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Prevalence of Helicobacter pylori Infection in Patients with and Without Liver Cirrhosis at a Tertiary Care Center

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Abstract

Introduction: Helicobacter pylori (H. pylori) is a Gram-negative bacterium linked to gastrointestinal diseases and increasingly associated with liver conditions, including cirrhosis. Cirrhosis, resulting from chronic liver damage due to hepatitis, alcohol use, and NAFLD, is a significant global health burden. H. pylori may contribute to cirrhosis progression through systemic inflammation and disruption of the gut-liver axis. This study evaluates the prevalence of H. pylori infection in cirrhotic and non-cirrhotic patients, aiming to inform screening strategies and better understand its role in chronic liver disease.

Materials & Methods: This cross-sectional study was conducted at Government Medical College, Tirunelveli over 18 months. Endoscopic gastric biopsy specimens from 248 patients (124 with cirrhosis, 124 without) aged 40–60 years were analyzed. Excluded were patients with hepatic encephalopathy, recent GI bleed, antibiotic use, or severe comorbidities. Specimens were stained with H&E and Giemsa and examined microscopically. Data were analyzed using SPSS v27, with associations tested via the Chi-square test. Ethical approval was obtained, and all procedures followed ethical guidelines.

Results: The majority of the study population was middle-aged (87.1%), with nearly equal gender distribution. In cirrhotic patients (Group A), portal hypertensive gastropathy (42.7%) and esophageal varices (39.5%) were common, while antral gastritis (53.2%) and GERD (30.6%) were more frequent in non-cirrhotic patients (Group B). H. pylori infection was significantly higher in cirrhotic patients (69.4%) compared to non-cirrhotic patients (9.7%), with higher prevalence in advanced Child-Pugh classes. Biochemical markers showed more severe liver dysfunction in H. pylori-positive patients, with elevated bilirubin and PT/INR values.

Conclusion: This study finds a strong association between H. pylori infection and liver cirrhosis. H. pylori infection correlates with increased bilirubin, prolonged PT/INR, and worsening Child-Pugh scores. Further research is needed to assess the benefits of H. pylori eradication in cirrhotic patients. Routine screening may be beneficial for chronic liver disease management.

Keywords: Helicobacter pylori (H. pylori), Liver cirrhosis, Child-Pugh classification, Chronic liver disease.

Introduction

Helicobacter pylori (H. pylori) is a Gram-negative bacterium primarily known for its role in gastrointestinal disorders, including chronic gastritis, peptic ulcer disease, and gastric malignancies. In recent years, emerging evidence has suggested that H. pylori may also be involved in a range of extra-gastric diseases, notably chronic liver disorders such as liver cirrhosis. [1-3]

Liver cirrhosis, characterized by irreversible hepatic fibrosis and progressive loss of liver function, represents the final stage of various chronic liver diseases, including chronic hepatitis B and C infections, alcohol-related liver disease, and non-alcoholic fatty liver disease (NAFLD). Patients with cirrhosis often experience compromised immunity and increased intestinal permeability, making them more vulnerable to bacterial infections. These factors may facilitate the translocation of pathogens like H. pylori, potentially linking gastrointestinal and hepatic pathophysiology through the gut-liver axis [4-7].

Several studies have proposed a possible association between H. pylori infection and cirrhosis, suggesting that the bacterium might contribute to hepatic inflammation, oxidative stress, and the exacerbation of cirrhotic complications such as hepatic encephalopathy and portal hypertension. However, findings across different populations remain inconsistent, with the prevalence of H. pylori among cirrhotic patients varying widely due to geographical, socioeconomic, and methodological differences [8,9].

Given the widespread prevalence of H. pylori, particularly in low- and middle-income countries, understanding its potential role in liver cirrhosis is clinically relevant. Determining whether H. pylori infection is more common in cirrhotic patients compared to non-cirrhotic individuals could inform diagnostic and therapeutic strategies in managing liver disease [10,11]. This study aims to compare the prevalence of H. pylori infection among patients with and without clinically diagnosed liver cirrhosis at a tertiary care centre. By clarifying this association, the study seeks to contribute to the broader understanding of H. pylori's role in chronic liver disease and support evidence-based screening and treatment.

