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ORIGINAL ARTICLE

Medicine Science International Medical Journal

Medicine Science 2024;13(3):693-8

Evaluation of gastric biopsy results and laboratory parameters in enterobiasis: Insights from a case-control study

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Received 12 July 2024; Accepted 05 August 2024
Available online 23 August 2024 with doi: 10.5455/medscience.2024.07.074

Abstract

Enterobius vermicularis, commonly known as pinworm, is a prevalent intestinal parasite that can cause various gastrointestinal symptoms. Despite its ubiquity, the impact of enterobiasis on gastric biopsy results and laboratory parameters has not been thoroughly investigated. This study compares gastric biopsy findings and laboratory parameters between patients with and without enterobius infection. This case-control study enrolled 71 patients presenting with dyspeptic complaints. All participants underwent upper and lower gastrointestinal endoscopy. The study group consisted of 21 patients with confirmed pinworm infection on colonoscopic examination, while the control group comprised 50 patients without pinworm infection. Demographic data, laboratory parameters, and gastric biopsy results (intestinal metaplasia, atrophy, *Helicobacter pylori*) were collected and analysed. The study included 21 patients with enterobiasis and 50 patients without enterobiasis. There was no significant difference in gastric biopsy findings between the study and control groups. However, the laboratory parameters of haemoglobin, hematocrit, potassium, albumin, aspartate aminotransferase, and C-reactive protein differed significantly. Hemoglobin and hematocrit values were lower, and C-reactive protein values were higher in the enterobiasis group, while potassium, albumin, and aspartate aminotransferase values were higher in the control group ($p<0.05$). This study demonstrates that while enterobius infection does not significantly alter gastric biopsy findings, it is associated with significant changes in several laboratory parameters. These findings suggest that enterobiasis may have systemic effects beyond the gastrointestinal tract, highlighting the importance of comprehensive laboratory evaluation in affected patients. Further research is warranted to elucidate the clinical implications of these laboratory alterations in enterobiasis.

Keywords: Enterobiasis, pinworm infection, endoscopy, *Helicobacter pylori*

Introduction

Enterobius vermicularis (EV), commonly referred to as pinworm, is a nematode that predominantly infects the human gastrointestinal tract, leading to a condition known as enterobiasis [1]. This parasitic infection is highly prevalent, especially in pediatric populations, and remains a significant public health concern globally. Enterobiasis is transmitted via the fecal-oral route, where ingestion of infective eggs results in larvae hatching in the small intestine and migrating to the colon. The female worms then migrate nocturnally to the perianal region to lay eggs, causing the characteristic symptom of pruritus ani [2].

Despite the high prevalence of enterobiasis, ranging from 5% to 50% in various populations, the clinical implications of this infection extend beyond the commonly recognised symptoms of perianal itching and discomfort. In some cases, enterobiasis can lead to abdominal pain, nausea, vomiting, and even appendicitis due to worm migration. Moreover, secondary bacterial infections can occur due to scratching the perianal region, leading to further complications [3].

The impact of enterobiasis on the gastric mucosa and related laboratory parameters has not been extensively studied. Gastric biopsies are a critical diagnostic tool for assessing various gastrointestinal conditions, including chronic gastritis, intestinal metaplasia, and *Helicobacter pylori* (*H. pylori*) infection. These conditions are often precursors to more severe gastrointestinal

CITATION
Kuloglu E, Aslan S, Ozturan A, et al. Evaluation of gastric biopsy results and laboratory parameters in enterobiasis: Insights from a case-control study. Med Science. 2024;13(3):693-8.

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DOI: 10.5455/medscience.2024.07.074

diseases, including gastric cancer [4]. It is essential to understand whether enterobiasis impacts these gastric biopsy findings, as this could have implications for diagnosing and managing gastrointestinal conditions in patients with pinworm infection.

