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Research

Evaluation of the Clinical and Endoscopic Characteristics of Duodenitis in Children

Çocuklarda Duodenitin Klinik ve Endoskopik Özelliklerinin Değerlendirilmesi

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ABSTRACT

Objective: Compared to gastritis and esophagitis, research on duodenitis in children remains limited. This study aimed to evaluate the etiological, endoscopic, and histopathological characteristics of biopsy-proven duodenitis in a large pediatric cohort.

Methods: The pathology reports of children who underwent upper gastrointestinal (GI) endoscopy at the pediatric gastroenterology department between January 2011 and December 2017 were retrospectively analyzed. Demographic data, complaints, endoscopic findings, and histopathological results were recorded and analyzed.

Results: Duodenitis was detected in 1,494 (24%) of 6,223 patients who underwent endoscopy, with a mean age of 9.1±3.2, and 53.3% were female. The most common symptoms were periumbilical pain (64.6%), vomiting (51.9%), epigastric pain (50.3%), and regurgitation (46.0%). Growth retardation was observed in 31.9% of cases, GI bleeding in 25%, and refractory iron deficiency anemia in 11.9%. Endoscopy revealed antral hyperemia (83.9%), antral nodularity (61.4%), corpus hyperemia (52.4%), esophageal hyperemia (46%), duodenal hyperemia (46%), and bulbar hyperemia (41.1%). Histopathological examination revealed acute inflammatory cells in 45.7% of cases, chronic inflammation in 54.2% of cases, *Helicobacter pylori (H. pylori)* in 46.0% of cases, and increased intraepithelial lymphocytes in 30.1% of cases. According to the Marsh classification, 13.5% of the patients were in stage 1, 7.5% in stage 2, and 4.7% in stage 3. The etiological factors were *H. pylori* gastritis (46%) and celiac disease (25.7%).

Conclusion: Duodenal biopsy is an important diagnostic tool in pediatric endoscopy, especially for detecting *H. pylori* gastritis, celiac disease, and *giardiasis*.

Keywords: Endoscopy, biopsy, duodenitis

ÖZ

Amaç: Gastrit ve özofajite kıyasla, çocuklarda duodenit üzerine yapılan araştırmalar sınırlıdır. Bu çalışmanın amacı, biyopsi ile doğrulanmış duodenitin etiyolojik, endoskopik ve histopatolojik özelliklerini geniş bir pediatrik kohortta değerlendirmektir.

Gereç ve Yöntem: Ocak 2011 ile Aralık 2017 tarihleri arasında çocuk gastroenterolojisi bölümünde üst gastrointestinal (Gİ) endoskopi uygulanan çocukların patoloji raporlarını geriye dönük olarak analiz edildi. Demografik verileri, şikayetleri, endoskopik bulguları ve histopatolojik sonuçları kaydedilerek analiz edildi.

Bulgular: Altın bin iki yüz yirmi üç endoskopiye alınan hastanın 1,494'ünde (%24) ortalama 9,1±3,2 yaşla duodenit tespit edildi; %53,3'ü kadındı. En sık semptomlar periumbilikal ağrı (%64,6), kusma (%51,9), epigastrik ağrı (%50,3) ve geğirme (%46) idi. Olguların %31,9'unda büyüme geriliği, %25'inde Gİ kanama, %11,9'unda refrakter demir eksikliği anemisi görüldü. Endoskopide antral hiperemi (%83,9), antral nodülarite (%61,4), korpus

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ÖZ

hiperemi (%52,4), özofagus hiperemi (%46), duodenal hiperemi (%46), bulbar hiperemi (%41,1) saptandı. Histopatolojik incelemede, olguların %45,7'sinde akut enflamatuvar hücreler, %54,2'sinde kronik enflamasyon, %46'sında *Helicobacter pylori (H. pylori)*, %30,1'inde artmış intraepitelyal lenfositler görüldü. Marsh sınıflandırmasında, olguların %13,5'i evre 1, %7,5'i evre 2 ve %4,7'si evre 3'tü. Etiyolojik faktörler *H. pylori* gastriti (%46), çölyak hastalığı (%25,7) idi.

Sonuç: Duodenal biyopsi, özellikle *H. pylori* gastriti, çölyak hastalığı ve giardiyazisi saptamak için çocuk endoskopisinde önemli bir tanı aracıdır.

