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FREQUENCY OF H. PYLORI IN GASTRIC PERFORATION: ANALYSIS USING RAPID UREASE TEST AND HISTOPATHOLOGY

Medicine

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ABSTRACT

Background And Aims: Helicobacter pylori (H. pylori) infection is a significant cause of gastroduodenal diseases, including chronic gastritis, peptic ulcer disease (PUD), and gastric cancer. The infection is linked to mucosal damage, with complications such as gastric perforation being life-threatening. Despite advancements in diagnostic tools, the prevalence of H. pylori in gastric perforations remains understudied. This study aims to assess the frequency of H. pylori in patients with gastric perforation using Rapid Urease Test (RUT) and histopathology, comparing their diagnostic accuracy to inform clinical management. **Methods:** This prospective clinical study was conducted in the Department of General Surgery, Government Medical College, and Susheela Tiwari Hospital, Haldwani, from October 2022 to February 2024. Ninety-six patients with confirmed gastric perforation were enrolled after obtaining ethical committee approval and informed consent. Biopsy samples from perforated sites were tested for H. pylori using RUT and histopathology. Statistical analysis was performed using SPSS version 25.0, with data presented as mean ± standard deviation, frequencies, and percentages. **Results:** H. pylori infection was detected in 63.55% of patients via histopathology and 61.45% using RUT, with a combined detection rate of 78.12%. The majority of patients presented with abdominal pain (72.91%) and diarrhea (72.91%). Nutritional imbalances were noted, with 36.45% underweight and 34.37% overweight. Complications were minimal, with 94.79% of patients having no adverse outcomes. No deaths were reported. **Conclusion:** This study highlights the significant role of H. pylori in gastric perforations, emphasizing the utility of combining RUT and histopathology for accurate diagnosis. The findings underscore the importance of early detection and effective management strategies to reduce complications and improve patient outcomes.

KEYWORDS

H. pylori, Gastric Perforation, Rapid Urease Test, Histopathology, Peptic Ulcer Disease

INTRODUCTION

Helicobacter pylori (H. pylori) infection is a significant global health concern, strongly associated with a broad spectrum of gastroduodenal diseases. [1,2] This spiral-shaped, Gram-negative bacterium primarily colonizes the gastric mucosa, causing conditions such as chronic gastritis, peptic ulcer disease (PUD), and, in severe cases, gastric cancer and mucosa-associated lymphoid tissue (MALT) lymphoma. [3,4,5] Acquired predominantly in childhood, the infection often persists for decades, with its prevalence varying significantly across regions. In countries with high endemicity, such as in parts of Asia, H. pylori remains a leading cause of gastroduodenal complications, including gastric and duodenal perforations, which are life-threatening emergencies requiring immediate surgical intervention. [6,7,8,9]

Peptic ulcer disease arises from the breakdown of the gastric mucosal defenses, leading to mucosal injury. H. pylori infection is a primary etiological factor, found in 60-90% of ulcer cases. Other contributing factors include prolonged use of NSAIDs, smoking, alcohol intake, and stress. [10] One of the most critical complications of PUD is perforation, which often presents as an acute surgical emergency. Early diagnosis and treatment are paramount, as delayed intervention significantly increases mortality and morbidity. Traditionally, diagnostic techniques for H. pylori, such as histopathology, bacterial culture, and serological tests, have provided reliable results but are often time-intensive and resource-dependent. [11,12,13]

The Rapid Urease Test (RUT) has emerged as a valuable tool in the diagnosis of H. pylori infection due to its high sensitivity, specificity, and rapid results. It detects urease activity—a hallmark of H. pylori—within minutes to a few hours, offering clinicians an effective bedside diagnostic option. [14,15] Despite the widespread use of RUT and histopathology in diagnosing H. pylori, limited data exists on the prevalence of this bacterium specifically in patients with gastric perforations. [15,16]

This study aims to address this gap by evaluating the frequency of H. pylori in gastric perforation cases using both RUT and histopathology. By comparing the diagnostic accuracy and utility of these methods, the study intends to provide a comprehensive understanding of H. pylori's role in gastric perforations, inform diagnostic protocols, and highlight the importance of eradication therapies. The findings are expected to enhance clinical management strategies and improve outcomes for patients with this severe complication.

MATERIAL AND METHODS

This prospective clinical study, titled "Study of the Frequency of H. pylori in Gastric Perforation Through Rapid Urease Test Kit and Histopathology," was conducted in the Department of General Surgery, Government Medical College and Susheela Tiwari Hospital, Haldwani, after obtaining approval from the Board of Studies and the Institutional Ethics Committee. The study spanned from October 2022 to February 2024.