Laboratory parameters provide crucial insights into the systemic health of patients and can reveal underlying infections or inflammatory processes. For instance, elevated leukocyte counts and increased levels of eosinophils are commonly associated with parasitic infections. Biochemical markers such as liver enzymes (alanine aminotransferase and aspartate aminotransferase), albumin, and electrolytes (sodium, potassium, calcium) are routinely measured to assess liver function, nutritional status, and electrolyte balance. Elevated C-reactive protein (CRP) levels indicate systemic inflammation, which could be a response to parasitic infection [5].

The primary aim of this study is to determine whether enterobiasis is associated with significant changes in gastric biopsy findings or laboratory parameters. By providing detailed insights into these associations, we hope to enhance the understanding of enterobiasis's systemic effects and implications for gastrointestinal health.

Material and Methods

This retrospective case-control study was conducted at Giresun Training and Research Hospital, enrolling patients between 18 and 90 admitted to the internal medicine, general surgery, and gastroenterology outpatient clinics between January 1, 2022, and July 1, 2023. The study aimed to evaluate the gastric biopsy results and laboratory parameters of patients with and without EV infection. Patients included in the study presented with complaints of abdominal pain, nausea, anorexia, diarrhoea, bloating, or pain and itching in the anus. Inclusion criteria required patients to undergo a colonoscopy revealing EV, upper gastrointestinal system endoscopy, and gastric biopsy without receiving any antiparasitic drug treatment before the study.

Exclusion criteria were applied to maintain the study's integrity and included patients who had received antiparasitic treatment before the study, had incomplete medical records or missing data regarding colonoscopy or gastric biopsy results, had other known gastrointestinal disorders such as Crohn's disease or ulcerative colitis, had systemic diseases like chronic liver disease or renal failure that could influence laboratory parameters or were pregnant or lactating.

The study group comprised 21 patients who met the inclusion criteria and were found to have EV on colonoscopic examination. A control group of 50 patients with similar complaints whose colonoscopies did not reveal EV, was also included for comparison. The study protocol was reviewed and approved by the local ethics committee of Giresun Training and Research Hospital, adhering to the ethical principles of the Declaration of Helsinki, revised in 2013. Patient confidentiality was strictly maintained, with all data anonymised before analysis.

Data collection involved extracting demographic data, laboratory parameters, and gastric biopsy results from the patients' medical records. The laboratory parameters analysed included leukocytes (WBC), neutrophils, lymphocytes, eosinophils, basophils, haemoglobin, hematocrit, mean corpuscular volume, platelets, glucose, urea, creatinine, sodium, potassium, calcium, albumin, alanine aminotransferase (ALT), aspartate aminotransferase (AST), C-reactive protein (CRP), ferritin, thyroid stimulating hormone (TSH), anti-HCV, anti-HIV, and HBsAg. Gastric biopsy specimens were evaluated for intestinal metaplasia, atrophy, and *H. pylori*, with histopathological examinations performed by experienced pathologists blinded to the clinical data.

Statistical Analysis

Statistical analysis of the data obtained in this study was performed using the SPSS version 22.0 (SPSS for Windows, Statistical Package for the Social Sciences, IBM Corp., Armonk, NY). The normality of the variables was evaluated using the Shapiro-Wilk test. Continuous variables are expressed as mean ±standard, while categorical variables are given as frequency and percentage (n, %). The comparisons between the two groups were made using the Mann-Whitney U test, Chi-square test and Fisher's exact test. $p<0.05$ values were considered statistically significant.

Results

The study included 21 patients with enterobiasis and 50 patients without enterobiasis. Table 1 compares demographic data in individuals with and without enterobiasis.

