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Original Article

Prevalence and Associated Factors of Helicobacter pylori Infection Among Symptomatic Adults Undergoing Upper Gastrointestinal Endoscopy in Bangladesh: A Single-Center Cross-Sectional Study

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Abstract

Background: Helicobacter pylori is a Gram-negative bacterium associated with gastritis, peptic ulcer disease, gastric cancer, and MALT lymphoma. It is transmitted mainly through oral–oral and fecal–oral routes and can be diagnosed using urea breath tests, stool antigen tests, serological methods, and endoscopic gastric biopsy-based tests. This study evaluated the proportion of H. pylori infection and its associated factors among symptomatic adults undergoing upper gastrointestinal (UGI) endoscopy.

Methods: A cross-sectional study was conducted in 2025 among 140 consecutive symptomatic adults undergoing UGI endoscopy at a hospital. Gastric biopsy rapid urease testing (RUT) was used to assess H. pylori infection status. Sociodemographic and clinical risk factors were assessed through structured questionnaires and health records. Data were analyzed using SPSS version 26. Ethical approval and informed consent were obtained.

Results: Among 140 symptomatic adults undergoing UGI endoscopy, H. pylori infection was detected in 60.0% of participants. Infection was significantly associated with gastritis and was particularly frequent among patients with duodenal ulcers (90.0%) and gastric ulcers (75.0%) ($p < 0.001$). Multivariable analysis identified current smoking (AOR = 2.64), rural residence (AOR = 2.31), and male sex (AOR = 1.92) as independent predictors of H. pylori infection.

Conclusion: Among symptomatic adults undergoing UGI endoscopy, H. pylori infection was common, being detected in 60.0% of participants, and was strongly associated with gastritis and peptic ulcer disease. Male sex, rural residence, and current smoking were independent predictors of infection. These findings highlight the importance of targeted detection and eradication strategies among symptomatic patients undergoing UGI endoscopy.

Keywords: Prevalence, Helicobacter pylori Infection, Upper Gastrointestinal Endoscopy, Risk Factor.

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Introduction

Helicobacter pylori is the leading cause of chronic gastritis and can, in certain individuals, result in severe conditions

like peptic ulcer disease (gastric and duodenal ulcers), gastric cancer, and gastric MALT lymphoma [1,2]. It is a flagellated, Gram-negative bacillus that inhabits the gastric mucosa (primarily gastric pits beneath the mucus layer) in proximity to epithelial cells. Approximately half of the world's population is infected, but merely 10–20% show symptoms or illness [3,4].

Helicobacter pylori spreads primarily through the oral–oral or fecal–oral pathways. Diagnosis is performed using invasive methods including rapid urease test (RUT), endoscopy with biopsy (the gold standard), brush cytology, and histology, along with non-invasive tests like urea breath test (UBT), serology, and stool antigen test (SAT) [5,6]. Upper gastrointestinal (GI) endoscopy is the primary and most effective method for investigating GI symptoms, as it provides direct and thorough visualization and evaluation of the GI mucosa more effectively than any other diagnostic approach [7]. In Bangladesh, the prevalence of H. pylori varies between 30% and 67%, and it is the primary factor behind chronic gastritis, peptic ulcer disease, and gastric cancer [8].

Global study discovered that the worldwide prevalence of Helicobacter pylori infection is approximately 44.3%. The prevalence differs significantly by region—exceeding 50% in several areas of Africa and Asia, while being lower in Europe and North America—primarily because of variations in sanitation, living conditions, and socioeconomic factors [9]. Another study found a significant prevalence of H. pylori infection in dyspeptic patients, suggesting a robust link to upper gastrointestinal symptoms and dyspepsia, highlighting its crucial role in the development of upper GI conditions [10].

A recent investigation in Bangladesh indicated a significant occurrence of Helicobacter pylori infection in individuals with functional dyspepsia, demonstrating a strong link between H. pylori and upper gastrointestinal symptoms in a specialized healthcare environment [11].

There is an absence of recent, uniform, and region-specific data regarding the prevalence of H. pylori infection in patients undergoing upper gastrointestinal endoscopy in Bangladesh, as existing studies demonstrate inconsistency. Thus, this research seeks to ascertain the prevalence of H. pylori infection among endoscopy patients in a hospital environment to offer current local data.