Sample Size

A total of 96 patients were included in the study. The sample size was calculated using the formula:

$$N=4pq/L^2$$

Where:

- P=4.6%P=4.6\%P=4.6%
- Q=95.4%Q=95.4\%Q=95.4% (complement of PPP)
- L=5%L=5\%L=5% (allowable error)

Sampling Technique

The study utilized a simple random sampling method to select participants.

Inclusion And Exclusion Criteria

Participants were selected based on the following criteria:

Inclusion Criteria

- Patients aged >18 years presenting with features of peritonitis, with plain abdominal X-rays indicating hollow viscus perforation and exploratory laparotomy findings confirming gastric perforation.

Exclusion Criteria

1. Patients presenting with features of gastric perforation but with no radiological or intraoperative evidence of perforation.
2. Patients with iatrogenic perforations during laparotomy or endoscopy.
3. Patients with perforations in the esophagus, small intestine, or large bowel.

4. Patients who did not provide consent.
5. Patients aged <18 years.

Methodology
Data collection involved detailed history taking, thorough clinical examination, and appropriate radiological, histopathological, and serological investigations. Perioperative findings and follow-up of cases meeting the inclusion and exclusion criteria were documented. Written informed consent was obtained from all participants.

Sample Collection
Biopsy samples were taken from the perforated margin (2–3 mm) during surgery. These samples were sent for histopathological examination. The rapid urease test (RUT) was performed as follows:

1. Ensure the RUT kit dot is yellow before use. Discard kits with pink/orange dots.
2. Peel back the label to expose the yellow media and introduce the biopsy into it. Add one drop of sterile distilled water.
3. Cover the sticker back and observe the color change.

- A change from yellow to pink/red indicates H. pylori positivity.
- Observe for 5 minutes, then up to 2 hours, and finally up to 24 hours if no immediate change is noted.

4. Store kits at room temperature and avoid freezing.

Statistical Analysis
Data analysis was performed using SPSS software (version 25.0) after initial entry into Microsoft Excel. Numerical data were presented as mean ± standard deviation, while categorical data were expressed as frequencies and percentages. As no comparative group was involved, statistical tests such as p-values were not calculated, and all results were presented descriptively.

RESULTS
Table 1 represents the age and gender distribution of patients in the study. The highest representation was seen in the 41–50 years age group (26.04%), followed by the 31–40 years group (21.87%). Additionally, males predominated the sample, constituting 60.42% of the participants, while females made up 39.58%.

Category	Number of Patients	Percentage (%)
20-30 years	16	16.66
31-40 years	21	21.87
41-50 years	25	26.04
51-60 years	20	20.83
61-70 years	10	10.41
>70 years	4	4.16
Male	58	60.42
Female	38	39.58
Total	96	100

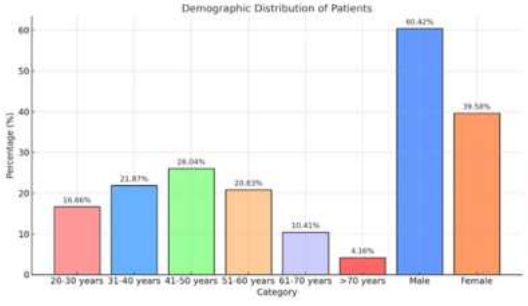


Table 2 represents patient history concerning gastric cancer, peptic ulcer disease (PUD), and H. pylori infection. A significant majority (96.87%) had no family history of gastric cancer. Additionally, 57.30% reported a history of PUD, and 52.09% had a history of H. pylori infection, indicating a substantial prevalence of these risk factors among the 96 patients.

History Type	Number of Patients	Percentage (%)
First-Degree Relative (Gastric Cancer)	2	2.08
Second-Degree Relative (Gastric Cancer)	1	1.04
No History (Gastric Cancer)	93	96.87
History of PUD (Yes)	55	57.30
History of PUD (No)	41	42.70
History of H. pylori (Yes)	50	52.09
History of H. pylori (No)	46	47.91

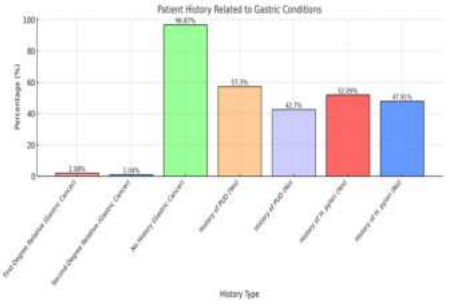


Table 3 represents the distribution of patients based on nutritional status and common symptoms. A significant proportion of patients were underweight (36.45%), followed closely by overweight individuals (34.37%). Abdominal pain and diarrhea were the most frequently reported symptoms, each affecting 72.91% of patients. Other common symptoms included regurgitation (66.66%) and vomiting (63.54%).

