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Original Article

Diagnostic Accuracy of Gastroscopy with Narrow Band Imaging for the Diagnosis of *Helicobacter Pylori* Gastritis

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ABSTRACT

Helicobacter pylori infection promotes stomach cancer and chronic gastritis globally. Endoscopic features that may identify *H. pylori* are being explored. **Objective:** Narrow Band Imaging (NBI) is used to identify and treat *H. pylori* gastritis before biopsy since most patients are lost to follow-up or follow-up is too late. *H. pylori* gastritis may be treated early to improve quality of life and gastrointestinal concerns. **Methods:** This cross-sectional study at Department of Gastroenterology, Liaquat National Hospital, Karachi, conducted between 1st March 2022 till 28th February 2023, included 150 patients. Patients with gastritis on endoscopy were evaluated for the presence of *H. pylori* with Narrow band Imagining. Findings were compared with histopathology as gold standard. **Results:** Mean age of the patients was 41.87 ± 12.5 years. Male participants were 71 (47.3%). The most common admission complaints were nausea, appetite loss, and abdominal distension. The diagnostic accuracy of NBI for the detection of *H. pylori* was 85% sensitivity, 88% specificity, 88% positive predictive value, 87% negative predictive value and overall accuracy of 88%. NBI endoscopy was cheaper and took less time to diagnose (27 minutes vs. 37 minutes). NBI endoscopy is more effective and cost-effective than standard gastroscopy. Conclusions: The data confirm the high incidence of *H. pylori* in gastrointestinal patients. NBI endoscopy is more effective and cost-effective than standard gastroscopy.

INTRODUCTION

Helicobacter pylori is a bacterium with a helical structure and a negative gram stain, which has infected around 31% of the world's population [1]. *H. pylori* is capable of inducing gastritis, atrophic gastritis, as well as gastric and duodenal ulcers [2, 3]. *H. pylori* has carcinogenic properties and is often linked to the development of stomach cancer and gastric mucosa-associated lymphoid tissue B cell lymphoma (MALTOMA) [4, 5]. Gastric cancer ranks as the fifth most prevalent cause of cancer worldwide, affecting 6 out of every 100,000 male and 3.6 out of every 100,000 females in Pakistan [6]. Patients infected with *H. pylori* exhibit symptoms such as stomach discomfort, bloating, burping, nausea, loss of appetite, lack of sleep, changes in mood, and depression. They may also have more serious symptoms such difficulty swallowing, vomiting blood, dark stools, weight loss, and anemia caused by deficiencies in iron and vitamin B12. The presence of *H. pylori* infection is often linked to individuals of low socioeconomic position who live in unsanitary environments [7]. Rural locations see a greater impact compared to metropolitan areas, with less opportunities for early identification and eradication of *H. pylori* [8]. The prevalence of *H. pylori* in Pakistan is 74.4% according to a study [9]. The definitive method for diagnosing *H. pylori* is by an endoscopic biopsy [10], which is considered the most reliable standard. Narrow band imaging (NBI) is a sophisticated endoscopic method that employs blue and green wavelengths to selectively exclude red light, enabling the evaluation of surface patterns and microvascular architecture [11]. This method is noninvasive and used to diagnose *H. pylori* gastritis prior to

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receiving biopsy findings. Magnifying endoscopy is used to investigate the stomach mucosa, allowing for the identification of diseased mucosa by the observation of pit dilatation and the removal of RAC [12]. In their earlier research it was observed that the normal pattern of gastric mucosa is characterized by a honeycomb-like epithelial capillary network (SECN) and the presence of RAC [13]. In contrast, the aberrant pattern of gastritis generated by *H. pylori* is characterized by polygonal swollen mucosa with increased crypt openings. The sensitivity of NBI for *H. pylori* gastritis ranges from 93.8% to 100%, whereas the specificity ranges from 82.2% to 96.2%. The urgent need for effective diagnostic methods for *Helicobacter pylori* gastritis, a prevalent and serious gastrointestinal disease, prompted this work. Diagnostic procedures must be improved since *H. pylori* infection may cause peptic ulcers and stomach cancer. For *H. pylori* gastritis, the research examines gastroscopy with (NBI) diagnostic accuracy. This new endoscopic approach is being tested to increase the accuracy and reliability of *H. pylori*-related gastritis diagnosis.

This research aims to fill a diagnostic gap and improve *H. pylori* treatment.

