

Original Research Article

Prevalence and risk factors of *Helicobacter pylori* infections in the patients suffering from acid-peptic disease at tertiary care center, Gujarat, India

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ABSTRACT

Background: *Helicobacter pylori* (*H. pylori*) infection is a medical encumber especially in the developing countries, ranging from acute inflammation to malignancy. The study is intended to explore the prevalence of *H. pylori* infection and also to compute its associated risk factors.

Methods: Sixty two (n=62) symptomatic patients attending the tertiary care hospital, were included in the study. Two antral biopsies collected from each patient were subjected to rapid urease test and Gram staining. IgG antibodies were detected by rapid test based on the principle of Immunochromatography. To evaluate the risk factors, various determinants were asked to each patient in the form of questionnaire. Statistical analysis was done using Fisher exact test. P value < 0.05 was considered significant.

Results: Prevalence rate of *H. pylori* infection was 24.19 % (15/62). More than half (53%) of the infected patients had complained of persistent burning abdominal pain. Prevalence rate was found highest in the patients suffering from peptic ulcer disease (66.6%, P=0.0237). Consumption of unfiltered water (P=0.007, Odd Ratio (OR)-1.06), eating spicy food, meat, fish and chili pepper (P=0.052, OR-1.01) was found the major risk factors. Addictive habits of either smoking/alcohol/tobacco (P=0.904) were not associated with infection.

Conclusions: Prevalence of *H. pylori* infection was found low comparatively and was mainly associated with symptom of persistent burning abdominal pain and peptic ulcer. Use of unfiltered water, spicy food, chili pepper and meat undoubtedly increase the risk of acquiring *H. pylori* infection. Addictive habits were not significantly associated with infection.

Keywords: *Helicobacter pylori*, Prevalence, Peptic ulcer, Risk factors

INTRODUCTION

The discovery of *Helicobacter pylori* in 1982 by Marshall and Warren was the starting point of a revolution pertaining to the concepts and management of Acid-peptic diseases.¹ *Helicobacter pylori*, in a very short period of time, has become one of the most important etiological agent causing gastrointestinal infections like

duodenal ulcer diseases, chronic antral gastritis, gastric ulcer diseases and, possibly non-ulcer dyspepsia.²

It has been classified as a class I carcinogen by international agency of research on cancer causing gastric cancer and mucosal-associated- lymphoid-type (MALT) lymphoma.² Prevalence of *H. pylori* infection diverges widely in different regions of the world.³ The prevalence of *H. pylori* infection in the Indian population ranges

from 31 to 84% or more in rural areas and the prevalence among children and adults are 87% and 88% respectively.⁴ More than 20 million Indians are estimated to suffer from peptic ulcer disease, which is the most common recognized manifestation of *H. pylori* infection in India.^{5,6}

Conventional risk factors like age, gender, blood group, low socioeconomic status, overcrowding, poor sanitation or hygiene, and living in a developing country plays a major role in increasing the susceptibility of an individual to get infected with *H. pylori*.⁷ It is imperative to consider the fact that in the country like India with diversity, other possible variants like personal abusive habits especially addiction to tobacco, smoking or alcohol as well as various other environmental and dietary factors (chili pepper, spicy food) too can predispose an individual to have symptomatic *H. pylori* infections.⁸

Detection of the as mentioned risk factors are of paramount importance as these specific risk factors may lead to the development of practical and effective preventive strategies against the *H. pylori* infection as well as early detection of *H. pylori* in any population and its eradication results in significant reduction in usage of acid suppression. Though, many studies have already been conducted in the past on the current topic, but there is a dearth of information about *H. pylori* infection prevalence in the rural area of eastern Gujarat. Hence the present hospital-based cross-sectional study was planned to estimate the prevalence of *H. pylori* infection among patients presenting with the dyspepsia and also compute various associated risk factors.

METHODS

This prospective cross-sectional study was conducted on sixty-two (n=62) consecutive, symptomatic patients (44 males and 18 females; age 20-80 years) attending the endoscopy unit of a tertiary care hospital, for a period of four months from May 2016 to August 2016. Based on endoscopic findings 34 patients with gastritis, 11 patients with duodenitis, eight patients (8) with reflux esophagitis, six (6) with peptic ulcer, and three (3) with gastric malignancy, were enrolled in this study. The study was approved by the Institutional ethical committee and informed consent was obtained from each patient.

Inclusion criteria

All the patients with the signs and symptoms of gastrointestinal tract infections of more than one-month duration were enrolled in the study.

Exclusion criteria

- Those patients taking aspirin or non-steroidal anti-inflammatory drugs (NSAIDs) in the past four weeks.

- Or those on proton pump inhibitors (PPI) or patients with previous therapy to eradicate *H. pylori*.