Materials & Methods

Study Design and Setting: A cross-sectional comparative study was carried out jointly in the Departments of Pathology and Medical Gastroenterology at Tirunelveli Medical College and Hospital, Tamil Nadu, India, over a period of 18 months, starting from the date of Institutional Ethics Committee approval. The study aimed to evaluate and compare histopathological changes in gastric mucosal biopsies obtained from patients with and without liver cirrhosis, and to assess their clinical significance.

Study Population: The study population consisted of endoscopic gastric biopsy specimens collected from clinically diagnosed patients presenting to the Department of Medical Gastroenterology for upper gastrointestinal endoscopy.
Patients were divided into two groups:

- **Group A:** Patients diagnosed with liver cirrhosis based on clinical, biochemical, and ultrasonographic findings.
- **Group B:** Patients without cirrhosis, who underwent endoscopy for dyspeptic or other upper gastrointestinal symptoms, serving as controls.

Inclusion Criteria

- Patients aged 40–60 years.
- Those undergoing endoscopic gastric biopsy during the study period.
- Patients who provided written informed consent to participate in the study.

Exclusion Criteria

- Patients with overt or previous hepatic encephalopathy.
- Those with a recent gastrointestinal bleed (within 2 weeks).
- Presence of neurocognitive impairment or poor vision interfering with study participation.
- History of Helicobacter pylori eradication therapy within the past 3 months.
- Recent antibiotic use within 2 weeks prior to endoscopy.

- Presence of severe comorbid illnesses (e.g., malignancy, renal failure, advanced cardiopulmonary disease).

Sample Size Determination: A total sample size of 248 was calculated (comprising 124 patients with cirrhosis and 124 without cirrhosis) using the formula for comparing two proportions, based on the prevalence rates of gastric mucosal changes among cirrhotic and non-cirrhotic patients reported in previous studies. The calculation was performed with a confidence level of 95% and a power of 80%, allowing for a 10% margin of error.

Sampling Method: A consecutive sampling technique was employed, wherein all eligible biopsy specimens received in the Department of Pathology during the study period were included until the desired sample size was achieved. Each biopsy specimen was appropriately labeled and accompanied by relevant clinical details, including age, sex, clinical diagnosis, and liver function test results.

Histopathological Examination: Biopsy specimens were fixed in 10% neutral buffered formalin, processed routinely, and embedded in paraffin wax. Sections of 4–5 µm thickness were stained using Hematoxylin and Eosin (H&E) for routine histopathological evaluation. Additional special stains, such as Giemsa, were used for the detection of Helicobacter pylori.

Each slide was examined under a light microscope by two independent pathologists who were blinded to the clinical diagnosis to minimize observer bias. Histological parameters assessed included:

- Degree of gastric mucosal inflammation
- Atrophy, intestinal metaplasia, and dysplasia
- Presence and density of H. pylori organisms
- Vascular congestion, edema, and fibrosis in the lamina propria

Findings were graded semi-quantitatively according to the Updated Sydney System for gastritis assessment.

Statistical Analysis: All data were entered into Microsoft Excel and analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including mean, standard deviation, and percentage, were used to summarize baseline characteristics of the study population. The Chi-square test (χ^2) was applied to compare categorical variables such as the presence of Helicobacter pylori infection and grades of inflammation between cirrhotic and non-cirrhotic groups. Continuous variables were analyzed using the independent sample t-test, and for non-normally distributed data, the Mann–Whitney U test was employed. Binary logistic regression analysis was further performed to identify independent predictors of gastric mucosal changes associated with liver cirrhosis. All statistical tests were two-tailed, and a p-value of less than 0.05 was considered statistically significant. The results were expressed as mean ± standard deviation (SD) or as frequency and percentage, and presented in both tabular and graphical formats for better interpretation and clarity.

Ethical Considerations: Institutional Ethics Committee approval was obtained from Government Medical College, Tirunelveli (Ref No: GMC-TNV/IEC/2023/9672). All participants were provided with a detailed Participant Information Sheet, and written informed consent was obtained prior to their inclusion in the study.