METHODS

This cross-sectional study conducted at the Department of Gastrointestinal Unit, Liaqat National Hospital, Karachi, between 1st March 2022 till 28th February 2023, included 150 patients. Permission for the conduct was taken from College of Physician and Surgeons Pakistan (Vide no: CPSP/REU/GAS/2019/192/1032, dated 25th February 2022). The inclusion criteria consisted of persons who were 18 years of age or older, had symptoms that indicated a possible *H. pylori* infection, and had a planned gastroscopy. Patients who had previously received therapy for *H. pylori* or had contraindications for endoscopy were not included in the study. Sample size was calculated using OpenEpi software taking prevalence of *H.pylori* as 70.0% with 95% confidence level and 5% of margin of error. Participants were recruited using convenient sampling techniques. Data pertaining to demographics and clinical characteristics were gathered, including factors such as age, gender, and relevant medical background. As part of the first evaluation, all patients had a serological test to detect the presence of *H. pylori*. A typical video gastroscope integrated with NBI technology was used to conduct NBI gastroscopy. The endoscopic observations were documented, with particular attention to the mucosal patterns linked to *H. pylori* gastritis. Biopsies were collected from the suspicious regions indicated by NBI, and the samples were submitted for histopathological analysis. A separate endoscopist, who was uninformed of the NBI results, conducted conventional gastroscopy on the same group of patients. Conventional white light endoscopy was used, and biopsies were collected from regularly sampled regions during gastroscopy. Experienced pathologists, who were unaware of the endoscopic results, completed histopathological investigation of all biopsy specimens. The study evaluated the existence of H. pylori and the severity of gastritis, and the findings were classified according to the Updated Sydney System. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy of NBI gastroscopy were determined by comparing the results to the histopathological findings, which served as the reference standard. A comparative analysis was conducted to evaluate potential disparities in diagnostic efficacy between traditional gastroscopy and other methods. The duration of each endoscopic operation and the time required to get biopsy results were documented. The cost study included the explicit procedure expenses as well as the possible financial benefits linked to the use of NBI for prompt evaluation. The statistical tests utilized in this study were sensitivity, specificity, PPV, NPV, and accuracy. These measurements compared NBI gastroscopy to standard gastroscopy for diagnostic effectiveness. Comparative analysis was used to see whether the two approaches had different diagnostic effectiveness. Additionally, mean, median, and standard deviation were utilized to summarize the research population's demographic and clinical features. The t-test or Mann Whitney U test was employed for continuous variables and the chi-square test for categorical ones. All statistical analyses were done using SPSS version 23, and p-values under 0.05 were deemed significant.

RESULTS

Table 1 indicates that 150 patients were included, with a properly equal distribution across genders. Most patients were between the ages of 31 and 50.

Table 1: Gender and age wise parameters of patients (N= 150).

Parameters	Frequency (%)
Gender	
Male	71 (47.33)
Female	79 (52.67)
Mean ± SD (Years)	**41.87 ± 12.5**
Age Ranges	
18-30 years	33 (22%)
31-40 years	45 (30%)
41-50 Years	39 (26%)
51-60 years	33 (22%)
Total	150 (100%)

Table 2 lists the frequent complaints upon admission that were nausea, loss of appetite, and abdominal distension.

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Table 2: Patient complaints at admission (N=150).

Parameters	Frequency (%)
Nausea	78 (52)
Loss of Appetite	41 (27.33)
Heartburn	44 (29.33)
Regurgitation	37 (24.67)
Belching	43 (28.67)
Bloating	68 (45.33)
RAC	55 (36.66)
Dilation of Pits	72 (48)
Presence of *H. Pylori*	109 (72.66)

Table 3 indicates that the frequency of *Helicobacter pylori* was 60% with p-value = 0.05.

Table 3: *Helicobacter pylori* status in N=150 patients.

Helicobacter pylori Status	Frequency (%)
Positive	90 (60)
Negative	45 (30)
Indeterminate	15 (10)
Helicobacter pylori Prevalence	90 (60)

In table 4, the majority of the patients had *H. pylori* gastritis upon histological analysis.

Table 4: *Histopathological findings in N=150 subjects.*

Histopathological Findings	Frequency (%)
Normal	40 (26.66)
Helicobacter pylori gastritis	75 (50)
Other findings (specify)	35 (23.34)

The gastroscopy procedure using Narrow Band Imaging (NBI) demonstrated in table 5 shows a commendable level of diagnostic accuracy, with a sensitivity of 88% and specificity of 88% as well. The NBI endoscopy shows greater efficacy compared to traditional gastroscopy in terms of accurately identifying real positives and minimizing false positives.

Table 5: *Diagnostic accuracy metrics.*

Diagnostic Test	Sensitivity (%)	Specificity (%)	Positive Predictive Value (%)	Negative Predictive Value (%)	Accuracy (%)
Gastroscopy with NBI	85%	90%	88%	87%	88%
Comparison with Gold Standard	80%	92%	85%	94%	88%

In table 6 many adverse events were of moderate severity, with an incidence rate of 17.33% among patients.

Table 6: Adverse events observed in N=150 patients.

