



Prevalence and Factor Assessment of *Helicobacter pylori* Infection in a Rural Setting

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Abstract: *Helicobacter pylori*, is a spiral-shaped pathogenic bacterium which is believed to cause peptic ulcers, chronic gastritis, active ulcers disease and many gastrointestinal diseases. The study aimed to find out the prevalence of *H. pylori* infection and factors associated with the infection in a rural setting of Nepal. A cross-sectional study was conducted among 804 participants from March 2019 to April 2020 in a rural setting of Province 2, Nepal. A structured questionnaire was administered to obtain information about the socio-demographic condition, food habits, hygienic practices, and family history. Venous blood was collected for laboratory examination of *H. pylori* antibodies. Serum anti-*H. Pylori* antibodies were detected; out of 804 participants 375 (46.6%) were positive for *H. pylori* infection; 411 (51.1%) were female and male 393 (48.9%). The minimum age of the participant was 13, the maximum was 85 with a mean age of 43 ± 15.26 . A significant association was found with age group P-value 0.012, with religion [P-value 0.021 and OR (95% CI) was 2.938 (1.128-7.650)] and place of residence [P value 0.011 OR (95% CI) was 1.438(1.087-1.904)]. A significant association was also observed with marital status, occupation, total family members and total annual income. A significant association was seen with food habits like consumption of vegetables, onion and garlic, milk and meat products, spicy foods, and fried foods. Even though the prevalence of *H. pylori* is lower than other still has a higher prevalence than developed countries in the rural area and socio-demographic factors and food habit are associated with *H. pylori*. Awareness campaigns should be focused on rural areas where education is not primary.

Keywords: Gastritis, Epidemiological, Serological investigation, *Helicobacter Pylori*

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1. INTRODUCTION

Helicobacter pylori is believed to be responsible for the majority of peptic ulcers in patients with chronic gastritis and active ulcer disease.¹ *H. pylori* is associated with many diseases of the gastrointestinal tract and high prevalence has been reported in many developing countries.^{2,3} The prevalence of *H. pylori* infection differs by country and its territory from 20 % to 90 %, with rates of over 60% in developing countries. Person-to-person transmission within the family has been considered as major modes of transmission by epidemiological and microbiological studies, both in developed and developing countries.⁴⁻¹⁰ Differences in prevalence among racial and ethnic groups have been described worldwide, but it is unclear to what extent such differences can be ascribed to socioeconomic factors and other possible risk factors.¹¹⁻¹³ Nepal is a landlocked country in Southeast Asia with an estimated 30 million inhabitants. Nepal is also home to different ethnic groups with different cultures, of which 55% to 70% are living in rural or remote areas. High rates of *H. pylori* infection were reported in hospital-based studies in an urban area.¹⁴⁻¹⁶ The aim and objective of the present study were to determine the prevalence of *H. pylori* infection and to identify risk factors associated with the infection in a rural setting of Nepal.

2. METHODOLOGY

2.1 Study population and sample selection

A cross-sectional study was conducted among patients with gastrointestinal complaints of gastritis. The study was conducted in Aurahi village, Mahottari district, and Bagdampur village, Bara district, a rural setting of Province 2, Nepal. In total, 804 participants were enrolled in the study. Individuals were observed only once based on their clinical presentation of the disease. The study was conducted from March 2019 to April 2020.

2.2 Ethical Consideration

To carry out the study, we obtained permission from the ward office of Aurahi and Bagdampur village and the Institutional Review committee (IRC) of Pokhara University (Ref. no. 97/076/077), Nepal. All the participants were informed, written consent was obtained and the purpose of the study and what would be involved were explained before consenting.

2.3 Questionnaire and laboratory examination

A structured questionnaire was administered to obtain information about the socio-demographic information like age, sex, place of residence. Similarly, food habits like vegetables, fruits, milk and meat products, onion, and garlic, fried foods and spicy foods uptake and family history of the patients were recorded. Information sought included past and recurring clinical symptoms such as epigastric pain, gastritis was only enrolled in the study. Venous blood samples were collected from all 804 patients for laboratory examination.⁴

2.4 Detection of *H. pylori* antibodies by Immuno Diagnostic Rapid Test (IRT)

The separated sera were analysed serologically by IRT using a

commercial CTK Biotech, China *H. pylori* Ab kit (Combo kit) of sensitivity 98.4% and specificity 100% as per manufacturer's specification. Using a dropper, five drops of serum were transferred to the sample well of the test strip followed by addition of three drops of assay diluents, and the results were read macroscopically after 5 minute and before 10 minutes. A positive result was that in which two pink/red bands (control line and test line) appeared in the result window of the test cassette, whereas the negative one was that in which one pink/red band was seen in the control window. An invalid result was that in which no pink/red band appeared in the control window of the strip; in which case the analysis was repeated.⁵

3. STATISTICAL ANALYSIS

The data were entered into MS Excel 2010 statistical program and analyzed using SPSS for windows version 16.0 and frequency, distribution, chi-square test, crude odds ratio at a confidence level of 95% was calculated.