Methodology

Study Design and Setting

This hospital-based cross-sectional study was conducted in the Department of Gastroenterology of Central Police Hospital, Dhaka, Bangladesh, from January 2025 to December 2025. The study aimed to determine the hospital-based prevalence of Helicobacter pylori infection among symptomatic adults undergoing upper gastrointestinal (UGI) endoscopy and to identify demographic and clinical factors associated with the infection.

Study Population

The study population comprised symptomatic adults undergoing diagnostic UGI endoscopy during the study period due to symptoms suggestive of upper gastrointestinal disorders, including dyspepsia, epigastric pain, nausea, vomiting, gastroesophageal reflux symptoms, upper gastrointestinal bleeding, and unexplained weight loss.

Inclusion Criteria

Patients aged 18 years and above who underwent upper gastrointestinal endoscopy for diagnostic purposes and provided informed written consent to participate in the study were included.

Exclusion Criteria

Patients were excluded if they had received H. pylori eradication therapy within the previous six months or had used proton pump inhibitors, bismuth compounds, or antibiotics within four weeks before endoscopy. Medication exposure was assessed through patient interviews and verified, where available, by reviewing prescription and medical records. Patients with a history of gastric surgery, critical illness, inability to provide informed consent, or incomplete clinical or laboratory data were also excluded.

Sample Size and Sampling Technique

Using an anticipated H. pylori prevalence of 60%, 95% confidence level, and 5% margin of error, the calculated sample size was 369. After adding 10% for possible exclusions, the required sample was 410. Due to feasibility constraints, 140 consecutive eligible symptomatic adults undergoing UGI endoscopy were included. No design effect was applied.

Data Collection Procedure

Data were collected using a pretested semi-structured questionnaire. Information regarding age, sex, residence, smoking status, presenting symptoms, and relevant clinical history was obtained through face-to-face interviews and review of medical records.

All participants underwent upper gastrointestinal endoscopy performed by experienced gastroenterologists using a standard video endoscope under routine clinical protocols. Endoscopic findings were recorded and categorized as normal/non-ulcer dyspepsia, gastritis, duodenitis, gastric ulcer, duodenal ulcer, gastric carcinoma, or esophagitis.

Detection of Helicobacter pylori Infection

During UGI endoscopy, two gastric biopsy specimens were collected from each participant: one from the gastric antrum and one from the gastric body. The specimens were tested using the CLOtest Rapid Urease Test

(Kimberly-Clark, USA) according to the manufacturer's instructions. A positive color change within the recommended observation period was considered indicative of H. pylori infection. The endoscopist and laboratory personnel performing the RUT were blinded to the participants' clinical and demographic information.

Study Variables

The primary outcome variable was the presence of Helicobacter pylori infection. Independent variables included age, gender, place of residence, smoking status, and endoscopic findings.

Statistical Analysis

Data were entered, cleaned, and analyzed using Statistical Package for the Social Sciences (SPSS) version 26.0. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages.

The hospital-based prevalence of H. pylori infection was calculated as the proportion of RUT-positive participants among the 140 symptomatic adults undergoing UGI endoscopy. Associations between H. pylori infection and categorical variables were assessed using the Chi-square test or Fisher's exact test where appropriate. Differences in continuous variables were evaluated using the independent-samples t-test. Variables showing statistical significance in bivariate analysis were included in a multivariable logistic regression model to identify independent predictors of H. pylori infection. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board (IRB) of Central Police Hospital, Dhaka, before commencement of the study. Written informed consent was obtained from all participants prior to enrollment. Confidentiality and anonymity of participants were strictly maintained throughout the study, and all procedures were conducted in accordance with the principles of the Declaration of Helsinki.

Results

Among the 140 patients undergoing upper gastrointestinal endoscopy, H. pylori infection was detected in 84 (60.0%; 95% CI: 51.5–68.1%) participants, while 56 (40.0%) were negative. Gastritis was the most common endoscopic diagnosis, and H. pylori infection was significantly associated with peptic ulcer disease, particularly duodenal ulcer. Rural residence, smoking, and male gender emerged as significant independent predictors of infection.

Table 1 shows that the largest proportion of participants belonged to the 30–39 years age group (25.7%). More than half of the participants were male (57.1%) and urban residents (54.3%). Current smokers comprised 30.0% of the study population.