Results

Table 1: Age distribution among Study Participants

Age group in years	Frequency (n)	Percentage (%)
40	32	12.9

41 - 50	125	51.4
51 – 60	91	35.7

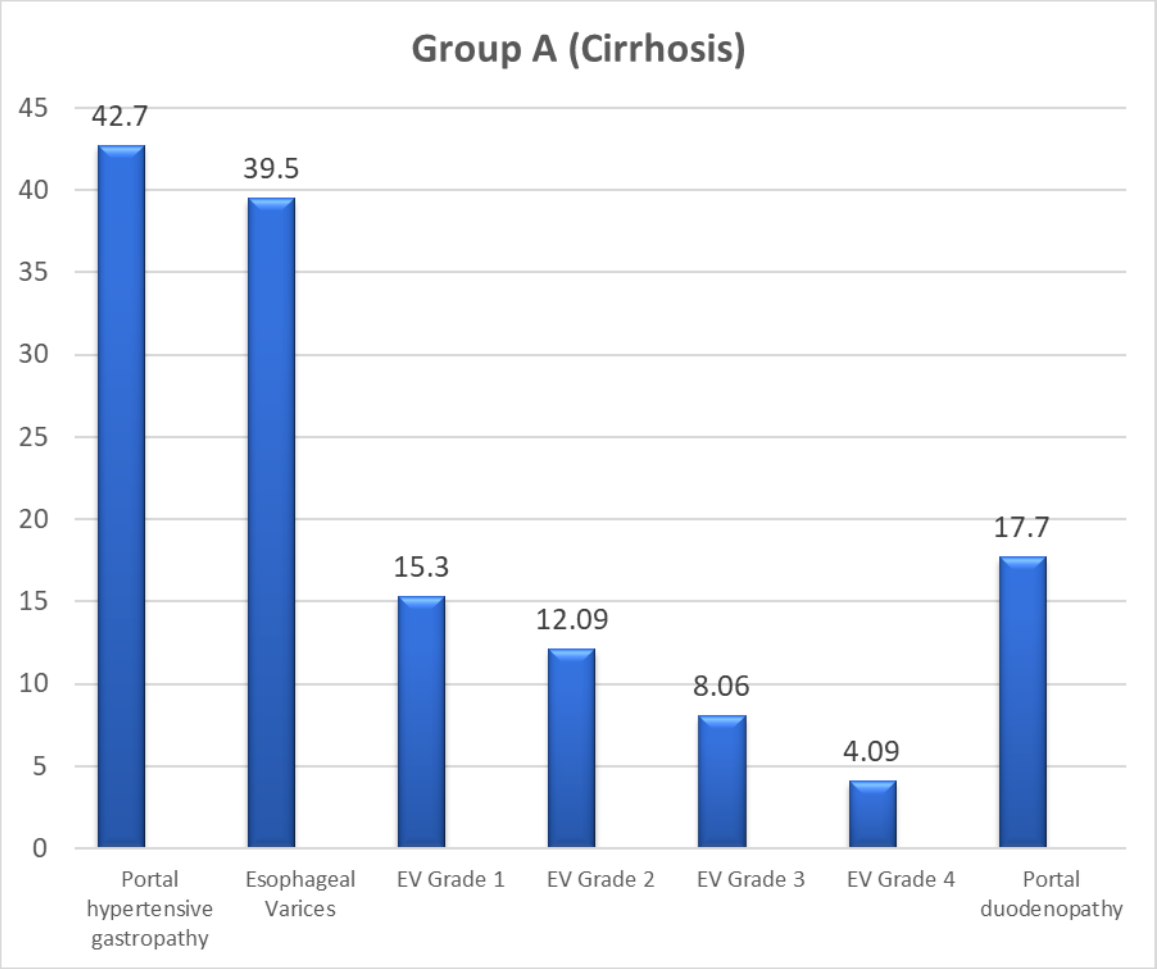
The age distribution of the study participants shows that the majority (51.4%) belong to the 41–50 years age group, followed by 35.7% in the 51–60 years category. The youngest group, aged 40 years, constitutes only 12.9% of the total sample. This indicates that middle-aged individuals (41–60 years) form the largest proportion of the study population, suggesting their greater involvement or representation in the study.