Anahtar Kelimeler: Endoskopi, biyopsi, duodenit

INTRODUCTION

Children should undergo endoscopic evaluations in line with international guidelines, which emphasize standardized procedures and biopsy protocols (1,2). Upper gastrointestinal endoscopy with biopsy is a fundamental diagnostic tool in the assessment of pediatric patients presenting with gastrointestinal symptoms. Among the pathological findings detected, duodenitis is a relatively common condition with diverse etiologies, including infections, celiac disease, and other inflammatory disorders (3).

In contrast to pediatric esophagitis and gastritis, which have been extensively studied, duodenitis has received comparatively limited attention in the literature (3-5). A clearer understanding of its clinical presentation and histopathological spectrum is essential to improve diagnostic accuracy and to guide appropriate management strategies.

The aim of this study was to investigate the etiological factors, clinical features, endoscopic findings, and histopathological characteristics of biopsy-proven duodenitis in children who underwent upper gastrointestinal endoscopy at a tertiary pediatric gastroenterology center over a six-year period.

METHODS

Study Design and Population

This retrospective observational study was conducted at Clinic of Pediatric Gastroenterology, University of Health Sciences Türkiye, Şişli Hamidiye Etfal Training and Research Hospital and included pediatric patients who underwent upper gastrointestinal endoscopy with biopsy between January 2011 and December 2017. Patients were excluded from the study if they had incomplete medical records or no histopathological reports available. In addition, patients in whom duodenal biopsies were not obtained or were insufficient for histopathological evaluation were excluded. Repeat endoscopies performed in the same patients during the study period were also excluded; only the first endoscopic examination was included in the analysis.

Data Collection

Data were collected from electronic medical records and included demographic characteristics (age and sex), presenting symptoms, endoscopic findings, and histopathological results. Presenting symptoms, such as abdominal pain, vomiting, regurgitation, gastrointestinal bleeding, growth retardation, iron deficiency anemia, and changes in bowel habits (diarrhea/constipation), were documented. Endoscopic reports were reviewed for findings, including antral and corpus hyperemia, nodularity, bulbar and duodenal changes, and scalloping. Histopathological reports were evaluated for inflammatory cell infiltration, *Helicobacter pylori* (*H. pylori*) presence, intraepithelial lymphocytosis, villous atrophy, and other specific findings, such as Brunner's gland hyperplasia and lymphatic dilatation.

Endoscopic Procedure

Upper gastrointestinal endoscopies were performed using standard pediatric video endoscopes (Olympus GIF-180 and XP-18; Olympus, Tokyo, Japan) under sedation or general anesthesia according to institutional protocols. According to the institutional endoscopy protocol of our tertiary pediatric gastroenterology center, systematic biopsies were obtained from predefined sites regardless of macroscopic appearance, in line with international pediatric endoscopy guidelines. During each upper gastrointestinal endoscopy, at least two biopsies from the gastric antrum, at least two from the gastric corpus, and at least two duodenal biopsies were obtained. Duodenal sampling included at least one biopsy from the duodenal bulb and three biopsies from the second portion of the duodenum to improve diagnostic accuracy, particularly for detecting celiac disease and inflammatory changes. Biopsy specimens were fixed in formalin, embedded in paraffin, and stained with hematoxylin and eosin for routine examination. Additional stains, such as Giemsa, were used to detect *H. pylori*. Duodenal biopsies were classified according to the Modified Marsh criteria for the evaluation of celiac disease.

Histopathological Evaluation

Histopathological evaluation was performed by experienced pathologists who were blinded to the clinical data. Biopsy

specimens were assessed for acute and chronic inflammatory cell infiltration, *H. pylori* colonization, intraepithelial lymphocytosis, villous architecture, and other pathological changes in the mucosa. Duodenitis was diagnosed based on histopathological findings, including acute and chronic inflammatory cell infiltration in the lamina propria, increased intraepithelial lymphocytes, crypt hyperplasia, and various degrees of villous blunting or atrophy. Duodenal biopsies were further classified according to the Modified Marsh classification system to evaluate the presence and severity of celiac disease.

Ethics Committee Approval

Ethical approval was obtained from the University of Health Sciences Türkiye, Şişli Hamidiye Etfal Training and Research Hospital Clinical Research Ethics Committee (approval no: 1328, date: 03.09.2019). The requirement for informed consent was waived due to the retrospective nature of the study.

Statistical Analysis

All statistical analyses were performed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize demographic data, clinical symptoms, endoscopic findings, and histopathological results. Categorical variables are presented as frequencies and percentages, and continuous variables are expressed as means ± standard deviations (SDs).

