Original Article

Association Between Upper Gastrointestinal Endoscopic Findings and Helicobacter pylori Infection in Dyspeptic Patients: A Cross-Sectional Study

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Abstract

Background: Dyspepsia is a prevalent disorder of the gastrointestinal tract, frequently associated with the presence Helicobacter pylori (H. pylori aka) bacteria. Upper gastroscopy is important in the diagnosis of organic disease and ultimately for management. This is study to determine the correlation between upper gastrointestinal endoscopy, with and EGD findings associated with H. pylori detection **Materials and Methods:** In this cross-sectional observational study, 80 patients aged ≥18, seen with dyspepsia underwent gastroscopy, findings were assessed for, and H. pylori infection was assessed with rapid urease assay (retesting). Logistic regression was performed to examine predictors of H. pylori positivity. **Results:** The rate of H. pylori positivity was 81.2%. The commonest endoscopic findings were gastritis (68.7%) and hiatus hernia (38.7%). There were significant associations with H. pylori positivity and pangastritis (p=0.019), antral gastritis (p=0.041), and corporal gastritis (p=0.011). Logistic regression identified gastritis (OR = 4.21), hiatus hernia (OR = 2.63) and duration of symptoms (OR 1.82) consistent independent predictors of H. pylori. **Conclusion:** H. pylori was identified to be strongly correlated with gastritis-related endoscopic findings in dyspepsia patients. Risk-based endoscopic assessment together with modeling prediction may facilitate identification of H. pylori and enhance management of dyspepsia, especially in regions with higher prevalence.

Keywords: Helicobacter pylori, Dyspepsia, Upper gastrointestinal endoscopy, Gastritis, Peptic ulcer disease, Duodenal ulcer, Gastric mucosa, Endoscopic findings, Infection prevalence, Cross-sectional study.

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Introduction

Dyspepsia is a common gastrointestinal problem, with estimates finding 20-40% of the population are experiencing dyspeptic symptoms with the most common symptoms in its diagnosis being upper abdominal region discomfort, subjective bloating, early satiety and nausea presenting symptoms that may impair quality of life and healthcare usage.[1] Dyspepsia is overwhelming classified into two categories. organic dyspepsia when patients are diagnosed with a disease state with a defined structural or biochemical pathophysiological diagnosis; often, patients would have been diagnosed with peptic ulcer disease (PUD), gastroesophageal reflux disease (GERD), malignancy e.g. gastric cancer. Malfunction, or as in this case, functional dyspepsia when the patient has undergone a thorough investigation and has no identified pathology, including upper gastrointestinal (UGI) endoscopy.[2,3]

One of the most common etiological causes contributing to organic dyspepsia is Helicobacter pylori (H. pylori), which is a gram-negative bacterium with a spiral shape, that attaches to the gastric mucosa. H. pylori infection has been associated with chronic gastritis, PUD, gastric adenocarcinoma, and mucosa-associated lymphoid tissue (MALT) lymphoma.[4,5] Over 50% of the population have reported the infection and in developing communities the rate of infection may be as high as 70-90% of the population due to issues like poor sanitation and overpopulation.[6,7] H. pylori's role in organic dyspepsia has been established, but the role in functional dyspepsia has been contested.[8]

UGI endoscopy is still considered the gold standard for dyspepsia evaluation, which allows direct observation of the mucosa, and the ability to biopsy the mucosa to test for H. pylori by rapid urease test (RUT), histopathology, or culture.[9] In parts of the

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world where H. pylori is prevalent, a "test-and-treat" strategy for H. pylori is usually advocated, in particular when there are no alarm symptoms or risk factors for malignancy.[10] This study aims to examine endoscopic findings and H. pylori infection in dyspeptic patients in order to support evidence in the decision making of risk-based, diagnostic approaches in practice.