Category	Number of Patients	Percentage (%)
Normal weight	28	29.16
Underweight	35	36.45
Overweight	33	34.37
Abdominal Pain	70	72.91
Epigastric Pain	45	46.87
Vomiting	61	63.54
Constipation	55	57.29
Regurgitation	64	66.66
Weight Loss	40	41.66
Loss of Appetite	51	53.13
Heartburn	25	26.04
Dyspepsia	26	27.08
Anemia	64	66.66
Diarrhea	70	72.91

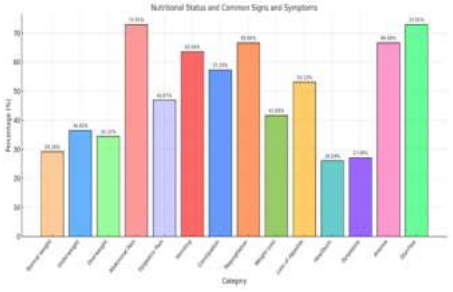


Table 4 represents the anatomical sites and timing of presentation for patients with perforated peptic ulcers. The lesser curvature was the most common site of perforation (37.5%), followed by the greater curvature (33.33%). Regarding the timing of presentation, most patients sought medical attention within 0–10 hours (33.33%), with fewer patients presenting beyond 60 hours (17.70%).

Category	Number of Patients	Percentage (%)
Lesser Curvature (Site)	36	37.50
Greater Curvature (Site)	32	33.33
Pre-Pyloric Region (Site)	28	29.16
Time (0-10 hours)	32	33.33
Time (11-24 hours)	28	29.16
Time (25-60 hours)	19	19.79
Time (>60 hours)	17	17.70

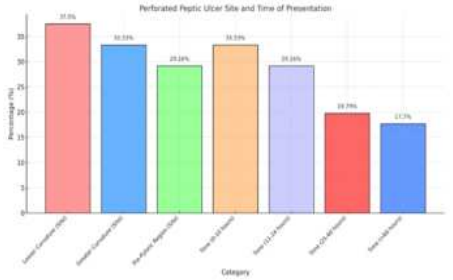
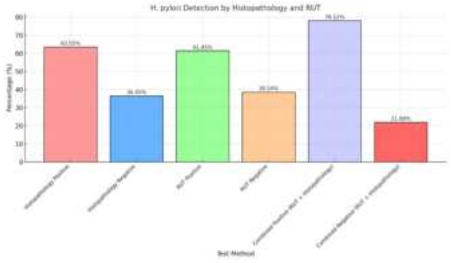


Table 5 represents H. pylori detection using histopathology and the Rapid Urease Test (RUT). Histopathology identified 63.55% positive

cases, while RUT detected 61.45%. Combined results from both methods showed 78.12% positivity, highlighting the enhanced detection rate with combined testing.

Test Method	Number of Patients	Percentage (%)
Histopathology Positive	61	63.55
Histopathology Negative	35	36.45
RUT Positive	59	61.45
RUT Negative	37	38.54
Combined Positive (RUT + Histopathology)	75	78.12
Combined Negative (RUT + Histopathology)	21	21.88



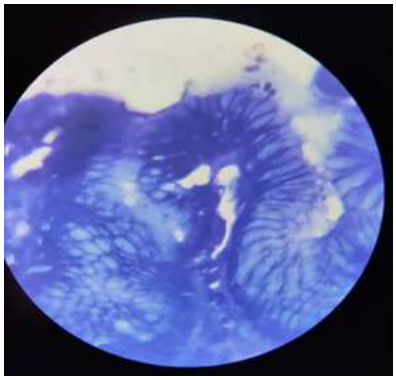
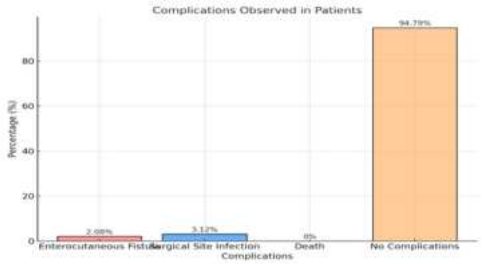


Table 6 represents complications observed among patients. A majority (94.79%) had no complications. Surgical site infections were observed in 3.12% of cases, while enterocutaneous fistulas were noted in 2.08%. Notably, no deaths were reported.