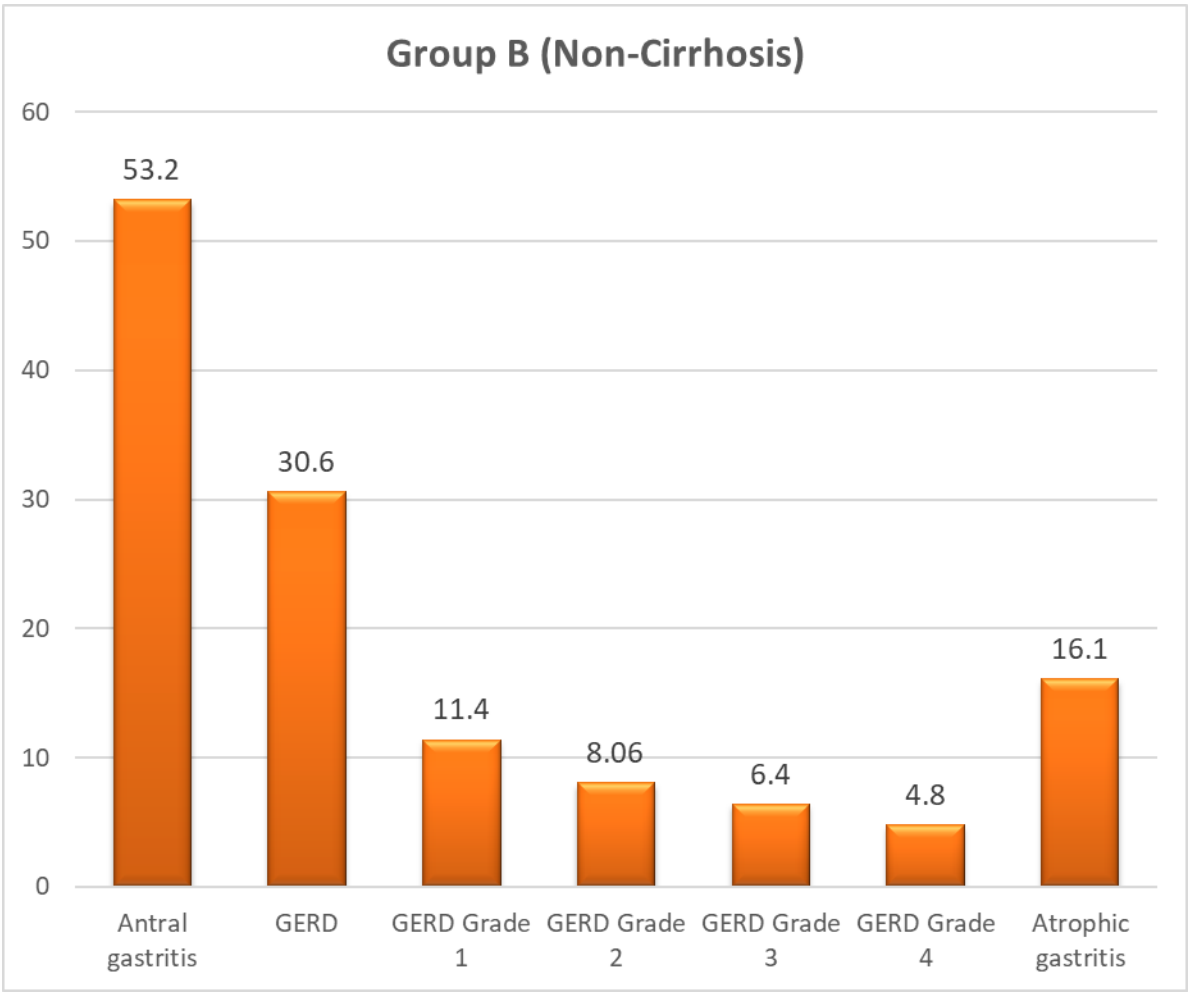
Table 2: Gender distribution among Study Participants

Gender	Frequency (n)	Percentage (%)
Female	123	49.6
Male	125	50.4
Total	248	100

The gender distribution of the study participants is nearly equal, with males (50.4%) slightly outnumbering females (49.6%). This balanced representation suggests that the condition being studied affects both genders almost equally, without significant gender predominance.