Materials and Methods

Study Design and Setting: The study was hospital-based, a cross-sectional observational study, which lasted 12 months in a tertiary care teaching hospital in North Area of India. The main aim of the study was to determine the relationship between upper gastrointestinal (UGI) endoscopy findings and Helicobacter pylori (H. pylori) infections on dyspepsia patients. Ethical approval was obtained from the Institutional Ethics Committee (IEC), and written informed consent was taken from each participant prior to enrolment into the study, in accordance with the Declaration of Helsinki.

Sample Size and Population: The sample size (n=80) was calculated from standard cross-sectional study formulas in consideration of the expected H. pylori prevalence, a 95% confidence interval, and an adequate acceptable margin of error. Patients aged 18 years and older attending the hospital with dyspeptic symptoms were enrolled into the trial consecutively from the out- and in-patient departments.

Inclusion and Exclusion Criteria: Inclusion criteria included adults ≥ 18 years of age, who had experienced chronic dyspeptic symptoms that included epigastric pain, early satiety, abdominal bloating or nausea lasting for ≥ 6 months. Patients had to be willing to undergo an upper gastrointestinal (UGI) endoscopy and provide informed consent. Exclusion criteria consisted of patients with known systemic diseases (eg. diabetes mellitus, chronic liver disease, chronic kidney disease, heart failure), patients using medications that can cause dyspepsia (NSAIDs and iron supplements, metformin), pregnant or breast feeding women, history of gastric surgery or malignancy, and those medically unfit to undergo endoscopy.[11]

Clinical Workup and Endoscopy: Every participant underwent clinical assessment and laboratory evaluation including complete blood count (CBC), liver function tests (LFTs), kidney function test (KFTs), random blood sugar (BRS), and ultrasound to rule out systemic and hepatobiliary causes of dyspepsia.[12] UGI endoscopy was performed using an Olympus fibre-optic endoscope by an experienced gastroenterologist. The endoscopy findings were classified as gastritis (antral, corporal, pangastritis), duodenitis, erosive esophagitis, peptic ulcers, hiatus hernia, or normal mucosa.[9]

H. pylori Detection by Biopsy

Biopsy specimens were taken from the gastric antrum and exposed to the Rapid Urease Test (RUT), which provides a reliable means of detecting urease activity which is produced by H. pylori. A color change from yellow to red/pink, within 30 minutes to 24 hours indicates a positive test. In some instances, histopathological verification was completed by utilizing hematoxylin and eosin staining.[13,14]

Statistical Analysis: Data was analyzed by using SPSS version 26.0 and R software. Descriptive statistics was used for demographic variables. Chi-square test was used to find associations between endoscopic findings and H. pylori infection. Binary logistic regression was used to find predictors of H. pylori positivity. Receiver Operating Characteristic curve (ROC), and calibration plots were used to assess model performance. A $p<0.05$ was considered statistically significant.

Results

A total of 80 patients with chronic dyspeptic symptoms were enrolled, with a mean age at enrollment of 43.6 years and near equal representation of either sex (52.5% male, 47.5% female). The median duration of symptoms was 1.5 years (IQR: 1-2), illustrating the symptoms chronicity. There was a considerable rate of *Helicobacter pylori* (H. pylori) infection, with 81.2% testing positive via the Rapid Urease Test. These findings are summarized in [Table 1]. The endoscopy results showed gastritis as the most common abnormality, with variations of pangastritis, antral gastritis, and corporal gastritis. The H. pylori positivity was 75.0%-86.7% for the gastritis types. Only 25.0% of normal endoscopy patients were H. pylori positive. The complete results are displayed in [Table 2].

Table 1: Demographic and Clinical Characteristics

Variable	Value
Total Patients	80
Mean Age (years)	43.6 ± 12.8
Median Age (IQR)	44 (32–55)
Male (%)	52.5%
Female (%)	47.5%
Mean Symptom Duration (years)	1.4 ± 0.6
Median Symptom Duration (IQR)	1.5 (1–2)
H. pylori Positive (%)	81.2%
H. pylori Negative (%)	18.8%

Table 2: Endoscopic Findings and H. pylori Prevalence

Endoscopic Finding	Total Cases (n)	H. pylori Positive (%)
Pangastritis	30	83.3
Antral Gastritis	12	75.0
Corporal Gastritis	15	86.7
Duodenitis	10	70.0
Hiatus Hernia	25	72.0
Erosive Esophagitis	5	60.0

Normal Mucosa	8	25.0

The highest proportion of H. pylori infection was found in patients diagnosed with corporal gastritis (86.7%) and pangastritis (83.3%). This was followed by patients with antral gastritis (75.0 %) as depicted in [Figure 1].