RESULTS

A total of 6,223 patients aged 0-18 years were evaluated. Of these, 1,494 patients (24%) with histopathologically confirmed duodenitis were included in the final analysis. Among these participants, 53.3% were female and 46.7% male, with a mean age of 9.1±3.2 years.

The most common presenting complaints were periumbilical pain (64.6%), vomiting (51.9%), epigastric pain (50.3%), and regurgitation (46.0%). Symptoms included gastrointestinal bleeding (25%), growth and developmental delay (31.9%), treatment-resistant iron-deficiency anemia (11.9%), and diarrhea or constipation (22.9%) among the patients. Endoscopic examination revealed antral hyperemia in 83.9% of patients, antral nodularity in 61.4%, corpus hyperemia in 52.4%, and esophageal hyperemia in 46% of patients. Duodenal findings in patients included bulbar hyperemia in 41%, bulbar ulceration in 28.7%, duodenal hyperplasia in 46%, and scalloping in 16.9% (Table 1).

Histopathological evaluation showed acute inflammatory cell infiltration in 45.7% and chronic inflammatory cell infiltration in 54.2% of antral biopsies. *H. pylori* infection was detected in 46% of patients. In the duodenum, intraepithelial lymphocytosis was present in 30.1%, villous atrophy in 25.7%, Brunner's gland hyperplasia in 0.14%, and lymphatic dilatation in 0.06% of cases (Table 2). Correlation between histopathological and clinical findings indicated that *H. pylori* gastritis accounted for 46% of duodenitis cases, celiac disease for 25.7%, non-specific gastritis for 23.3%, giardiasis for 4%, and Brunner's gland adenoma for 0.12% of cases (Table 2).

DISCUSSION

In this large cohort of pediatric patients undergoing upper gastrointestinal endoscopy, histopathologically confirmed duodenitis was identified in approximately one-quarter of cases, underscoring its clinical significance among children presenting with gastrointestinal symptoms. The study's findings highlight the varied etiological spectrum of duodenitis, which includes *H. pylori* infection, celiac disease, non-specific inflammatory changes, and parasitic infections such as giardiasis. Notably, nearly half of the duodenitis cases were associated with *H. pylori* gastritis, while celiac disease accounted for more than a quarter, underscoring the need for comprehensive histopathological evaluation of symptomatic pediatric patients. The frequent coexistence

Table 1. Distribution of histopathological findings of all cases with duodenitis

Histopathological finding	n	%
Acute inflammatory cell positivity (antrum)	683	45.7
Chronic inflammatory cell positivity (antrum)	810	54.2
Helicobacter pylori positivity	687	46
Intraepithelial lymphocytosis (duodenum)	450	30.1
Villous atrophy (duodenum)	384	25.7
Marsh 1	201	13.5
Marsh 2	112	7.5
Marsh 3	71	4.7
Non-specific gastritis	347	23.3
Brunner's gland hyperplasia	2	0.14
Dilated lymphatics	4	0.06
Giardia	60	4

Table 2. Etiological distribution of duodenitis cases

Etiology	n	%
Helicobacter pylori gastritis	687	46
Celiac disease	384	25.7
Non-specific gastritis	347	23.3
Giardiasis	60	4
Brunner's gland adenoma	2	0.12

of antral and duodenal inflammation, along with specific endoscopic findings such as antral nodularity and duodenal scalloping, further supports the importance of integrating clinical, endoscopic, and histological data for an accurate diagnosis and targeted management.

H. pylori is a significant factor in duodenal pathology and peptic ulcer disease, particularly among children (6). Its prevalence tends to be higher in developing countries and is associated with refractory anemia and impaired growth (7). Previous studies have indicated that infection rates among children under five years of age can reach as high as 50% in low-resource settings, whereas in developed countries they are 20% or lower (6). In our cohort, *H. pylori* was identified in 46% of biopsies, a rate that exceeds rates reported in developed nations but aligns with rates reported in developing regions. Improved sanitation, access to clean water, and widespread use of antibiotics contribute to reduced transmission and are key factors that determine the differences between developing and developed countries. Understanding these differences is crucial for adapting public health interventions and clinical strategies and underscores the importance of context-specific approaches for the diagnosis, treatment, and prevention of *H. pylori* infection in pediatric populations.

Celiac disease is another major cause. Its pathogenesis involves a combination of genetic predisposition, environmental triggers, and immune-mediated injury, leading to intraepithelial lymphocytosis, crypt hyperplasia, and varying degrees of villous atrophy (8). The global prevalence of pediatric celiac disease is estimated to be between 0.8% and 1% (8), with national studies in Turkey reporting rates ranging from 0.47% to 0.9% (9,10). In our series, 25.7% of patients diagnosed with duodenitis were ultimately found to have celiac disease, a rate significantly higher than population-based estimates. However, a notably higher proportion of celiac disease cases (25.7%) among patients with duodenitis in our series suggests a referral bias, as our center predominantly evaluates individuals with a strong clinical suspicion of celiac disease.