Figure 1 &2: Cirrhosis vs Non-Cirrhosis Endoscopic Diagnosis Among Participants





In Group A (Cirrhosis) (n=124), the most common endoscopic finding was portal hypertensive gastropathy (42.7%), reflecting vascular changes due to elevated portal pressure. Esophageal varices were seen in 39.5% of cases, distributed across severity grades: Grade 1 (15.3%), Grade 2 (12.1%), Grade 3 (8.1%), and Grade 4 (4.1%), indicating progressive portal hypertension. Portal duodenopathy was observed in 17.7%, underscoring the widespread gastrointestinal impact of cirrhosis.

In Group B (Non-Cirrhosis) (n=124), the predominant finding was antral gastritis (53.2%), followed by gastroesophageal reflux disease (GERD) in 30.6%, with severity graded as: Grade 1 (11.4%), Grade 2 (8.1%), Grade 3 (6.4%), and Grade 4 (4.8%). Atrophic gastritis was present in 16.1% of cases, suggesting chronic mucosal injury. These findings reflect the prevalence of acid-related and H. pylori-associated disorders among non-cirrhotic patients.

Table 4: Biochemical Parameters of Study Participants

Parameter	Mean ± SD	Minimum
Total Bilirubin (mg/dL)	0.76	0.1
Serum Albumin (g/dL)	3.88	2.5
PT/INR	4/1.19	4/1.27

The mean total bilirubin level was 0.76 mg/dL (range: 0.1–9.3 mg/dL), indicating generally preserved liver function, though some participants had elevated levels suggestive of hepatic impairment. The mean serum albumin was 3.88 g/dL (range: 2.5–5 g/dL), reflecting overall adequate nutritional and synthetic liver

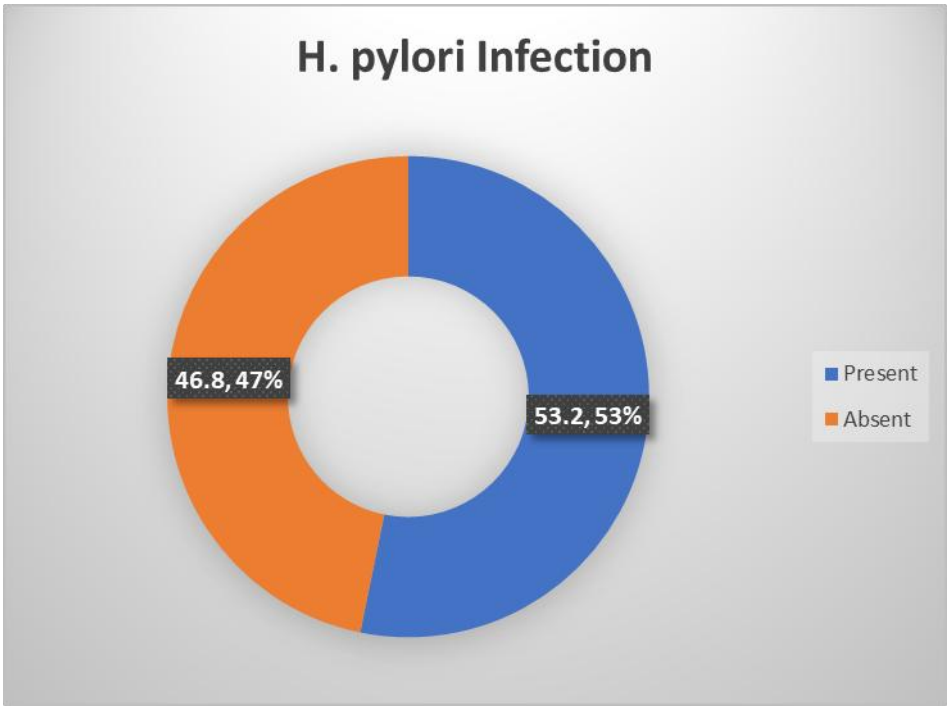
function, with occasional hypoalbuminemia. PT/INR values ranged from 4/1.19 to 6/1.77, indicating variability in coagulation status, likely due to differing degrees of liver dysfunction.