Table 1. Sociodemographic Characteristics of the Study Participants (N=140)

Characteristics	Frequency(n)	Percentage (%)
Age Group (years)		
18 –29	28	20.0
30 –39	36	25.7
40 –49	34	24.3
50 –59	24	17.1
≥60	18	12.9
Gender		
Male	80	57.1
Female	60	42.9
Residence		
Urban	76	54.3
Rural	64	45.7
Smoking Status		
Current smoker	42	30.0
Non -smoker	98	70.0

Figure I show that 84 patients (60.0%) tested positive for Helicobacter pylori, whereas 56 patients (40.0%) were negative. Thus, the proportion of H. pylori infection among symptomatic adults undergoing UGI endoscopy was 60.0% (95% CI: 51.5–68.1%).

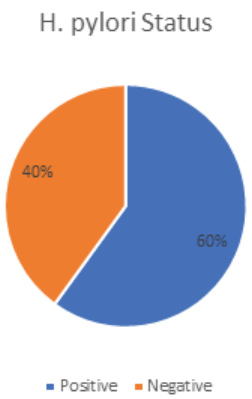


Figure I: Prevalence of Helicobacter pylori Infection Among Study Participants (N=140)

Table 2 shows gastritis was the most common endoscopic finding (37.1%), followed by non-ulcer dyspepsia or normal mucosa (21.4%) and duodenal ulcer (14.3%).

Table 2: Endoscopic Findings Among the Participants (N=140)

Endoscopic Findings	Frequency (n)	Percent age (%)
Non -ulcer dyspepsia/Normal mucosa	30	21.4
Gastritis	52	37.1
Duodenitis	10	7.1
Gastric ulcer	16	11.4
Duodenal ulcer	20	14.3
Gastric carcinoma	8	5.7
Esophagitis	4	2.9

Table 3 shows a statistically significant association between H. pylori infection and endoscopic findings (χ^2 test, $p<0.001$). The highest proportions of H. pylori positivity were observed among patients with duodenal ulcer (90.0%) and gastric ulcer (75.0%), while lower positivity was observed among patients with gastric carcinoma (12.5%) and esophagitis (0.0%). These findings indicate an association between H. pylori infection and specific endoscopic diagnoses; however, causality cannot be established due to the cross-sectional study design.

Table 3. Association Between H. Pylori Infection and Endoscopic Findings

Endoscopic Findings	H. pylori Positive n (%)	H. pylori Negative n (%)	Total	p - value
Normal/ Non -ulcer dyspepsia	10 (33.3)	20 (66.7)	30	<0.001
Gastritis	36 (69.2)	16 (30.8)	52	
Duodenitis	7 (70.0)	3 (30.0)	10	
Gastric ulcer	12 (75.0)	4 (25.0)	16	
Duodenal ulcer	18 (90.0)	2 (10.0)	20	
Gastric carcinoma	1 (12.5)	7 (87.5)	8	
Esophagitis	0 (0.0)	4 (100.0)	4	
Total	84	56	140	

Table 4 shows that H. pylori infection was significantly associated with younger age, male gender, rural residence, and smoking status. The prevalence of infection was higher among smokers (38.1%) compared with non-smokers (17.9%) (p=0.011).

Table 4. Factors Associated with H. pylori Infection

Variables	H. pylori Positive (n=84), n(%)	H. pylori Negative (n=56), n(%)	p - value
Mean age (years)	40.9 ± 12.8	45.7 ± 14.4	0.042
Male gender	54 (64.3)	26 (46.4)	0.036
Rural residence	46 (54.8)	18 (32.1)	0.008
Current smoker	32 (38.1)	10 (17.9)	0.011

Table 5 shows, multivariable logistic regression analysis rural residence (AOR=2.31, 95% CI: 1.18–4.51), smoking (AOR=2.64, 95% CI: 1.19–5.82), and male gender (AOR=1.92, 95% CI: 1.01–3.67) remained independent predictors of H. pylori infection. Although younger age showed a positive association, it did not reach statistical significance after adjustment (p=0.093).

