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Assessment of Helicobacter pylori Antibodies and Stool Antigens in Pediatric Patients with Epigastric Pain: Diagnostic Insights and Clinical Implications

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ABSTRACT

Objective: To assess the H. pylori Antibodies and Stool Antigens in pediatric patients with Epigastric Pain as the clinical implications of diagnosing H. pylori infection using these non-invasive methods.

Methodology: A cross-sectional, observational study was conducted over a period of 12 months from May 2023 to October 2023, at the Department of Pediatrics, AIMS Hospital, Muzaffarabad, AJK. Patients aged 5 to 12 years old, both genders presented with history of epigastric pain for at least more than 30 days were included. A 5 ml venous blood sample was obtained for serological testing and Enzyme immunoassay (EIA) was used to detect immunoglobulin G (IgG) antibodies against H. pylori. Stool samples were collected for the stool antigen test (SAT) and tests were done using a commercially available monoclonal antibody-based enzyme-linked immunosorbent assay (ELISA) kit. A self-made study proforma was used for the data collection and analysis of the data was done by spss version 26.

Results: Out of total study sample of 61, girls were in majority 62.3% and boys were 37.7%, with an overall mean age of 8.60±3.35 years. Of the participants, 63.9% (39) tested positive for H. pylori antibodies, while 36.1% (22) tests were negative. For H. pylori antigens, 90.2% (55) of the children tested positive, whereas 9.8% (6) tested negative. Furthermore, the differences in H. pylori antibody and H. pylori antigens positivity bases on gender and residential status, consumption of junk food and sources of water were not statistically significant (p=0.>0.05).

Conclusion: The findings, with 63.9% testing positive for H. pylori antibodies and 90.2% for H. pylori antigens, underscore a notable prevalence of H. pylori infection among children with recurrent abdominal pain.

Key words: Abdominal pain, Recurrent, H. pylori, Antibodies, Antigens, Children

Authors' Contribution:
[1,2]Conception; Literature research; manuscript design and drafting; [3,4]Critical analysis and manuscript review; [4]Data analysis; Manuscript Editing.

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Introduction

Helicobacter pylori is a significant pathogenic bacterium in the gastric mucosa, contributing to the development of conditions such as chronic gastritis, duodenal and gastric ulcer, metabolic syndrome, and the carcinoma of gastrointestinal tract in both adults and children.[1,2] The prevalence of infection in pediatric populations is high and differs between countries and within the same geographical regions. Helicobacter pylori typically colonize the gastric mucosa during childhood and remains

asymptomatic in most individuals, persisting in the gastric cavity for life unless eradication therapy is administered.[3,4] Helicobacter pylori infection affects 50% of the global population, encompassing around 70% of people in developing countries and 30% to 40% of those in industrialized nations.[5] Numerous studies have found a substantial link between Helicobacter pylori (H. pylori) infection in Pakistan, with incidences ranging from 8% to 68.7% in children suffering from recurring pain of abdomen.[6,7]

Additionally, diagnosing this infection presents numerous challenges due to issues with the diagnostic methods, such as invasiveness, lack of sensitivity or specificity, and variability among observers.[8] The accuracy of these methods is also directly related to the incidence of H. pylori. Clinicians must carefully evaluate the advantages and disadvantages of each diagnostic approach to ensure the highest standard of care.[8] H. pylori infection usually occurs in childhood, especially in nations with limited resources. Regarding these areas, a low-cost, immediate diagnostic tool that is reliable across all age groups could be useful for controlling the infection caused by H. pylori. Its prevalence is closely related to socioeconomic position and living conditions, particularly in situations typified by overpopulation and poor sanitation.[9] Infections of the H. pylori are detected using a variety of diagnostic approaches, both invasive and noninvasive. Serological assays detect antibodies towards H. pylori, with the enzyme immunoassay (EIA) representing the most often performed.[10] Such test evaluates the "immunoglobulin G (IgG)" and has sensitivity and specificity values ranging from '60% to 100%'.[10] Furthermore, the SAT may identify a recent infection, while serological tests simply suggest interaction with the pathogen, whether current or previous. The SAT has several advantages, including its non-invasive nature, rapidity, high sensitivity, specificity, and dependability. It can be used to diagnose infections as well as to assess the success of therapies. Its low cost, convenience of implementation and capacity to gather samples have all contributed to its increasing acceptance.[10-13] Given the increased incidence of infection with H. pylori among children as well as the challenges associated with it, there's a pressing requirement for reliable, non-invasive diagnostic procedures. Serological examinations which discover antibodies towards H. pylori and SAT, which indicates current infection, are two prominent non-invasive procedures. A comprehensive assessment of these diagnostic approaches can provide significant insights into their efficacy and limitations, aiding medical practitioners in selecting the most appropriate method for certain clinical settings. Hence this study aims to enhance clinical practice by identifying the most reliable, cost-effective, and easy-to-use diagnostic methods.