Table 1. Comparison of sociodemographic data in individuals with and without enterobiasis

Variables		Enterobiasis (n: 21)		Control (n: 50)		p
		Number	%	Number	%	
Gender	Female	12	57.1	25	50.0	0.772
	Male	9	42.9	25	50.0	
Age	18-64	14	66.7	50	100	**0.000****
	Above 65	7	33.3	0	0	
Age[t]		Med.±S.D (Min.-Max.)		Med.±S.D (Min.-Max.)		
		53.58±7.15 (41-64)		56.57±17.91 (23-94)		0.466

*p<0.05, **p<0.01, χ^2:Chi-square test (Categorical data), t: Independent Sample T Test, Med: median, S.D: standard deviation, Min: minimum, Max: maximum

DOI: 10.5455/medscience.2024.07.074

Gender distribution did not differ in individuals with and without enterobiasis (p>0.05).

Age distribution differed in patients with and without enterobiasis (p<0.05). While all patients in the control group were 64 or younger, this rate was 66.7% in the enterobiasis patient group. According to these data, the proportion of patients aged 65 years and over was higher in the enterobiasis group. In addition, the mean age of the patients in the control group was 53.58 years, and the mean age of the patients with enterobiasis was 56.57 years. According to these results, the mean ages of both groups differed (p>0.05).

A comparison of complete blood count parameters in patients with and without enterobiasis is presented in Table 2.

Table 2. Comparison of complete blood count parameters

Parameters	Enterobiasis (n: 21)	Control (n: 50)	p
	Med.±S.D	Med.±S.D	
Leukocytes (WBC)[t]	7.99±2.02	7.78±2.07	0.697
Neutrophils[t]	4.90±1.73	4.61±1.66	0.522
Lymphocytes[t]	2.20±1.10	2.40±10.00	0.595
Eosinophils[t]	0.21±0.18	0.23±0.19	0.702
Basophils[t]	0.04±0.02	0.04±0.02	0.713
Haemoglobin (Hgb)[t]	12.05±2.73	13.48±1.94	**0.015***
Hematocrit (Hct)[t]	36.98±7.26	42.32±5.49	**0.001****
Mean corpuscular volume (MCV)[z]	87.45±8.35	87.75±7.12	0.796
Platelets[t]	278.33±84.40	269.38±68.35	0.640

*p<0.05, **p<0.01, χ^2:Chi-square test (Categorical data), t: Independent Sample T-Test, z: Mann Whitney U Test, Med: median, S.D: standard deviation

There was no significant difference between WBC, neutrophil, lymphocyte, eosinophil, basophil, MCV and platelet values in individuals with and without enterobiasis (p>0.05).

A significant difference was observed between Hgb and Hct values in patients with and without enterobiasis (p<0.05). While Hgb and Htc values were 13.48 and 42.32 in the control group, they were 12.05 and 36.98 in the enterobiasis group. According to these data, Hgb and Htc values in patients with enterobiasis were lower than those in the control group.

The comparison of biochemical parameters in patients with and without enterobiasis is presented in Table 3.

Table 3. Comparison of biochemical parameters

Parameters	Enterobiasis (n: 21)	Control (n: 50)	p
	Med.±S.D	Med.±S.D	
Glucose[z]	117.62±52.52	119.66±56.5	0.811
Urea[t]	33.95±12.69	31.44±10.53	0.391
Creatinine[t]	0.87±0.32	0.78±0.2	0.200
Sodium[t]	139.10±3.14	139.92±2.23	0.214
Potassium[t]	4.17±0.52	4.50±0.34	**0.012***
Calcium[z]	9.12±0.70	9.45±1.44	0.333
Albumin[t]	42.25±5.63	44.66±3.84	**0.043****
ALT[z]	15.29±7.12	19.42±9.97	0.058
AST[t]	16.14±5.43	20.48±6.99	**0.014****
CRP[z]	20.90±36.66	9.74±33.74	**0.036***
Ferritin[z]	51.71±57.11	78.77±77.12	0.093
TSH[t]	1.83±1.25	1.60±1.03	0.450

*p<0.05, **p<0.01, χ^2:Chi-square test (Categorical data), t: Independent Sample T-Test, z: Mann Whitney U Test, Med: median, S.D: standard deviation

DOI: 10.5455/medscience.2024.07.074

There was no significant difference between glucose, urea, creatinine, sodium, calcium, ALT, ferritin, and thyroid-stimulating hormone (TSH) values in patients with and without enterobiasis (p>0.05).

