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PREVALENCE OF HELICOBACTER PYLORI INFECTION IN PERFORATED PEPTIC ULCER DISEASE AT A TERTIARY CARE HOSPITAL

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Abstract

Objective: *To determine the prevalence of biopsy-confirmed Helicobacter pylori infection among adults undergoing emergency surgery for perforated peptic ulcer disease.*

Study Design: *Prospective hospital-based cross-sectional study.*

Setting: *Department of General Surgery, Liaquat University of Medical and Health Sciences, Jamshoro, Sindh, Pakistan.*

Period: *Four months from January 2025 to April 2025.*

Material and Methods: *Ninety-two adults with intraoperatively confirmed gastric, prepyloric or duodenal ulcer perforation were enrolled by non-probability purposive sampling. Two antral mucosal biopsies were obtained during surgery. Modified-Giemsa histopathology defined the primary outcome; rapid urease testing was evaluated as a supportive test. Prevalence was reported with an exact 95% confidence interval. Stratified associations were assessed with chi-square or Fisher's exact tests, and agreement was measured with Cohen's kappa.*

Results: *Median age was 42.0 years (IQR 33.0-55.3), 84 (91.3%) participants were male and 68 (73.9%) perforations were duodenal. Histopathology identified H. pylori in 56 patients, giving a prevalence of 60.9% (exact 95% CI 50.1-70.9%). Prevalence did not differ significantly by age group, sex, perforation site, NSAID use or smoking status (all $p>0.05$). Rapid urease testing was positive in 63 (68.5%) patients and agreed with histopathology in 77/92 (83.7%); Cohen's kappa was 0.645 ($p<0.001$).*

Conclusion: *H. pylori infection was present in approximately three-fifths of surgically treated perforated peptic ulcers. Routine postoperative evaluation and targeted eradication are therefore clinically relevant, while negative histopathology should prompt attention to other ulcerogenic exposures.*

INTRODUCTION

Perforated peptic ulcer is a time-critical surgical emergency in which disruption of the gastric or duodenal wall causes chemical and bacterial peritonitis. Although proton-pump inhibitors and H. pylori eradication have reduced uncomplicated ulcer disease, perforation continues to carry substantial morbidity and

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mortality, particularly when diagnosis, resuscitation or source control is delayed. Contemporary reviews identify H. pylori, non-steroidal anti-inflammatory drug exposure, smoking and physiological stress among the principal modifiable contributors to ulcer disease and perforation. [1,2,3]

The contribution of H. pylori to perforation is less uniform than its relationship with uncomplicated duodenal ulcer. Published prevalence estimates vary with geography, age, prior antibiotics or acid suppression and, importantly, the diagnostic method used. A prospective Indian study reported infection in 54% of 136 patients when rapid urease testing was supported by histopathology. [4] More recent South Asian reports have continued to show heterogeneous frequencies, while a 2025 Indian series confirmed that perforated ulcers remain concentrated in younger men and are predominantly duodenal. [5,6,7] Current international guidance recommends reliable detection, treatment of confirmed infection and post-treatment confirmation of eradication because antimicrobial resistance has reduced the reliability of empirical regimens. [8,9,10]

Local biopsy-based data from Jamshoro are limited. Treating every patient empirically may expose uninfected patients to unnecessary antibiotics, whereas failing to detect infection leaves a preventable cause of recurrence untreated. This study therefore aimed to determine the prevalence of modified-Giemsa histopathology-confirmed H. pylori infection among patients undergoing emergency surgery for perforated peptic ulcer disease and to describe its distribution across selected demographic, exposure and operative characteristics. Agreement between histopathology and the rapid urease test was assessed as a secondary objective.

MATERIAL AND METHODS

Study design and setting: This prospective hospital-based cross-sectional study was conducted in the Department of General Surgery, Liaquat University of Medical and Health Sciences, Jamshoro, Sindh, Pakistan, over four months after institutional approval from January 2025 to April 2025.

Sample size and sampling: The sample size was calculated with the WHO single-population-proportion formula, using an expected biopsy-confirmed prevalence of 61.3%, a 95% confidence level and 10% absolute precision. The minimum sample was 92 patients. [11] Eligible patients were recruited through non-probability purposive sampling until the target was achieved.

Inclusion and exclusion criteria: Adults aged 18 years or older of either sex were included when emergency laparotomy or laparoscopy confirmed a gastric, prepyloric or duodenal peptic ulcer perforation and written consent was provided by the patient or legally authorised attendant. Patients were excluded when perforation was attributed to malignancy, trauma, foreign body, corrosive or iatrogenic injury; when successful H. pylori eradication had been documented within six months; when biopsy tissue was inadequate or lost; or when an antral biopsy could not be obtained safely because of haemodynamic or operative circumstances.

Data collection: Demographic, clinical and exposure data were recorded on a structured proforma. NSAID use was defined as use on at least three days per week during the preceding four weeks. Current smoking meant daily tobacco use during the preceding 30 days. Prior dyspepsia comprised recurrent epigastric pain or burning, postprandial fullness or early satiety for at least two weeks before perforation. Operative variables included perforation site, maximum diameter and procedure.

