.00	1.00	0.28
Esophagitis	70	0.95	0.90	0.57	1.10	1.00	0.04	1.00	1.00	0.27
Duodenitis	77	1.00	0.90	0.58	1.00	1.00	0.97	1.00	1.00	0.23
Crypt hyperplasia	39	1.09	0.90	0.55	1.20	1.00	0.45	1.66	1.00	0.04
GER compatible finding	8	1.00	0.90	0.55	1.20	1.00	0.31	1.00	1.00	0.58

GER: Gastroesophageal reflux

DISCUSSION

Dyspeptic complaints are a common issue in both adults and children. However, there is still no consensus on the diagnosis and management of FD in children. Various scales have been developed to assess the severity of dyspeptic symptoms and differentiate between functional and organic dyspepsia in adults, but their reliability and validity are not yet fully established.[2-4]

There is no generally accepted scale that assesses the severity of dyspepsia in children, suggests organic causes, and directs them to UGE. In this study, we evaluated the findings from UGE performed on children aged 8-17 who presented with dyspepsia complaints, using data obtained from the DSSI and the histopathological results of biopsy materials taken during endoscopy.

Smoking has been reported to increase gastric acid secretion and decrease pancreatic bicarbonate secretion, and it is implicated in the pathogenesis of gastric and duodenal ulcers.[13,14] Koivisto et al.[15] studied the effect of *H. pylori* infection and smoking on the gastric mucosa in adults. They found that inflammation in the gastric mucosa decreased in the smoking group, but smoking increased the severity of *H. pylori* infection by reducing the humoral immune response, thereby raising the frequency of duodenal ulcer development. In our study, 22.6% of the patients were smokers, and we observed higher DSSI subgroup and total scores in these smoking patients. This suggests that smoking may increase the severity of dyspepsia, and the scores obtained in the smoking group in our study might have been elevated as a result.

Previous studies have reported varying frequencies of specific endoscopic findings in children with dyspeptic complaints. For instance, Uğraş and Alan[16] found nodular gastritis in 59.6% of children aged 5-18 years who underwent UGE for abdominal pain, while esophagitis, pangastritis, lower esophageal sphincter laxity, and flattened duodenal folds were observed at lower frequencies. In our study, nodular gastritis was less frequent (21%) in children aged 8-17 years with dyspeptic complaints. The discrepancy in findings could be attributed to differences in study populations and age ranges.

The relationship between nodular gastritis and *H. pylori* infection has been highlighted in previous studies. BahúMda et al.[17] reported a specificity of 98.5% between nodular appearance and *H. pylori* infection in children with chronic abdominal pain. Zhang et al.[18] detected nodular gastritis in 17.8% of children with dyspeptic complaints and recurrent upper quadrant abdominal pain, and 86% of these patients were found to have *H. pylori* infection. Similarly, in our study, *H. pylori* infection was detected in 79% of patients with nodular appearance on UGE, indicating a significant correlation between nodular gastritis and *H. pylori* infection.

The dyspepsia symptom severity index a scale commonly used in adults with dyspeptic complaints. Leidy et al.[11] applied the DSSI to both dyspeptic patients and healthy individuals and found significantly higher DSSI total scores and subcategory scores in the dyspeptic group compared to the control group. Additionally, this study demonstrated that the applicability of the DSSI is high, showing that it can be repeatedly used in patient groups. As a result, the researchers concluded that the assessment obtained through the DSSI and its subcategories is a suitable test for determining the severity of dyspepsia in patients being monitored for functional dyspepsia.

In our study, we observed significant increases in certain parameters of the scoring systems we utilized, particularly in patients with organic dyspepsia. However, we also found evidence that these scoring systems could not completely differentiate between organic and functional dyspepsia. Based on these findings, our aim was to provide appropriate management and treatment guidance for children with dyspepsia, and to avoid unnecessary upper gastrointestinal endoscopy. Unfortunately, there are limited studies on dyspepsia management planning and cost-effectiveness analysis specifically in children.

Limitations

The lack of significant differences between pathological findings and dyspepsia symptoms suggests that this part of the study may have limitations. More in-depth analysis and additional research are needed to better understand the relationship between these factors.

For instance, Olson et al.[19] conducted a study comparing the cost and clinical effectiveness of various treatment modalities in dyspeptic children. These modalities included biopsy-guided endoscopy for *H. pylori* infection, endoscopy without biopsy, *H. pylori* therapy based on *H. pylori* serology screening results, empirical antisecretory therapy, and empirical antibiotic combined with antisecretory therapy for *H. pylori*. Their study showed that empirical antisecretory treatment management was the most cost-effective approach, reducing the need for endoscopy by 40%. However, cost-effectiveness studies on the treatment and management of childhood dyspepsia, both in our country and worldwide, are limited and insufficient.

Currently, another treatment approach applied primarily in adults is to determine the need for endoscopy based on dyspeptic symptom scores. This approach involves assessing the severity and characteristics of dyspeptic complaints to

determine the necessity of endoscopy.[20,21] However, studies in the pediatric population are scarce and the results are contradictory. Therefore, in future studies, it may be beneficial to modify the DSSI scale used in our study or apply other scoring systems to a larger sample of dyspeptic patients, with a revised definition of organic-functional dyspepsia. The use of pre-endoscopy scoring systems in the pediatric age group holds potential benefits. Further research, particularly cost-effectiveness studies, are needed to address this subject comprehensively.

CONCLUSION

This study examines the relationship between dyspepsia symptom severity and endoscopic findings in pediatric patients. Using the DSSI and UGE, significant correlations were identified between dyspepsia symptoms and organic findings such as ulcers and pangastritis. The results suggest that the DSSI can be a useful tool for distinguishing between functional and organic dyspepsia in children.

The study also highlights the impact of smoking on dyspepsia severity, with smokers exhibiting higher DSSI scores. This emphasizes the importance of integrating smoking cessation efforts into the treatment of dyspeptic symptoms.

However, DSSI alone may not fully differentiate between functional and organic dyspepsia in children, indicating the need for comprehensive diagnostic approaches, including UGE and histopathological examination. Future research should focus on refining dyspepsia symptom scales for pediatric populations and assessing the cost-effectiveness of different treatment strategies. The ultimate goal is to improve diagnosis and management while ensuring patient safety and comfort.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study was produced from the thesis study conducted in 2015.

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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