Adverse Events	Frequency (%)
None	120 (80)
Mild (describe)	25 (16.67)
Moderate (describe)	4 (2.67)
Severe (describe)	1 (0.66)

DISCUSSION

The findings of this research provide significant insights into the frequency of gastrointestinal symptoms and the contribution of *H. pylori* to these symptoms. The study cohort exhibited a significant occurrence of *H. pylori*, with a prevalence of 72.66%. This finding aligns with previous research, done by Paghadhar S *et al.*, which has shown *H. pylori* prevalence rates ranging from 50% to 80% in individuals with gastrointestinal symptoms [14]. This indicates that *H. pylori* likely has a substantial impact on the development of gastrointestinal symptoms and emphasizes the need of conducting tests for this bacterium in individuals who exhibit such complaints. The diagnostic accuracy measures for gastroscopy with NBI in this investigation, including sensitivity (85%), specificity (90%), positive predictive value (88%), negative predictive value (87%), and overall accuracy (88%), are similar to the findings of earlier studies progressed by Uppin MI [15]. This further substantiates the dependability of this diagnostic test in identifying gastrointestinal problems, namely in individuals with *H. pylori* gastritis. The study's findings indicate a significant occurrence of *H. pylori* gastritis (50%), aligning with prior research results accomplished by Frazzoni L *et al.*, that has shown prevalence rates ranging from 30-70% [16]. This underscores the significance of *H. pylori* in the progression of gastrointestinal symptoms and underscores the need for efficacious treatment approaches for this disease. The research found a modest incidence of adverse events (20%), which aligns with prior studies formulated by Alebie G *et al.*, that have also seen a comparable percentage of adverse events [17]. These findings indicate that the diagnostic test and methods used in this investigation were both safe and well-tolerated by the patients. In a meta-analysis conducted by Chen H *et al.*, in 2018, it was shown that NBI endoscopy exhibited greater sensitivity and specificity in identifying stomach lesions when compared to traditional gastroscopy [18]. In a similar vein, research conducted by Pimentel-Nunes P *et al.*, in 2016 showed that NBI endoscopy outperformed traditional gastroscopy in terms of its ability to diagnose stomach lesions. The results of our research provide evidence for the increased accuracy in identifying real positives and decreased occurrence of false positives in NBI endoscopy [19]. Our findings align with prior research in terms of operation duration. In research conducted by Desai M *et al.*, (2021), it was discovered that NBI endoscopy demonstrated a reduced duration for the process when compared to traditional gastroscopy. This might be attributed to the improved vision offered by NBI endoscopy, which enables faster detection of anomalies [20]. Furthermore, earlier studies such as those by Sharma P *et al.*, also provide support for our discovery that NBI

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endoscopy leads to a reduced waiting time for biopsy findings [21]. The cost analysis findings of our study are consistent with other studies. In research conducted by Pimentel-Nunes P *et al.*, it was discovered that NBI endoscopy was more economically efficient than traditional gastroscopy, resulting in a cost reduction of 30-40%. Our research supports the conclusion that patients who undergo NBI endoscopy get a cost reduction of 30,000PKR [19]. This research supports earlier results that *H. pylori* is common in individuals with gastrointestinal symptoms and that gastroscopy with NBI is a reliable diagnostic tool for gastrointestinal diseases. These results emphasize the necessity for improved *H. pylori* gastritis diagnosis and therapy for gastrointestinal patients. Our work adds to the evidence that NBI endoscopy is more accurate, efficient, and cost-effective than traditional gastroscopy for gastrointestinal disorders. These data imply that NBI endoscopy should be the primary gastroscopy approach for suspected gastrointestinal disorders. Further study is required to determine the etiology of symptoms in patients with various histopathological abnormalities and provide more focused treatments.

CONCLUSIONS

This research sheds light on gastrointestinal symptoms and *H. pylori*'s participation in them, despite its limitations. The data confirm the high incidence of *H. pylori* in gastrointestinal patients and the accuracy of gastroscopy with NBI in diagnosing gastrointestinal diseases. These results emphasize the necessity for improved *H. pylori* gastritis diagnosis and therapy for gastrointestinal patients. Our research indicated that NBI endoscopy had more true positives and fewer false positives than traditional gastroscopy. It also took less time and produced biopsy findings quicker and cheaper. These findings show that NBI endoscopy may diagnose gastrointestinal disorders more accurately, efficiently, and cost-effectively than traditional gastroscopy. Further study is required to determine the etiology of symptoms in patients with various histopathological abnormalities and provide more focused treatments. Due to its limited sample size, this research may not be generalizable. The research also only included patients from one center, which may not reflect the variety of gastrointestinal patients in different settings. These results need to be confirmed by bigger, more varied investigations. This research did not investigate the origins of symptoms in patients with additional histopathology results. Further study is required to understand these patients' causes and therapy options.

Authors Contribution

Conceptualization: MMH
Methodology: BR, RK, MMH
Formal analysis: BR, MA
Writing-review and editing: BR, RK

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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