Complications	No of Pts.	Percentage
Enterocutaneous fistula	02	2.08
Surgical site infection	03	3.12
Death	0	0
No complications	91	94.79



DISCUSSION

Helicobacter pylori (H. pylori) infection plays a pivotal role in the development of various gastric and extragastric diseases, including chronic gastritis, peptic ulcer disease, and gastric cancer. Despite its asymptomatic nature in most cases, its potential to cause gastric carcinogenesis underscores its clinical significance. This study reported a prevalence of 63.55% via histopathology and 61.45% using the Rapid Urease Test (RUT), highlighting the utility of both diagnostic methods. The findings align with previous literature, although considerable variation in H. pylori prevalence has been observed in studies across different regions and methodologies.

Several studies have reported variability in the prevalence of H. pylori infection among patients with perforated peptic ulcers (PPU). Similarly, **Gisbert et al. [18]** noted a low infection rate of 47%, suggesting a distinct pathogenesis for PPU compared to chronic peptic ulcers. This reinforces the idea that factors beyond H. pylori, such as NSAID use or stress, may play a larger role in PPU etiology.

The diagnostic accuracy of different methods for detecting H. pylori has been widely studied. This study found histopathology to be the most reliable diagnostic tool, consistent with findings by **Khalifehgholi et al. [19]**, who reported a sensitivity of 95.6% for histology, though specificity was affected by potential overdiagnosis. Similarly, **Güven B. et al. [24]** highlighted RUT's high sensitivity but noted reduced specificity due to contamination by other urease-producing organisms. The present study supports these observations, with RUT showing 61.45% positivity but occasionally yielding false positives due to other urease-producing bacteria. **Wu J.C.Y. et al. [23]** emphasized the importance of biopsy location, showing 100% positivity for samples from the gastric angle, reinforcing histopathology as a gold standard for detecting H. pylori.

The clinical presentation of H. pylori-related conditions in this study included abdominal pain and diarrhea as the most common symptoms (72.91% each). These findings align with the literature but contrast with **Shah et al. [20]**, who identified the duodenum and pre-pyloric region as more common sites for perforation. Additionally, significant nutritional imbalances were observed, with 36.45% of patients underweight, 34.37% overweight, and 29.16% of normal weight. Although nutritional status may influence disease progression, further studies are needed to establish direct correlations.

Complication rates in this study were minimal, with no deaths and only 5.2% of patients experiencing surgical site infections or enterocutaneous fistulas. These outcomes contrast sharply with findings by **Chowdhary et al. [17]**, who reported a 22% mortality rate and postoperative complications in 47% of cases. This difference may reflect improved surgical techniques, early diagnosis, and better perioperative care in the present cohort.

The role of histopathology as a diagnostic standard is further supported by studies such as **Bizzozero et al. [1]** , who demonstrated over 60% positivity for H. pylori using Gimenez staining, and **Khalifehgholi et al. [19]**, who emphasized the importance of pathologist expertise in ensuring accurate results. Additionally, studies by **Jan et al. [22]** and **Dogra et al. [21]** reported lower H. pylori infection rates (47% and 42%, respectively), underscoring the variability in prevalence based on the diagnostic methods employed.

This study's findings contribute valuable insights into the prevalence and diagnostic approaches for H. pylori in PPU and other gastric conditions. However, the variability in prevalence across studies underscores the need for standardized diagnostic protocols and further exploration of alternative pathogenic factors in PPU. While histopathology remains the gold standard, the use of RUT as a rapid, cost-effective diagnostic tool remains indispensable, particularly in resource-limited settings. Future studies should also investigate the role of nutritional status and other comorbidities in influencing disease progression and outcomes.

CONCLUSION

In our study, we found that the significant role of H. pylori in gastric and peptic ulcer diseases, emphasizing the need for early diagnosis and management. Common symptoms like abdominal pain and diarrhea reflect its clinical burden, while a combined approach of histopathology and RUT enhances detection accuracy. Nutritional status and timely medical attention influence outcomes, and minimal complications demonstrate the effectiveness of current treatment strategies, underscoring the importance of refining diagnostic and therapeutic approaches to improve patient care.

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Consent: Written consent from participants has been obtained and preserved.
Ethical Approval: Ethical approval was obtained and documented as per institutional guidelines.

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