Methodology

A cross-sectional, observational study was conducted over a period of 12 months from May 2023 to October 2023, at the Department of Paediatrics, AIMS Hospital, Muzaffarabad, AJK. A total number of 61 samples from pediatric population were selected in order to ensure adequate statistical power with 90% confidential level and 8% margin of error, to detect variations in diagnostic results between serological testing and stool antigen assays. All the patients aged 5 to 12 years old, both genders presented with history of epigastric pain for at least more than 30 days were included. All the patients with already detected H. pylori infection, cases with history of recently uses of antibiotics were, chronic gastrointestinal disease, severely ill hospitalized patients and those who were not willing to participate in the study were excluded. A detailed medical history and physical examination were done. Before the investigations, the parents or guardians of eligible patients were informed and thoroughly explained regarding the objective, advantages and the potential risks of the study by the principal

researcher or by the trained research coordinator. A 5 ml venous blood sample was obtained for serological testing and Enzyme immunoassay (EIA) was used to detect immunoglobulin G (IgG) antibodies against H. pylori. Furthermore, the stool samples were collected for the stool antigen test (SAT) and tests were done using a commercially available monoclonal antibody-based enzyme-linked immunosorbent assay (ELISA) kit. A self-made study proforma was used for the data collection and analysis of the data was done by SPSS version 26.0.

Results

Out of total study sample of 61, girls were in majority 62.3% and boys were 37.7%, with an overall mean age of 8.60±3.35 years. Out of all 57.4% cases were rural resident and 42.6% were urban resident. 55.7% (34) of the participants have a history of consuming junk food, and according to the source of drinking water, 63.9% (39) of the participants use spring water, 8.2% (5) were using filtered water, and a significant 91.8% (56) were using unfiltered water. Table. I

Table I: Analysis of demographic characteristics n=61

Variables	Frequency	Percentage
Gender		
Male	23	37.7%
Female	38	62.3%
Total	61	100.0%
Residence		
Rural	35	57.4%
Urban	26	42.6%
Total	61	100.0%
Junck food history		
Yes	34	55.7%
No	27	44.3%
Total	61	100.0%
Source of water		
Spring water	39	63.9%
Filtered	5	8.2%
Un-filtered	56	91.8%

In accordance to the H. pylori antibodies and stool antigens among children having history recurrent abdominal pain (n=61). Of the participants, 63.9% (39) tested positive for H. pylori antibodies, while 36.1% (22) tests were negative. For H. pylori antigens, 90.2% (55) of the children tested positive, whereas 9.8% (6) tested negative. Table. II. The differences in H. pylori antibody and H. pylori antigens positivity bases on gender and residential status and consumption of junk food were not statistically significant (p=0.>0.05). Furthermore, there was also no significant difference in antibody positivity based on water source (p=0.251), but there was a marginally significant difference in antigen positivity (p=0.053). Table. III

Table II: H. pylori Antibodies and Stool Antigens in children with recurrent abdominal pain n=61

Diagnosis	Frequency	Percentage
H. pylori antibody		
Positive	39	63.9%
Negative	22	36.1%
Total	61	100.0%
H. pylori antigen		
Positive	55	90.2%
Negative	6	9.8%
Total	61	100.0%

Discussion

Helicobacter pylori (H. pylori) is a widespread bacterial infection, particularly prevalent among children aged 5 to 10 years, those with large families, and individuals in developing countries.[14] As a result, an affordable and rapid diagnostic method could be highly beneficial for managing H. pylori infection in children and adolescents from these regions.[14] However, this study enrolled 61 children with recurrent abdominal pain, with an overall mean age of 8.60±3.35 years and a female predominance of 62.3%, to assess the H. pylori antibodies and stool antigens in pediatric patients with epigastric pain and to evaluate the clinical implications of diagnosing H. pylori infection using these non-

invasive methods. Consistently Iranikhah et al.,[15] reported that out of 39 tested cases, 22 (56.4%) were females and 17 (43.6%) were males. In aligns (55) of the children tested positive, whereas 9.8% (6) tested negative. These findings indicate a notable prevalence of both H. pylori antibodies and antigens