H. pylori assessment: After identifying the perforation and before definitive repair, two small antral mucosal specimens were obtained when safe. One was placed immediately in urea-containing indicator medium; colour change to pink or red within 24 hours was recorded as rapid urease test positive. The second was fixed in 10% neutral buffered formalin and processed for modified-Giemsa histopathology. Curved or spiral bacilli morphologically consistent with H. pylori were classified as present. Histopathology was the prespecified reference defining the primary outcome.

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Histology remains valuable when tissue is already available, although organism density and recent antimicrobial or acid-suppressive exposure can affect sensitivity. [12,13]

Statistical analysis: Data were analysed in IBM SPSS Statistics version 26. Shapiro-Wilk testing indicated non-normal distributions for age, symptom duration and perforation diameter; these are presented as median and interquartile range, with minimum and maximum where relevant. Categorical variables are reported as frequencies and percentages. Biopsy-confirmed prevalence was calculated with an exact Clopper-Pearson 95% confidence interval. Prevalence was stratified by age group, sex, perforation site, NSAID use and smoking. Pearson chi-square or Fisher's exact tests were used as appropriate. Agreement between rapid urease testing and histopathology was summarised by overall agreement and Cohen's kappa. All tests were two-sided and $p \leq 0.05$ was considered statistically significant.

Ethical approval: The study was initiated after approval from the relevant institutional review body. Written informed consent was obtained. Emergency treatment was not delayed, identifiers were excluded from the analysis dataset and histopathology results were communicated to the treating team.

RESULTS

All 92 enrolled participants had complete data and an adequate histopathology result. Median age was 42.0 years (IQR 33.0-55.3; range 18-70), and 84 (91.3%) were male. Median acute symptom duration was 19.0 hours (IQR 13.0-30.0). Previous dyspeptic symptoms were reported by 47 (51.1%), current smoking by 49 (53.3%), and NSAID use during the preceding four weeks by 24 (26.1%) participants. Duodenal perforation was most common (68; 73.9%), followed by prepyloric (17; 18.5%) and gastric perforation (7; 7.6%). Omental patch repair was performed in 86 (93.5%) patients (Table 1).

Table 1 Baseline clinical and operative characteristics (n=92)

Characteristic	Value
Age, years, median (IQR)	42.0 (33.0-55.3)
Male sex	84 (91.3%)
Acute symptom duration, hours, median (IQR)	19.0 (13.0-30.0)
Previous dyspeptic symptoms	47 (51.1%)
Previous diagnosed peptic ulcer	20 (21.7%)
NSAID use in previous 4 weeks	24 (26.1%)
Current smoker	49 (53.3%)
PPI/H2 blocker in previous 2 weeks	17 (18.5%)
Antibiotics before biopsy	79 (85.9%)
Previous eradication therapy >6 months earlier	7 (7.6%)
Perforation diameter, mm, median (IQR)	7.0 (5.0-9.0)
Gastric perforation	7 (7.6%)
Prepyloric perforation	17 (18.5%)
Duodenal perforation	68 (73.9%)
Omental patch repair	86 (93.5%)

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Characteristic	Value
Primary repair	5 (5.4%)
Distal gastrectomy	1 (1.1%)

Values are n (%) unless otherwise stated. IQR: interquartile range; NSAID: non-steroidal anti-inflammatory drug; PPI: proton-pump inhibitor.

Modified-Giemsa histopathology identified H. pylori in 56 of 92 patients, corresponding to a prevalence of 60.9% (exact 95% CI 50.1-70.9%). Stratified prevalence ranged from 42.9% in gastric perforations to 64.7% in prepyloric perforations. No statistically significant difference was detected across age group, sex, perforation site, NSAID use or smoking status (all p>0.05; Table 2).

Table 2 Biopsy-confirmed H. pylori prevalence across prespecified strata (n=92)

Variable	Category	Total n	Positive n (%)	p-value
Age group	18-30 years	20	14 (70.0)	0.616
	31-45 years	34	20 (58.8)	
	46-60 years	29	18 (62.1)	
	>60 years	9	4 (44.4)	
Sex	Male	84	49 (58.3)	0.143*
	Female	8	7 (87.5)	
Perforation site	Gastric	7	3 (42.9)	0.582
	Prepyloric	17	11 (64.7)	
	Duodenal	68	42 (61.8)	
NSAID use	No	68	41 (60.3)	0.849
	Yes	24	15 (62.5)	
Current smoking	No	43	27 (62.8)	0.724
	Yes	49	29 (59.2)	

*Pearson chi-square test unless marked. *Fisher's exact test. Analyses were exploratory and were not adjusted for multiple comparisons.*

The rapid urease test was positive in 63 (68.5%) patients. Fifty-two patients were positive by both methods and 25 were negative by both, giving overall agreement of 83.7%. Cohen's kappa was 0.645 (standard error 0.082; p<0.001), consistent with substantial agreement. Using histopathology as the reference, the rapid urease test showed sensitivity of 92.9%, specificity of 69.4%, positive predictive value of 82.5% and negative predictive value of 86.2% (Table 3).

