ISSN: 0975 -8542

Journal of Global Pharma Technology

Available Online at: www.jgpt.co.in

RESEARCH ARTICLE

AGE-STRATIFIED PREVALENCE AND ANTIBIOTIC RESISTANCE PATTERNS OF HELICOBACTER PYLORI INFECTION AMONG PATIENTS UNDERGOING UPPER GASTROINTESTINAL ENDOSCOPY IN A TERTIARY CARE HOSPITAL, INDIA

Imtiyaz Ahmad[1], Syed Belal Hassan[2], Syed Fiza Mustaqueem[3], Ausaf Ahmad[2*]

[1]*Department of Surgery, IIMSR, Integral University, Lucknow, UP, India.*

[2]*Department of Community Medicine, IIMSR, Integral University, Lucknow, UP, India.*

[3]*Department of Pathology, IIMSR, Integral University, Lucknow, UP, India.*

*****Corresponding Author:* **Ausaf Ahmad**

Abstract: The infection rate of H. pylori varies significantly between developing and developed nations, with rates approximately four to five times higher in developing countries. Antibiotic misuse has contributed to resistance issues, complicating eradication efforts. Study aimed to assess age-specific H. pylori prevalence and antibiotic resistance among patients undergoing Upper Gastrointestinal Endoscopy at a tertiary care hospital in India. Study included patients aged 14 to 86 presenting with symptoms like dyspepsia and epigastric pain. Demographic data and treatment history were collected, excluding recent antibiotic or proton pump inhibitor users. Statistical analysis was performed using SPSS version 16.0. Results indicated an overall prevalence of 61.1%, with similar rates across genders. Infection rates peaked at 73.7% in patients above 70 years. Positive endoscopic findings correlated significantly with H. pylori infection, underlining the importance of endoscopic evaluations. Notably, symptoms like epigastric pain were linked to H. pylori positivity. The study concluded that H. pylori prevalence is notably high in individuals above 70 years old. Additionally, it shed light on gender-specific prevalence patterns and highlighted metronidazole resistance as the most common, followed by levofloxacin and amoxicillin resistance. Furthermore, the study stressed the importance of endoscopic examinations in diagnosing H. pylori infection.

Keywords: *Antibiotic Resistance, Dyspepsia, Epigastric pain, H. pylori, Prevalence.*

INTRODUCTION

Chronic gastritis and peptic ulceration are health issues of considerable magnitude affecting people worldwide [1]. The leading cause of chronic active gastritis is Helicobacter pylori, a bacterium known to induce complications such as gastric adenocarcinoma and mucosa-associated lymphoid tissue lymphoma [2].

This bacterium, characterized by its gram-negative and flagellated nature, tends to colonize gastric pits beneath the protective mucus layer, establishing a close association with gastric epithelial cells. In terms ofprevalence, around 50% of the global population carries H. pylori, indicating a widespread occurrence. However, it is important to note that only a subset, approximately 10-20% of carriers, develop symptomatic manifestations [3,4].

This highlights the complex interplay between H. pylori colonization and the onset of clinical symptoms, underscoring the need for a nuanced understanding of the factors

influencing the manifestation of these gastrointestinal conditions on a global scale. H. pylori infection is intricately linked to various factors related to hygiene practices, lifestyle choices, and economic conditions. This connection is reflected in the annual incidence rate of H. pylori infection, which is markedly higher in developing nations at around 5% compared to the relatively lower rate of about 0.5% observed in developed and industrialized countries [5]. In developing nations, the prevalence of H. pylori infection is particularly significant among children under the age of 10, with rates reaching as high as 80%.

A detailed breakdown of infection prevalence in India reveals percentages of 22%, 56%, and 87% in the age groups of 0-4 years, 5-9 years, and 10-19 years, respectively [6]. These statistics highlight the substantial impact of regional and demographic factors on the prevalence of H. pylori. Aside from socioeconomic factors, other contributors to chronic gastritis include smoking, the use of non-steroidal anti-inflammatory drugs (NSAIDs), and the reflux of gastric juice, leading to chemical gastritis. While H. pylori is recognized as the primary causative agent of gastritis, it is important to note that it can also synergize with other etiological factors, emphasizing the complexity of the disease's origins and progression [7].