Data was collected through a preformatted bilingual (Hindi and Gujarati) questionnaire regarding the demographic details of each patients as well as personal habits like smoking, consumption of alcohol, tobacco, dietary habits like eating spicy food, chili pepper, consumption of non-vegetarian food, good sanitary habits like hand washing, drinking filtered water etc. was acquired from each patient.

Two samples of antral biopsies were collected from each symptomatic patient in Brain-heart infusion (BHI) broth and were transported to the laboratory without delay. For RUT, one biopsy specimen was immediately placed into 0.5ml urea indicator broth at room temperature. Any change in color from yellow-orange to pink in the next four hours indicated the presence of *H. pylori* in the sample.⁹

For gram staining, biopsy was crushed, and smears were prepared on a clean slide and stained with the standard protocols.¹⁰ For serology five (5ml) of blood was collected from each patient and serum was separated for serological test. Detection of IgG antibodies in the patient's serum was done by rapid test based on the principle of Immunochromatography. Kits were procured from SD Bio Standard Diagnostics, Alere, India. Sample was processed according to the protocol given by manufacturer.

Criteria for true positive result for *H. pylori* (Gold standard)

Subjects were considered as having current infection with *H. pylori* if any of the two tests were positive out of three or all the three were positive. If only serology is positive, then it will be considered as past infection. If any single test out of RUT, Gram staining or serology is positive then the result was considered false positive and report was given as negative.¹¹

Statistical analysis

A Pearson Chi-square test and fisher exact probability test was used to find out the significant correlations. P-value <0.05 will be considered significant. Data analysis was conducted using Statistical Package for Social Sciences (SPSS) version 15.0.

RESULTS

Out of 62 dyspeptic patients, 44 were males and 18 were females, age range from 20 to 80 yrs, out of 62, 15 patients were positive for *H. pylori* with the overall prevalence rate of 24.19%.

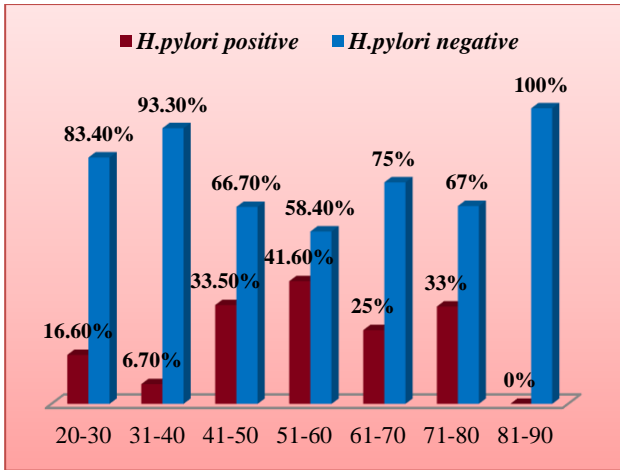


Figure 1: H. pylori infections in different age-groups

Rate was higher in males (9/15, 60%) compare to females (6/15, 40%). High infection rate was found in the age group of 51-60 years (41.6%, 5/12), followed by 41-50 years (33%, 5/15) and 71-80 years (33%, 1/3). Least rate was found in the young age group of 21-40 years (11%, 3/27). (P value=0.044, significant) (Figure 1). Majority of the patients complain of persistent burning pain in the abdomen with regurgitation (41/62) followed by vomiting (11/62) and dysphagia (6/62) hemetemesis (2/62) anemia

(1) and melena (1). *H. pylori* infection was present in 53.3% (8/15) cases with symptoms of burning abdominal pain with regurgitation (Table 1). Prevalence rate was found highest in the patients suffering from peptic ulcer (66.6%, P value=0.0237, OD=8.18), followed by GERD (25%), gastritis (20.5%) and duodenitis (18 %) (Table 2).

Table 1: Symptom profile in H. pylori infected and non-infected patients.

Symptoms	H. pylori positive	H. pylori negative
Persistent burning abdominal pain (n=41)	8 (53.3%)	33
Vomiting (n=11)	3 (20%)	8
Dysphagia with regurgitation (n=6)	2 (13.3%)	4
Anaemia (n=1)	-	1
Hematemesis (n=2)	2 (13.3%)	-
Melena (n=1)	-	1

Personal and addictive habits

Authors found that 50/62 patients had a habit of eating spicy food, 46/62 drinking non-filtered water, 37/62 patients were eating meat, fish and chili pepper.

Table 2: Correlation of H. pylori infection with various endoscopically diagnosed acid-peptic lesions.