Table. III: H. pylori Antibodies and Stool Antigens according to age, gender, food and water sources n=61

		H pylori antibody		p-value	H pylori antigen		p-value
		Positive	Negative		Positive	Negative	
Gender	Male	13	10	0.348	21	2	0.816
		21.3%	16.4%		34.4%	3.3%	
	Female	26	12		34	4	
		42.6%	19.7%		55.7%	6.6%	
Residence	Rural	21	14	0.458	33	2	0.210
		34.4%	23.0%		54.1%	3.3%	
	Urban	18	8		22	4	
		29.5%	13.1%		36.1%	6.6%	
Junk food history	Yes	24	10	9.225	30	4	0.570
		39.3%	16.4%		49.2%	6.6%	
	No	15	12		25	2	
		24.6%	19.7%		41.0%	3.3%	
Source of water	Spring water	27	12	0.251	33	6	0.053
		44.3%	19.7%		54.1%	9.8%	
	Tape water	12	10		22	0	
		19.7%	16.4%		36.1%	0.0%	

to this study, Hasan et al.,[16] reported a mean age of 9.49±2.47 years for children infected with H. pylori, although they found a male predominance of 52%, which is inconsistent with our findings. On the other hand, Yousaf et al.,[17] stated that the mean age of H. pylori-infected children was 10±4.36 years, and they also found a male predominance of 72%, which again differs from our results. In comparison, Hassan et al[18] reported that among 148 children with recurrent abdominal pain (RAP), 83 (56.1%) were male, and the average age was 7.6±1.9 years, with 103 (69.6%) being under 8 years old. The differences in gender distribution observed in our study compared to others may be attributed to variations in study populations and settings. In this study in accordance to the H. pylori antibodies and stool antigens in children with recurrent abdominal pain (n=61). Of the participants, 63.9% (39) tested positive for H. pylori antibodies, while 36.1% (22) tests were negative. For H. pylori antigens, 90.2% among the study population, suggesting a significant presence of H. pylori infection in children experiencing recurrent abdominal pain. The occurrence of antibodies and stool antigens among children having H. pylori infection differs between investigations. Darma et al., demonstrated that serum IgG diagnosed H. pylori in 13.33% of children, compared to serum IgM in 63.33% and HpSA in 40%. In the study by Malaty et al.,[20] demonstrated that H. pylori infection is present in approximately 81% of children experiencing recurrent abdominal pain (RAP) and the infection typically manifests during childhood and varies among different populations. Palanduz et al.,[21] stated that the most significant discovery in this study was the high seropositivity rate among the children, which was 82.4%. However, investigations have demonstrated that non-invasive approaches such stool antigen testing employing immunomagnetic beads with monoclonal antibodies are efficient for identifying H. pylori.[22] In

this study, the differences in H. pylori antibody and antigen positivity based on gender, residential status, and junk food consumption were not statistically significant (p>0.05). Additionally, no significant difference in antibody positivity was observed based on the water source (p=0.251), although there was a marginally significant difference in antigen positivity (p=0.053). Stool antigen testing was considered more reliable in this study, but the findings cannot be recommended as final clinical implications due to several limitations, such as the limited sample size and the lack of comparison with any standard technique for sensitivity.[23,24] Therefore, large-scale studies using a gold standard technique are recommended to ensure the accuracy of both methods.

Conclusion

The findings, with 63.9% testing positive for H. pylori antibodies and 90.2% for H. pylori antigens, underscore a notable prevalence of H. pylori infection among children with recurrent abdominal pain. The higher detection rate of H. pylori antigens compared to antibodies indicates that stool antigen testing might be a more sensitive and reliable method for diagnosing H. pylori infection in children with epigastric pain. Further large-scale studies are recommended, using gold standard methods, to confirm these results and solidify the clinical utility of non-invasive H. pylori diagnostic tests in pediatric patients.

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