This intricate interplay highlights the need for a comprehensive understanding of the multifaceted factors influencing the prevalence and impact of H. pylori infection on a global scale. Upper gastrointestinal endoscopy is recommended for various diagnostic and therapeutic reasons. It is frequently employed in cases presenting with dyspeptic symptoms, instances of upper gastrointestinal bleeding, foreign body removal, and selected cases of portal hypertension to screen for varices [8].

Gastritis emerges as the most prevalent finding, with other common observations encompassing esophagitis, gastric ulcer, duodenal ulcer, biliary gastritis, and gastric mass. Normal findings were also reported, with varying percentages across different studies conducted [9-12].

This procedure serves as a versatile tool in clinical practice, allowing clinicians to not only identify and address specific issues such as gastritis but also to explore a spectrum of gastrointestinal conditions. Furthermore, treatment for symptomatic H. pylori infection aims to eradicate the bacteria and reduce the recurrence of associated gastroduodenal diseases. This involves complex regimens of multiple antimicrobial agents administered over at least a two-week period. Typically, triple therapy regimens include a combination of two antimicrobial agents such as metronidazole, amoxicillin, tetracycline, or clarithromycin along with a proton pump inhibitor or bismuth. Common reasons for treatment failure include patient noncompliance and antimicrobial resistance of the infecting H. pylori strain.

The emergence of antimicrobial resistance in H. pylori poses a significant public health concern due to the high prevalence of infection and the risk of severe complications [5]. Despite numerous studies on this subject, there is a noticeable lack of information regarding the prevalence and antimicrobial resistance of H. pylori infection in Northern India. This research endeavors to fill the existing knowledge void, particularly in the context of Northern India, shedding light on the extent of H. pylori infection within the population experiencing associated symptoms.

By undertaking this study, we seek to enhance our understanding of the regional dynamics of H. pylori prevalence and antimicrobial resistance, thereby contributing to the broader body of knowledge on the topic. Recognizing this research gap, the current study aims to investigate the age-specific prevalence of Helicobacter pylori infection and assess antibiotic resistance patterns among patients undergoing Upper Gastrointestinal Endoscopy at a tertiary care hospital in India.

MATERIAL AND METHODS

A descriptive cross-sectional study was undertaken at a tertiary care hospital's endoscopic department from January 1st, 2022, to December 31st, 2022, involving 460 patients. Selection criteria were based on symptoms, and the age range of participants spanned from 14 to 86 years. Exclusion criteria included patients on proton pump inhibitor therapy or any antibiotic treatment within the last month.

Sample size calculation was done using the formula, $n= Z^2 x\ p\ x\ q\ /d^2$, where, n is sample size, Z is 1.96 at 95% Confidence Interval (CI), p is the prevalence (50%), q is 1-p ,d is margin of error (5%) and non-response rate is 20%. The final sample calculated was, $n= (1.96)^2\ x\ 0.5\ x\ 0.5/(0.05)^2 = 460$. The study was approved and ethical clearance was obtained from institutional ethical and research committee. The study involved the data analysis of routine procedure carried out in an institution and informed consent was obtained from each patient before the procedure.

DATA ANALYSIS

Data analysis was carried out using the statistical package for social sciences, for Windows version 16.0 (SPSS 16; Chicago, IL, USA). Descriptive statistics such as frequency, percentage and mean were used. Confidentiality and privacy of the data were maintained by utilizing it just for the study purpose. Categorical variables were compared with Chi-square test. $P < 0.05$ was taken as statistically significant.

RESULTS

Table 1 presents the age group-wise distribution of H. pylori infection among a total of 460 individuals. The data reveals varying infection rates across different age groups. In the age group <10, there were no cases of H. pylori infection, with all three cases showing a negative result, indicating an absence of infection in this age range.