Endoscopic finding (n=62)	H. pylori positive (n=15)	95% CI	Odd ratio	P value
Antral gastritis (n=22)	4 (18%)	0.138-1.48	0.452	0.18
Corporal gastritis (n=6)	-			
Erosive gastritis (n=1)	1 (100%)			
Fundal gastritis (n=5)	1 (20%)	0.188-5.85	1.051	0.95
Reflux oesophagitis (n=8)	2 (25%)			
Duodenitis (n=11)	2 (18%)	0.123-3.40	0.649	0.60
Gastric malignancy (n=3)	-	0.020-8.39	0.410	0.56
Gastric ulcer (n=4)	3 (75%)	1.324-50.5	8.18	0.0237*
Duodenal ulcer (n=2)	1 (50%)			

*p value significant, <0.05, CI: confidence interval

Table 3: Evaluation of various risk factors for H. pylori infection.

Determinants	H. pylori positive	H. pylori negative	95% confidence interval	Odd ratio	p-value
Gender	Male (n=44)	9	0.1513-1.748	0.514	0.286
	Female (n=18)	6			
Consumption of filtered/Boiled water	Yes (n=16)	4	0.2836-3.966	1.06	*0.007
	No (n=46)	11			
Consumption of meat/fish/chili pepper	Yes (n=37)	9	0.3109-3.332	1.017	*0.052
	No (n=25)	6			
Habit of hand washing with soap	Yes (n=15)	2	0.4918-12.56	2.485	0.270
	No (n=47)	13			
Habit of eating Spicy Food	Yes (n=50)	13	0.3393-9.097	1.756	0.501
	No (n=12)	2			

*p value <0.05 is significant, CI: confidence interval

Authors found that out of 15 *H. pylori* positive patients, 13 patients (86.6%) were eating spicy food regularly (P value=0.5, OD-1.75), 13 patients (86.6%) did not have a habit of hand washing with soap (P value=0.2, OD- 2.4), 11 patients (73%) were drinking non-filtered water (P value=0.007, OD-1.06) and nine (60%) had a habit of eating meat/fish and chili pepper (P value= 0.052, OD-1.017) (Table 3). Out of 62 patients, 24 patients had a habit of either smoking, tobacco, alcohol or all the three and 38 patients did not have any of these habits. Out of 24, 6 were *H. pylori* positive and 18 were negative, while in those without addictive habits, nine were positive for *H. pylori*, so statistically addictive habits were not associated as a risk for developing *H. pylori* infection. (P value=0.904) (Table 4).

Table 4: Analysis of abusive habits and its association with *H. pylori* infection in symptomatic patients.

Variable	<i>H. pylori</i> infected	<i>H. pylori</i> Non-infected	
Habits (n=24)			
Smoking (n=2)	1	1	
Tobacco (n=4)	1	3	
Smoking +Tobacco (n=7)	2	5	P value=0.906
Smoking + Alcohol (n=2)	1	1	Odd ratio: 1.074
Smoking +Alcohol+ Tobacco (n=9)	1	8	95%CI: (0.3272-3.526)
No Habits (n=38)	9	29	
Total	15	47	

Table 5: Comparison of various diagnostic tests of *H. pylori* infections.

Diagnostic tests	Rapid urease test	Gram's staining	Serology
Sensitivity	87%	87%	87%
Specificity	94%	98%	96%
Positive predictive value	81%	93%	87%
Negative predictive value	96%	96%	96%
Accuracy	92%	95%	94%

Comparison of diagnostic tests

Of all the invasive and non invasive diagnostic tests, sensitivity was found equal in all the three tests. Gram staining showed 98% specificity with 95% accuracy (Table 5).

Serology showed 96% specificity with 94% accuracy. RUT had 3 false positive results which has reduced its accuracy to 92% compare to other tests.

DISCUSSION

This study was conducted out to uncover the predominance of *H. pylori* infection among symptomatic patients undergoing upper GI endoscopy and also to determine the associated risk factors with special emphasis on personal and dietary habits. The study revealed a prevalence of 24.19% in the rural area of Gujarat, which appears to be very less compared to other studies from India. Study done by Vijaya et al, showed a prevalence of 62.7%, while Sasidharan S et al, showed a prevalence of 35.6%, Ashtari S et al, showed a prevalence rate of 83.5%. Khan S et al, showed the prevalence of 72.8%.^{10,12-14} Low prevalence in our zone can also be explained by many plausible facts; one is the probably the disparity of prevalence from one zone to another as prevalence widely depends on the environment (geographical area, water supply, sanitation, socioeconomic status), host (age, ethnicity, race, hygiene level, crowding in the household) and laboratory detection methods (use of gold standard test like histopathology or molecular diagnosis).¹⁵ Another probable reason could be the low sample size compare to other studies, so further large scale study can only reveal the actual prevalence rate in our zone.