A significant difference was observed between potassium, albumin, AST and CRP values in patients with and without enterobiasis (p<0.05). While potassium, albumin, AST, and CRP values were 4.50, 44.66, 20.48 and 9.74, respectively, in the control group, they were 4.17, 42.25, 16.14 and 20.90 in the enterobiasis patients. According to these data, while CRP values were higher in patients with enterobiasis, potassium, albumin, and AST values were higher in patients in the control group.

A comparison of gastric biopsy results in patients with and without enterobiasis is presented in Table 4. Intestinal metaplasia, atrophy and *H. pylori* distribution did not differ in individuals with and without enterobiasis (p>0.05).

The occurrence of pinworms in the lumen of the colon during colonoscopic examination is illustrated in Figure 1.

Table 4. A comparison of gastric biopsy results between two groups

Variables		Enterobiasis (n: 21)		Control (n: 50)		p
		Number	%	Number	%	
H. pylori	**Negative**	11	52.4	31	62.0	0.626
	Positive	10	47.6	19	38.0	
Intestinal metaplasia	**Negative**	19	90.5	46	92.0	1.000
	Positive	2	9.5	4	8.0	
Atrophy	**Negative**	18	85.7	48	96.0	0.150
	Positive	3	14.3	2	4.0	

*p<0.05, **p<0.01, χ^2:Chi-square test (categorical data), t: Independent Sample T-Test

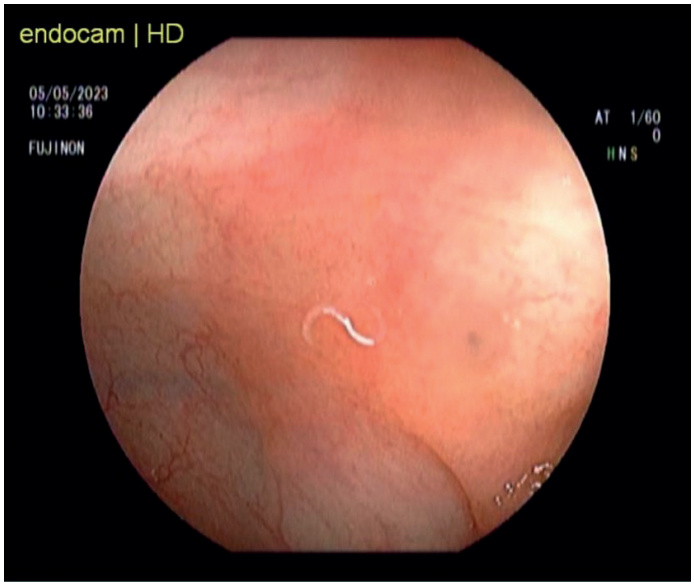

Figure 1. Pinworm seen on colonoscopic examination

Discussion

The present study analyses sociodemographic data, complete blood count parameters, biochemical markers, and gastric biopsy results in patients with and without enterobiasis. Our findings reveal several significant differences between the two groups, contributing valuable insights into the systemic effects of Enterobius vermicularis infection.

One notable observation was the difference in age distribution between the enterobiasis and control groups. Patients with enterobiasis were more likely to be 65 years or older, suggesting that older adults may be more susceptible to enterobiasis or that the infection persists longer in this age group. This finding aligns with previous research by Ahmed M. (2023), highlighting an increased prevalence of enterobiasis among the elderly, possibly due to a weakened immune response [6]. Additionally, Braseth AL. et al. (2021) found that age-related immunosenescence could contribute to the persistence and severity of parasitic infections, including enterobiasis, in older adults [7].