In the subsequent age groups (10-20, 20-30, and so on), the prevalence of H. pylori infection shows fluctuating patterns. The highest infection rate is observed in the age group ≥70, with 73.7% of individuals testing positive for H. pylori, while the lowest infection rate is in the age group 10-20, with 56.3% testing positive. Overall, the data suggest a trend of increasing H. pylori prevalence with advancing age, reaching its peak in the oldest age group (≥70).

Table 1: Age group wise distribution of H. pylori (total, n= 460)

Age group	H. pylori				Total
	Positive		Negative		
	N	%	N	%	
<10	0	0.0	3	100.0	3
10-20	9	56.3	7	43.8	16
20-30	26	53.1	23	46.9	49
30-40	45	54.2	38	45.8	83
40-50	60	59.4	41	40.6	101
50-60	61	62.2	37	37.8	98
60-70	52	72.2	20	27.8	72
≥70	28	73.7	10	26.3	38
Total	281	61.1	179	38.9	460

Table 2 provides a gender-wise distribution of H. pylori infection among a total of 460 individuals. The data reveals that out of 293 males, 60.4 % tested positive for H. pylori, while 39.6 % tested negative. Similarly, among 167 females, 62.3 % were H. pylori positive, and 37.7 % were negative. The overall H. pylori prevalence in the total sample is 61.1 %, with 38.9 % testing negative. The chi-square statistic for the gender distribution is 0.155, and the associated P-value is 0.693. This P-value suggests that there is no statistically significant association between gender and H. pylori infection in this sample. Approximately similar prevalence rates in males and females were found in result.

Table 2: Gender wise distribution of H. pylori (total, n=460)

Gender	H. pylori				Total
	Positive		Negative		
	N	%	N	%	
Male	177	60.4	116	39.6	293
Female	104	62.3	63	37.7	167
Total	281	61.1	179	38.9	460

Chi-square statistic is 0.155, P-value is 0.693

Table 3 depicts the prevalence of H. pylori infection across different age groups in male participants, comprising a total sample size of 293 individuals. Notably, the youngest age group (<10 years) showed an absence of H. pylori infection, with both individuals testing negative. A discernible prevalence trend emerges as H. pylori infection increases with advancing age, evident in the 10-20, 20-30, 30-40, and 40-50 age categories. The highest prevalence rates of H. pylori-positive males were noted in the 60-70 and ≥70 age groups, constituting 72.2% and 73.7%, respectively.

Table 3: Age group distribution of male H. Pylori (n=293)

Age group	H. pylori				Male Total
	Positive		Negative		
	N	%	N	%	
<10	0	0.0	2	100.0	2
10-20	5	56.3	4	43.8	9
20-30	17	53.1	15	46.9	32
30-40	27	54.2	23	45.8	50
40-50	37	59.4	26	40.6	63
50-60	38	62.2	24	37.8	62
60-70	32	72.2	16	27.8	48
≥70	21	73.7	6	26.3	27
Total	177	60.4	116	39.6	293

Table 4 outlines the age group distribution of H. pylori infection among female participants, with a total sample size of 167 individuals. In the youngest age group (<10 years), no instances of H. pylori infection were observed, with the lone participant testing negative. As the age progresses, a consistent pattern of increasing prevalence of H. pylori infection is evident in the 10-20, 20-30, 30-40, and 40-50 age categories. The highest prevalence rates of H. pylori-positive females were recorded in the 60-70 and ≥70 age groups, constituting 72.2% and 73.7%, respectively.

Table 4: Age group distribution of female H. Pylori (n=167)

Age group	H. pylori				Female Total
	Positive		Negative		
	N	%	N	%	
<10	0	0.0	1	100.0	1
10-20	4	56.3	3	43.8	7
20-30	13	53.1	4	46.9	17
30-40	20	54.2	13	45.8	33
40-50	21	59.4	17	40.6	38
50-60	22	62.2	14	37.8	36
60-70	17	72.2	7	27.8	24
≥70	7	73.7	4	26.3	11
Total	104	62.3	63	37.7	167

Table 5 examines the association between positive endoscopic findings and the detection of H. pylori, considering a total sample size of 460 cases. The data highlights a significant relationship, with a chi-square statistic of 13.717 and a corresponding p-value of 0.0002. The prevalence of H. pylori is notably higher in cases where endoscopic abnormalities are present, reaching 65.7%, compared to 34.3% in cases where such abnormalities are absent. This robust association underscores the potential impact of H. pylori infection on the occurrence of endoscopic abnormalities.