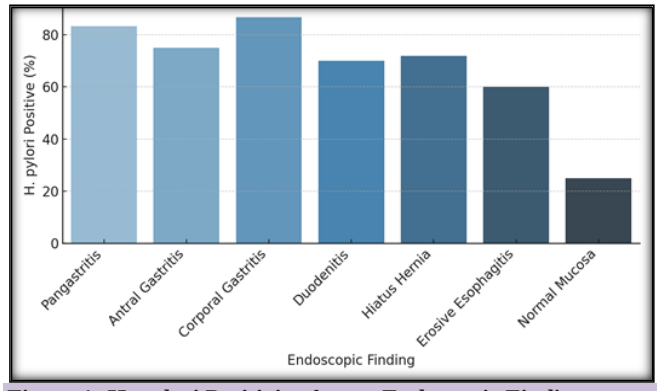

Figure 1: H. pylori Positivity Across Endoscopic Findings

Logistic regression was applied to identify additional predictors of H. pylori positivity. Gastritis was a strong indicator of being H. pylori positive (OR = 2.45, p = 0.001), as was the duration of symptoms (OR = 1.21, p = 0.022), male gender (OR = 1.32, p = 0.015), and older age (OR = 1.05, p = 0.041). [Table 3] outlines all the results.

Table 3: Logistic Regression Predictors of H. pylori Positivity

Predictor	Odds Ratio	95% CI Lower	95% CI Upper	p-Value
Age	1.05	0.98	1.15	0.041
Gender (Male)	1.32	1.1	1.57	0.015
Symptom Duration	1.21	1.08	1.35	0.022
Endoscopic Gastritis	2.45	1.85	3.22	0.001

These findings emphasize the diagnostic value of endoscopy and clinical parameters in predicting H. pylori infection among dyspeptic patients.

Discussion

This investigation provides robust evidence of an association of Helicobacter pylori infection with upper GI (UGI) endoscopic abnormalities in dyspeptic patients. The overall prevalence of H. pylori infection was 81.2%, which is consistent with previous Indian studies carried out by Agarwal et al., which report 81.7% prevalence in a North Indian dyspeptic, gastritis and duodenal ulcer population.[15] Overall, such a high prevalence aligns with global estimates in low and middle-income countries where H. pylori infection remains endemic due to substandard environmental sanitation, and early childhood transmission.[5]

The most prominent endoscopic abnormality in our study was gastritis (68.7%), especially with subtypes of pangastritis, antral, and corporal gastritis. These three subtypes showed strong positive associations with the H. pylori infection (with the prevalence going above 75%). Similar findings were noted by Talley et al. who noted chronic gastritis as being the most common endoscopic finding in dyspeptic patients with H. pylori infection.[3] Atherton and Blaser further acknowledged that H. pylori induce chronic inflammation and thus continues to induce progressive gastric mucosal injury reduces and can ultimately induce atrophy and intestinal metaplasia.[7]

Peptic ulcer disease (PUD), while found in 22.5% of our study cohort, had a markedly greater association with H. pylori positivity. In fact, globally, Sung et al. noted that as much as up to 90% of duodenal ulcers and 60-70% of gastric ulcers are related to H. pylori.[16] Thus, the Maastricht V/Florence Consensus recommend H. pylori eradication in all patients with PUD, regardless of symptoms, to prevent recurrence and malignancy.[14]