Our study also found significant differences in haemoglobin and hematocrit levels between the two groups, with lower values observed in the enterobiasis group. This suggests that enterobiasis may contribute to anaemia, potentially through chronic blood loss or nutritional deficiencies exacerbated by the parasite [8]. Chronic intestinal parasitic infections are known to cause malabsorption and micronutrient deficiencies, as reported by Friesen J. et al. (2019), who documented similar anaemia patterns in patients with hookworm infections [9]. Furthermore, the inflammatory response triggered by enterobiasis may lead to anaemia of chronic disease, characterised by impaired iron utilisation and erythropoiesis suppression [10].

Biochemical parameter analysis revealed significant differences in potassium, albumin, AST, and CRP levels. Elevated CRP levels in the enterobiasis group indicate an ongoing inflammatory response. Elevated CRP is a well-known marker of inflammation and has been associated with various infectious and inflammatory conditions [11]. In parasitic infections, elevated CRP levels reflect the host's immune response to the parasitic antigens, leading to cytokine release and acute-phase protein production. This systemic inflammatory response can exacerbate the anaemia and other systemic effects observed in enterobiasis [12].

DOI: 10.5455/medscience.2024.07.074

In contrast, the control group had higher potassium, albumin, and AST levels. The lower potassium levels in the enterobiasis group could be due to gastrointestinal losses or altered renal handling of electrolytes in chronic inflammation [13]. The lower albumin levels in enterobiasis patients could indicate a chronic inflammatory state or malnutrition, as albumin is a negative acute-phase reactant that decreases during inflammation [14]. Chronic enterobiasis may lead to protein-losing enteropathy, further contributing to hypoalbuminemia. Elevated AST levels in the control group might be incidental or related to transient liver function variations unrelated to enterobiasis [15].

Our study did not find significant differences in gastric biopsy results, including intestinal metaplasia, atrophy, and Helicobacter pylori infection, between the enterobiasis and control groups. This suggests that enterobiasis does not directly impact gastric mucosal pathology, which is detectable via biopsy. However, it is essential to consider that the gastrointestinal symptoms and systemic effects observed in enterobiasis patients may not always correspond with visible gastric mucosal changes [16].

Overall, our findings contribute to the growing literature on the systemic effects of enterobiasis. The significant differences in haematological and biochemical parameters emphasise the need for comprehensive clinical evaluations in patients with gastrointestinal complaints and suspected enterobiasis. Future research should focus on longitudinal studies to better understand the long-term impacts of enterobiasis on these parameters and explore potential interventions to mitigate its effects.

Study Limitations

This study has several limitations that should be acknowledged. Firstly, the retrospective design may introduce selection bias and limit the ability to establish causal relationships. The relatively small sample size, especially in the enterobiasis group, may affect the generalizability of the findings. The cross-sectional nature of the study also prevents the assessment of the long-term effects of enterobiasis on laboratory parameters and gastric biopsy results. Future studies with more extensive prospective cohorts and longitudinal follow-ups are needed to confirm these findings and further explore the underlying mechanisms.

Conclusion

In conclusion, enterobiasis is associated with significant changes in several laboratory parameters, including lower haemoglobin and hematocrit levels and higher CRP levels, indicating a systemic inflammatory response. These findings underscore the importance of considering enterobiasis in the differential diagnosis of anaemia and inflammation in patients with gastrointestinal symptoms. Recognising these associations can improve diagnostic accuracy and patient management by prompting comprehensive laboratory evaluations when enterobiasis is suspected.

Our study highlights the need for further research to elucidate the clinical implications of these laboratory alterations and to explore potential interventions that can mitigate the systemic effects of enterobiasis. Continued investigation will help refine treatment strategies and improve outcomes for patients with this common parasitic infection.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that they have received no financial support for the study.

Ethical Approval
The study protocol was reviewed and approved by the local ethics committee of Giresun Training and Research Hospital, adhering to the ethical principles of the Declaration of Helsinki, revised in 2013. (KAEK-151/Decision no 03. Date: 14.05.2023).

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