Table 5: Association of positive endoscopic findings with detection of H. pylori.

		H. pylori				Total
		Positive		Negative		
		N	%	N	%	
Endoscopic abnormalities	**Present**	232	65.7	121	34.3	353
	Absent	49	45.8	58	54.2	107
Total		281	61.1	179	38.9	460

Chi-square statistic is 13.717 and P-value is 0.0002

Fig 1 analyzes the association between specific symptoms and the presence or absence of H. pylori infection in a sample size of 248 cases. The presence of dyspepsia is reported in 33 cases among H. pylori-positive individuals, constituting 37.5% of positive cases, while 55 cases with negative H. pylori status account for 62.5%. Similarly, epigastric pain is prevalent in 97 H. pylori-positive cases (60.6%) compared to 63 cases (39.4%) in H. pylori-negative individuals. Gastritis is observed in 73 H. pylori-positive cases (64.6%) and 40 H. pylori-negative cases (35.4%). Additionally, pain in the upper abdomen is reported in 78 H. pylori-positive cases (78.8%) and 21 H. pylori-negative cases (21.2%).

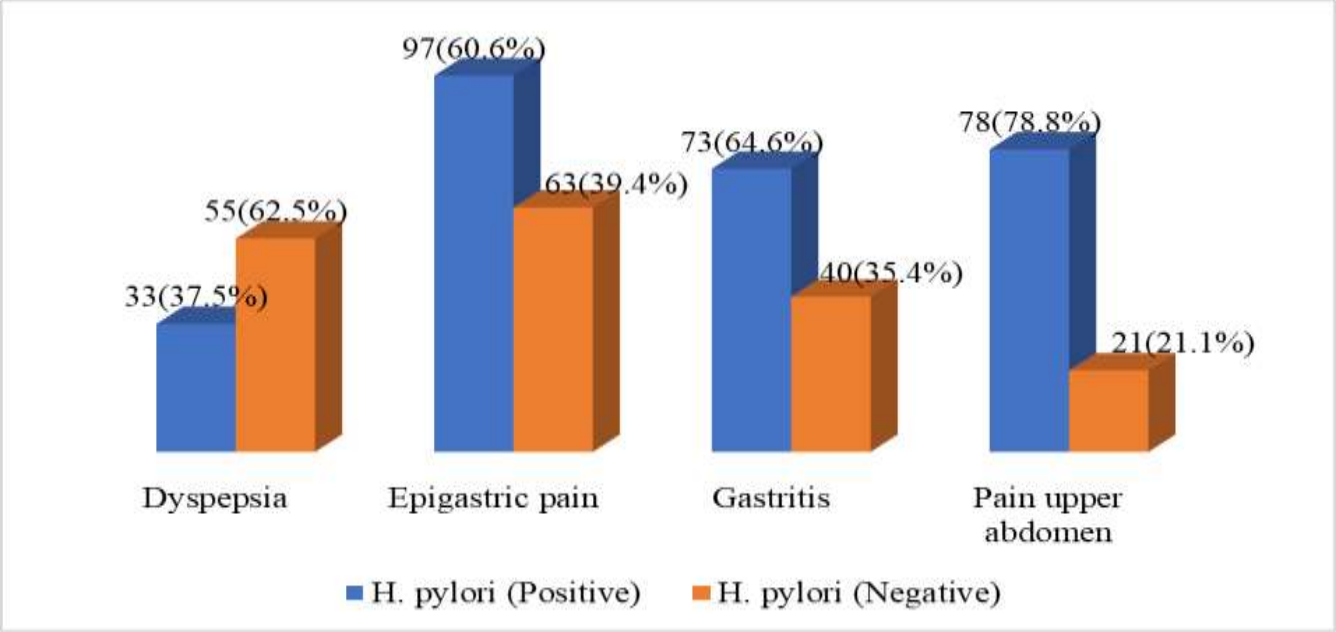

Figure 1: Symptoms according to H. pylori positivity

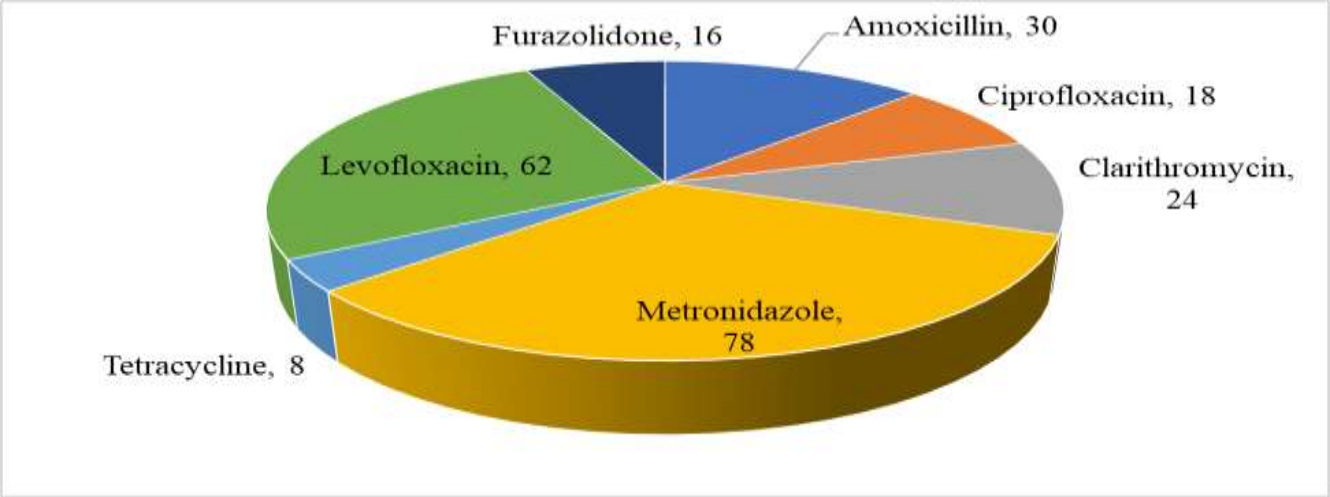

Figure 2: History of drug resistance patterns of commonly used antibiotics for the treatment of H. pylori infection among patients undergoing UGIE