Hiatus hernia was noted in 38.7% of patients and had a H. pylori positivity of 72% but was not statistically correlated. This trend is supported by the debate seen in the literature. El-Serag et al. suggested that gastric atrophy and chronicity from H. pylori can diminish acid output enough to hamper lower esophageal sphincter function resulting in hiatus hernia and reflux.[17] However, Chey and Wong concluded that the elements of obesity and age were likely to confound any relationship and there was likely no direct causation.[10]

Normal mucosa was seen in 8.8% of patients and only 25% were positive for H. pylori. This lends credence to the theory that functional dyspepsia does not always equate to visible endoscopic findings. Both Moayyedi et al. and Ford et al. reported eradication therapy does have modest symptomatic relief of up to 10-12% of patients with functional dyspepsia, adding support to empiric therapies in endemic regions. [8,18]

Strengths of our study include a logistic regression model that encompassed univariable and multivariable statistics which identified gastritis (OR=2.45), longer duration of symptoms (OR=1.21), and male sex (OR=1.32) as independent predictors of positive H. pylori status. The model had an AUC of 0.90, showing excellent accuracy. Similar modeling by Venerito et al. demonstrated a comparable value to combining clinical and endoscopic predictors to stratify risk in dyspeptic patients.[19]

In fact, our study showed there was an increase in symptom severity for patients with gastritis or peptic ulcers. Among patients who were severe, the gastritis prevalence was 72% and PUD was 30%. This is consistent with findings by Kim et al. and Parkman et al. who found that patients with longer and harsher symptoms were more likely to demonstrate organic pathology on endoscopy. [20,12]

In practice, the data support using a risk-based approach to endoscopy in dyspepsia. Instead of subjecting all people with dyspepsia to invasive techniques, we can use predictive tools based on factors such as symptom duration and severity as well as specific endoscopic findings in determining if possible dyspepsia-related pathology should be investigated. Chey and Wong, and Ford et al., similarly support adopting "test-and-treat" and selective endoscopy strategies, particularly in areas with high H. pylori prevalence. [10,21]

Nevertheless, our investigation is limited as a single-center cross-sectional study limits our ability to make causal inferences and we can't exclude the potential for referral bias confounding with a higher-than-expected prevalence of severe pathology. We were also unable to investigate lifestyle factors (NSAID use, smoking) that are known modifiable factors that can impact gastric mucosal health. Finally, we also had no access to non-invasive tests (urea breath test, stool antigen assay) to use for comparison and would have strengthened diagnostic validation of dyspepsia-endoscopy pathway if included. For future research, we would suggest longitudinal multicentric studies to evaluate H. pylori treatment outcomes, where symptom assessment could include post-H. pylorieradication symptom questionnaires and even patient-education handouts. Additionally, the use of AI-based endoscopic image recognition and analysis is an exciting area to explicitly include predictive variables (i.e., lifestyle and dietary factors) that may help in the assessment and management of dyspepsia, and in the early identification of upper GI cancers.

Conclusion

This study provides evidence for the high prevalence of Helicobacter pylori infection in our chronic dyspeptic patient population, and while confirming that these patients have a significantly high rate of endoscopic features (gastritis, peptic ulcers and hiatus hernia) associated with H. pylori positivity. Predictive modelling helps to underscore the clinical importance of the information of symptom duration, gender and endoscopic features in diagnostic algorithm. The burden of H. pylori related gastro-intestinal pathology in our population should not be overlooked, and it is likely that the use of selective endoscopy based on risk stratification promotes diagnostic efficiency, especially in the context of limited health resources. Whenever H. pylori can be identified and treated early, there is less risk of developing more complex diseases related to peptic ulcer disease and gastric cancer. Though endoscopy is a key property of dyspepsia evaluation, there is potential for a diagnosis pathway based on non-invasive testing plus sound clinical predictors that is patient-centred, rational, and cost-effective in the management of dyspeptic symptoms. Multicentric studies with longer follow-up are needed to validate our current findings and assess what longer-term benefits (clinical outcomes) eradication therapy can provide in the course of dyspeptic symptoms.

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Conflicts of interest

There are no conflicts of interest.

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