The prevalence of duodenitis in our cohort (24%) was higher than that reported in several previously published pediatric series (3,4,11). Alabd Alrazzak et al. (11) reported an incidence of 11% among 1,000 patients, while Alper et al. (3) found duodenitis in 12.7% of 2,772 endoscopies. Akbulut et al. (12) reported a higher rate of 30.7% in a smaller, single-center study. The higher prevalence of duodenitis observed in our cohort, compared with previously published pediatric series, may reflect several underlying factors. Referral bias is a significant consideration, as our institution likely receives a greater proportion of complex or symptomatic cases, which could inflate the observed incidence. Additionally, the volume and thoroughness of endoscopic evaluations performed at our center may contribute to increased detection rates. Variability in diagnostic criteria and histopathological interpretation across studies can also influence the reported prevalence, making direct comparisons challenging.

Parasitic infections have also been identified as causes of duodenitis, with *Giardia* intestinalis reported in 2-5% of pediatric populations in previous studies (13). In our study, 4% of the patients were diagnosed with *giardiasis*. This prevalence is consistent with previously reported rates of 2-5% in developed countries. The clinical course of parasitic infections can range from acute or chronic gastrointestinal symptoms to completely asymptomatic presentations. This highlights the importance of not overlooking parasitic etiologies during the diagnostic process, especially in pediatric patients presenting with non-specific symptoms.

Other rare etiologies include Brunner's gland hyperplasia and adenoma, which are observed in 0.14% and 0.12% of cases, respectively (14). While these lesions are exceedingly uncommon in children, studies in adults have demonstrated occasional dysplastic changes, emphasizing the importance of recognizing these lesions. Intestinal lymphangiectasia was found in four patients (0.06%), which is consistent with its rarity in the literature (15). Our series did not encounter any cases of eosinophilic duodenitis. According to a study conducted in our country, eosinophilic duodenitis is classified among the rare secondary causes of duodenitis (16). The absence of eosinophilic duodenitis cases in our study may be attributed to the small number of infant patients, a population in which this condition might be more commonly observed.

Overall, our findings support the diagnostic value of duodenal biopsy in children undergoing upper gastrointestinal endoscopy (5). Even in cases where gross endoscopic findings are non-specific or absent, histological evaluation can yield critical diagnostic information, particularly for differentiating celiac disease, *H. pylori* infection, and parasitic involvement. This highlights the role of biopsy as a valuable tool in pediatric endoscopic practice.

Study Limitations

The main limitations of this study are its retrospective and single-center design, which may limit the generalizability of the findings and preclude causal inference. As the study was conducted in a tertiary referral center, referral bias toward more severe cases cannot be excluded. The lack of

comparative statistical analyses and the absence of long-term clinical follow-up data constitute additional limitations. Nevertheless, the large sample size provides valuable epidemiological insight and supports the importance of routine duodenal histopathological evaluation in pediatric endoscopic practice.

CONCLUSION

Our findings indicate that duodenitis is a prevalent histopathological diagnosis in children undergoing upper gastrointestinal endoscopy, predominantly linked to *H. pylori* infection and celiac disease. Despite the non-specific nature of gross endoscopic findings, duodenal biopsy is crucial for diagnosis, especially for detecting celiac disease, *H. pylori* gastritis, and parasitic infection. Our findings must be interpreted cautiously because of the study's retrospective, single-center design. However, the substantial sample size underscores the need to perform routine duodenal biopsies during pediatric endoscopic procedures.

ETHICS

Ethics Committee Approval: Ethical approval was obtained from the University of Health Sciences Türkiye, Şişli Hamidiye Etfal Training and Research Hospital Clinical Research Ethics Committee (approval no: 1328, date: 03.09.2019).

Informed Consent: The requirement for informed consent was waived due to the retrospective nature of the study.

FOOTNOTES

Authorship Contributions

Surgical and Medical Practices: B.Y., Concept: N.U., B.Y., Design: N.U., Data Collection or Processing: T.K., B.Y., Analysis or Interpretation: S.B.A., Literature Search: S.B.A., A.M.U., Writing: S.B.A., A.M.U.

Conflict of Interest: No conflict of interest was declared by the authors.

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