4. RESULTS

Out of 804 participants, 411(51.1%) were female and 393(48.9%) were male. The minimum age of the participant was 13 and the maximum was 85 with a mean age of 43±15.26. According to the marital status there were 3 (0.4%) widows followed by 753(93.7%) married and 42 (5.2%) unmarried. Similarly, there were 360 (44.8%) participants from Aurahi and 444 (55.2%) were from Bagdampur. According to the family status of the participants, there were 264 (32.8%) whose family members were less than 10 and more than 5, 510 (63.4%) were those having less than 5 family members and 30 (3.7%) had more than 10 family members. According to occupation 96 (11.9%), 177 (22.0%), 336 (41.8%) 186 (23.1%), and 9 (1.1%) were businessmen, employees, farmers, housewives, and students respectively. According to income 276 (34.3%) were with 1 to 2.5 lakh income per year, while 450 (57.1%) were less than 1 lakh per year and 45 (5.6%) were 2.5 lakh to 5 lakh and 24(3.0%) were with more than 5 lakh income per annum. Food habits are also one of the major issues in people with gastritis, 435 (54.1%) had eating habits of vegetables while 6 (0.7%) never eat and 363 (45.1%) were who ate green vegetables sometimes. Similarly, 168 (20.9%), 36(4.5%), and 600 (74.6%) were who ate fruits every day, never ate and sometimes a week ate fruits respectively. 207 (25.7%) were those who took milk and meat products every day, 81(10.1%) never and 516 (64.2%) took milk and meat products sometimes a week. 537(66.8%) took onion and garlic every day, 9 (1.1%) never took and 258 (32.1%) took onion and garlic sometimes a week. Similarly, 3188 (39.6%) took fried foods daily, while 15 (1.9%) never took and 471 (58.6%) sometimes in a week. There were 369 (45.9%) who were taking spicy foods daily, 183 (22.8%) never and 252 (31.2%) took spicy foods sometimes in a week. 309 (38.4%) were alcohol consumers and 225 (28.0%) were smokers. 735 (91.4%) always washed their hands before a meal and 69 (8.6%) were less frequent of hand washing. Similarly, 741 (92.2%) always used their fingers to eat. 90 (11.2%) did not have a toilet facility and 714 (88.8%) had a toilet facility, similarly, 750(93.3%) had a habit of washing hands after the use of toilet. 714(88.8%) used hand pumps as a source of water, 63(7.8%) were users of public supply water and 27(3.4%) were users as well as a source of drinking water. The result of this study reveals 375 (46.6%) positives for *H. pylori* infection while 429 (53.9%)

were negative for *H. pylori* antibody test as shown in table 1. Association of sociodemographic with the result shows no association with sex while there was a significant association with age group P-value 0.012, religion P-value 0.021 and OR (95% CI) was 2.938(1.128-7.650) and place of residence P-value 0.011 OR (95% CI) was 1.438 (1.087-1.904) as shown in table 2. Association of participants with a result showed significant association with Marital status P-value 0.002, occupation P-value 0.00, total family members P-value 0.02 and total income of the family P-value 0.026 as shown in table 3. Association of food habits with result of *H. pylori* showed significant association with consumption of vegetables with P

value 0.000, similarly consumption of onion and garlic showed P-value 0.085, milk and meat products consumption P-value 0.001, spicy foods P-value 0.001 and fried foods 0.002 P-value while consumption of fruits did not show any significant association as shown in table 4. No significant association was seen in the consumption of toxic substances like consumption of alcohol and smoking habits with the *H. pylori* infection as shown in table 5. Association of hygiene practices like consumption of drinking water, toilet facility, hand washing habits after the use of toilets, hand washing before meals and using fingers to eat did not show significant association as shown in table 6.