Table 5. Independent Predictors of H. pylori Infection

Variable	Adjusted OR	95% CI	p - value
Male gender	1.92	1.01 –3.67	0.047
Rural residence	2.31	1.18 –4.51	0.015
Smoking	2.64	1.19 –5.82	0.017
Age (<40 years)	1.74	0.91 –3.34	0.093

Discussion

The present study demonstrated a substantial burden of Helicobacter pylori infection among symptomatic adults undergoing UGI endoscopy, with 60.0% testing positive. This finding represents a hospital-based proportion among symptomatic endoscopy patients and should not be interpreted as the prevalence of H. pylori in the general Bangladeshi population. A similar high burden among dyspeptic patients in Bangladesh has been reported, with associations with peptic ulcer disease and demographic and behavioral factors such as male sex, rural residence, and smoking [12]. A community-based study from Dhaka also reported a considerable burden of H. pylori infection, supporting the continuing importance of this infection in Bangladesh [13]. Differences between community and

hospital-based estimates may reflect variation in patient selection, symptoms, diagnostic methods, and health-care-seeking patterns.

Gastritis was the most frequent endoscopic finding, followed by non-ulcer dyspepsia/normal mucosa and duodenal ulcer, which is comparable with previous endoscopic studies among dyspeptic patients [14]. H. pylori infection was significantly associated with endoscopic findings, with the highest positivity observed in duodenal and gastric ulcers. Similar studies have reported strong associations between H. pylori and peptic ulcer disease, particularly duodenal ulcer [15]. Because of the cross-sectional design, these findings demonstrate an association rather than causality.

Only 1 of 8 patients with gastric carcinoma (12.5%) was H. pylori positive. This finding should be interpreted cautiously because of the very small number of carcinoma cases and should not be considered evidence against the established relationship between H. pylori infection and gastric cancer. The estimate is likely to be imprecise, and larger studies with adequate numbers of gastric carcinoma cases are required to evaluate this association reliably.

In the present study, younger age, male sex, rural residence, and smoking were associated with H. pylori infection in the unadjusted analysis. Similar associations have been reported previously [16]. The higher infection burden among rural residents may be related to differences in sanitation, household conditions, socioeconomic factors, environmental exposure, and access to healthcare. The association with smoking may reflect behavioral or biological effects, although causality cannot be established from this study.

Current smoking was independently associated with H. pylori infection (AOR=2.64, 95% CI: 1.19–5.82). In the revised methodology, current smoking should be defined according to the actual exposure criteria used in the study, including smoking frequency and duration and whether bidi, hookah, or smokeless tobacco were considered. These details are important for interpreting the observed association and for comparison with previous studies [16,17].

Male sex, rural residence, and smoking remained independent predictors in the multivariable model, whereas younger age lost statistical significance after adjustment [17]. This suggests that the crude age association may have been partly influenced by other covariates. The <40-year cutoff should be justified using a predefined clinical or evidence-based rationale rather than being selected solely from the observed data. For the regression model, variables should be selected based on clinical relevance, previous evidence, potential confounding, and statistical criteria. The final manuscript should also report the number of variables entered, number of H. pylori-positive events, model specification, goodness-of-fit assessment, and multicollinearity assessment to demonstrate model adequacy.

Clinically, the findings suggest that symptomatic patients with peptic ulcer disease and those with relevant demographic or behavioral risk factors may benefit from appropriate assessment and management of H. pylori. However, the findings should be interpreted within the context of the study population and should not be generalized to asymptomatic individuals or the wider Bangladeshi population.

LIMITATIONS

This study has multiple constraints. To begin with, its design as a single-center hospital study and the use of consecutive sampling could lead to selection bias and restrict generalizability. Secondly, the sample size was quite limited, especially for gastric carcinoma, leading to inaccurate subgroup estimates. Third, only symptomatic adults who underwent UGI endoscopy were included; thus, the noted 60.0% proportion cannot be regarded as a community or national prevalence. Fourth, the cross-sectional approach hinders the evaluation of temporal relationships and fails to demonstrate causation. Fifth, RUT served as the only diagnostic approach, thus false-negative or false-positive outcomes cannot be entirely ruled out. Ultimately, residual confounding from socioeconomic, environmental, dietary, household, and additional behavioral factors might still exist.

Conclusion

Helicobacter pylori infection was common among symptomatic adults undergoing UGI endoscopy and was significantly associated with gastritis and peptic ulcer disease, particularly duodenal ulcers. Male sex, rural residence, and smoking were independently associated with infection. As this was a hospital-based cross-sectional study, these findings demonstrate associations rather than causality and should not be interpreted as population prevalence. The findings support further multicenter studies to characterize H. pylori epidemiology and associated risk factors in Bangladesh and may help inform locally appropriate diagnostic and management strategies.

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