Table 5: Comparison of H. pylori Infection in Cirrhotic and Non-Cirrhotic Patients

Group	H. Pylori Positive (%)	H. Pylori Negative (%)	P-value
Liver Cirrhosis (Yes) N=124	86	38	0.000
Liver Cirrhosis (No) N=124	46	78	
total	132	116	

Among the 124 patients with liver cirrhosis, 86 (69.4%) tested positive for Helicobacter pylori, while 38 (30.6%) were negative. The statistically significant P-value (0.000) suggests a strong association between H. pylori infection and liver cirrhosis, indicating a potential link between the bacterium and liver disease progression.

Figure 3: H. pylori Infection by Histological Diagnosis Among Participants



The data shows that 53.2% of participants had the condition under study, while 46.8% did not. This nearly balanced distribution allows for meaningful comparisons between the two groups, helping to assess the association between the condition and other clinical factors.

Table 6: Distribution of Child-Pugh Classification in cirrhosis patient

Child-Pugh Class	Frequency (124)	Percentage (%)
Class A	54	43.5
Class B	40	32.2
Class C	30	24.3

In this study, most cirrhotic patients were in Child-Pugh Class A (43.5%), followed by Class B (32.2%) and Class C (24.1%), indicating a predominance of compensated liver disease. This distribution aligns with previous studies, highlighting that while early-stage cirrhosis is common, a significant number progress to advanced stages, emphasizing the need for early detection and management.

Discussion

This study demonstrates a significantly higher prevalence of Helicobacter pylori infection among cirrhotic patients (69.4%) compared to non-cirrhotic individuals (37.1%), suggesting a potential association between chronic liver disease and increased susceptibility to H. pylori colonization. Similar observations have been reported in earlier studies, which proposed that immune dysfunction and alterations in gastric mucosal defense mechanisms in cirrhosis may facilitate persistent H. pylori infection (Pellicano et al., Tsai et al., Gupta et al.) [2,6,7].

The endoscopic findings also varied significantly between the two groups. Cirrhotic patients predominantly exhibited portal hypertensive gastropathy and esophageal varices, findings that are consistent with portal hypertension, whereas non-cirrhotic patients more frequently showed antral gastritis and gastroesophageal reflux disease, conditions commonly associated with H. pylori infection and acid-related mucosal injury (Marshall et al., Pellicano et al.) [1,8]. These differences highlight the distinct gastrointestinal manifestations associated with liver cirrhosis compared to non-cirrhotic conditions.

Biochemical analysis revealed that H. pylori-positive patients had significantly elevated serum bilirubin levels and prolonged PT/INR values, indicating more advanced hepatic dysfunction. Similar associations between H. pylori infection and worsening liver function parameters have been documented previously (Shiota et al., Liu et al.) [9,11]. Furthermore, the higher prevalence of H. pylori infection among patients with increased Child–Pugh scores suggests a correlation between infection and the severity of liver disease, as also noted by Pellicano et al. and Gupta et al. [2,7].

The observed association may be explained by mechanisms such as bacterial translocation, systemic inflammation, and altered gut–liver axis interactions in cirrhosis (Frances et al., Llorente et al.) [5,10]. These mechanisms may contribute to disease progression and exacerbate cirrhosis-related complications. Overall, the findings of the present study support the hypothesis that H. pylori infection may not merely coexist with chronic liver disease but could potentially aggravate its clinical course. This underscores the importance of early detection and consideration of eradication therapy for H. pylori in cirrhotic patients to possibly reduce disease-related complications and improve clinical outcomes.

Conclusion

This study demonstrates a high prevalence of H. pylori infection in patients with cirrhosis, particularly those with advanced liver disease. The association between H. pylori, deteriorating liver function, and specific gastrointestinal pathologies highlights the need for integrated management strategies that include H. pylori detection and treatment in cirrhotic patients.

Conflict of Interest: Nil

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