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Table 3 Agreement between rapid urease testing and histopathology (n=92)

Rapid urease test	Histology absent	Histology present	Total
Negative	25	4	29
Positive	11	52	63
Total	36	56	92

Overall agreement 83.7%; Cohen's kappa 0.645 (p<0.001). Histopathology with modified Giemsa was the prespecified reference standard.

DISCUSSION

This study found biopsy-confirmed H. pylori infection in 60.9% of adults undergoing emergency surgery for perforated peptic ulcer disease. The estimate is clinically important because it indicates that a treatable infection was present in approximately three of every five patients, but it also shows that perforation cannot be attributed to H. pylori in every case. The exact confidence interval remained broad enough to support meaningful local uncertainty, reinforcing the value of systematic testing rather than assuming universal infection.

Our prevalence is higher than the 54% reported by Anwar and colleagues in a prospective cohort of 136 patients from northern India, but is close to the 61.3% biopsy-confirmed prevalence used for the present sample-size calculation. [4,11] A 2024 Pakistani report found a frequency of approximately 54%, whereas another recent regional series reported higher positivity. [5,6] Such heterogeneity is expected because studies differ in biopsy location, staining method, rapid urease kit, timing of specimen collection and exposure to antibiotics or proton-pump inhibitors. Recent reviews continue to place histology-based H. pylori prevalence in perforated duodenal ulcer broadly within the 50-80% range. [3]

The demographic pattern was typical of perforated ulcer disease in resource-limited settings: most patients were men, the median age was in the early forties and nearly three-quarters had a duodenal perforation. Contemporary surgical reviews describe a younger, predominantly male and smoking-exposed population in developing regions, contrasting with the older, comorbidity- and NSAID-associated phenotype often reported in high-income settings. [3,7,14] In our data, neither smoking nor recent NSAID exposure was associated with biopsy positivity. This does not reduce their importance as independent ulcerogenic factors; rather, it suggests that these exposures and H. pylori may contribute through overlapping or separate pathways. The study was designed to estimate prevalence and was not powered to establish causal exposure-outcome relationships.

Histopathology and rapid urease testing demonstrated substantial agreement (kappa 0.645), but 15 results were discordant. Eleven patients were rapid-urease positive but histology negative, whereas four were histology positive but rapid-urease negative. Rapid urease testing is practical intraoperatively and showed high sensitivity in this dataset, but its lower specificity against histology argues against treating it as interchangeable with the prespecified tissue reference. Patchy colonisation, low bacterial density, sampling variation, reading time, handling and recent antibiotics or acid suppression can produce discordance. [12,13,15] The high proportion receiving antibiotics before biopsy is particularly relevant and may have influenced organism viability or density, although emergency antimicrobial therapy should never be delayed for research testing.

The clinical implication is to incorporate a defined H. pylori pathway after repair. Current Maastricht and American College of Gastroenterology guidance supports treating confirmed infection with regimens selected for contemporary resistance patterns and confirming eradication after therapy. [8,9] Eradication after simple closure reduces ulcer recurrence, and recent surgical reviews

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continue to consider infection-directed treatment a central component of definitive management. [3,16] Because nearly 40% of our patients were histology negative, clinicians should also address NSAID exposure, smoking, acid suppression adherence and other uncommon causes rather than attributing every perforation to infection.

This study adds biopsy-based evidence from a Pakistani tertiary surgical unit using a uniform intraoperative sampling protocol and a clearly defined primary outcome. Complete data and parallel rapid urease testing permitted a direct assessment of agreement. The findings are relevant to hospitals where follow-up testing after emergency surgery can be inconsistent and where empirical antibiotic use must be balanced against rising antimicrobial resistance. Global and regional evidence shows that resistance to clarithromycin, metronidazole and fluoroquinolones is increasing, making stewardship and confirmation of eradication increasingly important. [8,9,17,18]

The study has limitations. It was conducted at a single centre using non-probability sampling, so the findings may not represent other hospitals or community populations. The modest sample produced small cells in some strata, particularly female patients and gastric perforations, limiting power for subgroup comparisons. Recent antibiotic exposure was common and may have affected test performance. Culture, molecular testing and antimicrobial susceptibility were not performed, and no post-treatment test of cure or recurrence follow-up was included. Histopathology was the protocol-defined reference but no single diagnostic method is perfect. Multicentre studies using standardized multi-site biopsy, resistance testing and follow-up would provide more precise regional estimates and guide locally effective eradication regimens.

CONCLUSION

Biopsy-confirmed H. pylori infection was present in 60.9% of patients operated on for perforated peptic ulcer disease. Rapid urease testing showed substantial, but incomplete, agreement with histopathology. A structured postoperative strategy based on reliable testing, targeted eradication and confirmation of cure is warranted, alongside management of non-infective ulcer risk factors.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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