Fig 2 showed that the drug resistance patterns of commonly used antibiotics for treating H. pylori infection among patients undergoing UGIE at a tertiary care hospital in India. According to the findings, resistance percentages vary across different antibiotics. Notably, amoxicillin exhibited a resistance rate of 30%, while ciprofloxacin and clarithromycin showed resistance rates of 18% and 24%, respectively. The highest resistance was observed for metronidazole at 78%, whereas tetracycline demonstrated a much lower resistance rate of 8%. Levofloxacin and furazolidone displayed resistance rates of 62% and 16%, respectively.

CONCLUSION

In conclusion, our study explored the prevalence and distribution of H. pylori infection across diverse age groups and genders. The study emphasized the importance of endoscopic examinations in identifying cases and revealed a significant association between positive endoscopic findings and H. pylori infection. Diverse symptoms were linked to H. pylori positivity, with a notable association with epigastric pain. Furthermore, our study reveals that Metronidazole resistance is the predominant finding, succeeded by Levofloxacin and Amoxicillin.

These results underscore the escalating resistance to conventional antibiotics utilized in Helicobacter pylori treatment regimens. While our findings provide valuable insights, it's crucial to acknowledge study limitations, including potential biases and variations in healthcare-seeking behaviors. Future research should focus on longitudinal studies to further elucidate the dynamics of H. pylori infection across diverse populations, considering various influencing factors.

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