Age group wise prevalence

Age group wise the prevalence of active *H. pylori* infection was highest in the age group 51-60 years (41.6%), equal in the middle age 41-50 years (33%) and older age of 71-80 years (33%). Least rate was found in the young age group of 21-40 years i.e. 11% (Figure 1). Study done by Sulami AA et al, found the highest prevalence in the age group of 41-50 years (79%) and not in the older age group.¹⁶ Khan S et al, showed maximum prevalence in the age group of 15-25 years (84.2%).¹⁴

Gender wise prevalence

Gender wise prevalence was higher in males (60%, 9/15) compare to females (40%, 6/15). Khan S et al, also found male preponderance (77.1%), Vijaya et al, also found higher infection rate in males (65.9%).^{10,14} On the contrary, a cross sectional study done by of Valliani et al, in Pakistan revealed substantial prevalence of *H. pylori* with females being more affected than males.¹⁷ In present study the reason for male preponderance is may be due to their addiction to habits like tobacco, alcohol and smoking. However, when we look at the overall picture in *H. pylori* positive and negative patients the effect of addiction to smoking/tobacco/alcohol does not influence much. Here again the sample size is less to confirm this affirmation.

Addictive habits

Twenty-four patients (24/62, 38.75%) were addicted to smoking, alcohol or tobacco and out of them, 25% (6/24) were *H. pylori* positive. On the contrary 61.29% (38/62)

were not addicted to any of the above habits and out of them 23.6% were *H. pylori* positive. The difference is not that significant to confirm any relation between addictive habits and infection. Majority of other cross-sectional studies like that of Sharma B et al, and Alsaimary et al, have also found no relationship between them.^{18,19} However, present study findings were contrary to the findings of Khan S et al, and Ghosh et al.^{14,20}

Dietary habits

Present study results highlighted the association between the source of drinking water and *H. pylori* infection. Prevalence of *H. pylori* was higher in participants consuming non-filtered or unboiled water compared with participants using water filters or boiling the water before consumption. Present study findings are in accordance with previous research on this topic done by Mhaskar RS et al, and Rodrigues MN et al.^{3,21} Meat has also been shown to be a risk factor for *H. pylori* infection.²⁰ Authors observed a higher association between *H. pylori* and non-vegetarian diet with an infection rate of 60%. Non-vegetarian diet has been studied as a risk factor for peptic ulcer and gastric cancer.^{22,23}

Consumption of chili pepper in food was also an added risk factor in our study but many studies have proved that it has protective effect against *H. pylori* infection as capsaicin, one of the active ingredients in chili exhibits bactericidal activity when incubated at pH values as low as 5.4 and it is also a potential anti-inflammatory drug by the inhibition of the production of interleukin (IL)-8 in *H. pylori*-infected gastric epithelium.²⁴ However, the exact mechanism behind the bactericidal action of chili peppers is being debated.

Diagnostic tests

In present study Gram's stain has shown excellent results with high specificity and accuracy compared to other diagnostic tests. Present study results do not agree with study of Berry V et al, who reported low sensitivity of Gram's staining and reported that the sensitivity of Gram's staining is generally poor and inferior to culture, while it supports the results of Vijaya D et al, who got the sensitivity of 98% and specificity of 100%.^{10,25}

Present study results of RUT were quite in accordance with the study done by Ruparelia et al, which got the sensitivity of 81% and specificity of 100%.²⁶ Authors got less sensitivity of RUT compared to other studies.^{10,27} The sensitivity of RUT is greatly affected by the quality and accuracy of sampling and also affected by the presence of other urease-producing bacteria in the gastric sample such as *H. heilmanni* and *Proteus* spp.¹⁰ Other reason may be the patchy distribution of infection and low concentration of bacteria in the fragment. With serology we got less sensitivity (87%) compared to the studies of Rahman SH et al, who got the sensitivity of 97%, while Poddar U et al, got the sensitivity of 95%, reason could be the use of highly

sensitive test kits based on the principle of ELISA, whereas authors use the rapid test kit based on immunochromatography.^{28,29} Authors got less false positive results which increases its specificity to 96%.

The study was conducted as a part of short term studentship program sponsored by ICMR for the duration of four months, so the major limitation was that the study was time bound, due to which the sample size was small. Further extension of the study with more number of samples will give us the actual prevalence and the role of individual risk factors.

CONCLUSION

Prevalence rate of *H. pylori* infection was found low compared to other places in India and was mainly associated with Peptic ulcer disease. Spicy food, meat/fish, non-filtered water, hand washing straightforwardly increases the risk of acquiring the infection. Addictive habits of smoking, alcohol or tobacco is not a risk factor for developing infection. Amongst the diagnostic test Gram stain was found to be the best invasive diagnostic test.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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