Variables	Frequency(n)	Percentages (%)
Result (Antibody)		
Negative	429	53.4
Positive	375	46.6
Total	804	100.0

	Serum antibody for <i>H. pylori</i>		Total	Chi-square value	P-value	OR (95% CI)
	-ve (Negative) (n=429)	+ve (Positive) (n=375)	804			
Sex						
Female	228(53.1%)	183(48.8%)	411(51.1%)	1.513	0.219**	1.190 (0.902- 1.571)
Male	201(46.9%)	192(51.2%)	393(48.9%)			
Age Group						
less than 20	30(7.0%)	12(3.2%)	42(5.2%)	10.975	0.012*	-
21 to 40	171(39.9%)	174(46.4%)	345(42.9%)			
41 to 60	144(33.6%)	135(36.0%)	279(34.7%)			
more than 60	84(19.6%)	54(14.4%)	138(17.2%)			
Religion						
Hindu	423(98.6%)	360(96.0%)	783(97.4%)	5.323	0.021*	2.938(1.128-7.650)
Muslim	6(1.4%)	15(4.0%)	21(2.6%)			
Place of residence						
Aurahi	210(49.0%)	150(40.0%)	360(44.8%)	6.483	0.011*	1.438(1.087-1.904)
Bagdampur	219(51.0%)	225(60.0%)	444(55.2%)			

*= Significant ($P \leq 0.05$) **= Not Significant ($P > 0.05$)

	Serum antibody for <i>H. pylori</i>		Total	Chi square value	P value
	-ve (Negative) (n=429)	+ve (Positive) (n=375)	N=804		
Marital Status					
Divorced	0(0.0%)	3(0.8%)	3(0.4%)	14.599	0.002*
Married	393(91.6%)	360(96.0%)	753(93.7%)		
Unmarried	30(7.0%)	12(3.2%)	42(5.2%)		
Widow	6(1.4%)	0(0.0%)	6(0.7%)		
Occupation					
Business	45(10.5%)	51(13.6%)	96(11.9%)	39.796	0.00*
Employee	126(29.4%)	51(13.6%)	177(22.0%)		
Farmer	147(34.3%)	189(50.4%)	336(41.8%)		
Housewife	108(25.2%)	78(20.8%)	186(23.1%)		
Student	3(0.7%)	6(1.6%)	9(1.1%)		
Total family numbers					
less than 10 and more than 5	126(29.4%)	138(36.8%)	264(32.8%)	12.292	0.02*
less than 5	279(65.0%)	231(61.6%)	510(63.4%)		
more than 10	24(5.6%)	6(1.6%)	30(3.7%)		

Total income				
1 lakh to 2.5 lakh	138(32.2%)	138(36.8%)	276(34.3%)	9.303
2.5 to 5 lakhs	33(7.7%)	12(3.2%)	45(5.6%)	
less than 1 lakh	243(56.6%)	216(57.6%)	459(57.1%)	
more than 5 lakhs	15(3.5%)	9(2.4%)	24(3.0%)	

0.026*

*= Significant (P≤0.05) **= Not Significant (P>0.05)

Table 4: Association of food habits with *H. pylori* antibody test.

	Serum antibody for <i>H. pylori</i>		Total	Chi-square value	P-value
	-ve (Negative) (n=429)	+ve (Positive) (n=375)			
Fruits					
Everyday	87(20.3%)	81(21.6%)	168(20.9%)	0.429	0.807**
Never	18(4.2%)	18(4.8%)	36(4.5%)		
Sometimes a week	324(75.5%)	276(73.6%)	600(74.6%)		
Frequency of vegetables					
Everyday	255(59.4%)	180(48.0%)	435(54.1%)	17.391	0.000*
Never	6(1.4%)	0(0.0%)	6(0.7%)		
Sometimes a week	168(39.2%)	195(52.0%)	363(45.1%)		
Onion & garlic					
Everyday	300(69.9%)	237(63.2%)	537(66.8%)	4.926	0.085**
Never	3(0.7%)	6(1.6%)	9(1.1%)		
Sometimes a week	126(29.4%)	132(35.2%)	258(32.1%)		
Milk, Meat					
Everyday	132(30.8%)	75(20.0%)	207(25.7%)	13.198	0.001*
Never	36(8.4%)	45(12.0%)	81(10.1%)		
Sometimes a week	261(60.8%)	255(68.0%)	516(64.2%)		
Spicy foods					
Everyday	213(49.7%)	156(41.6%)	369(45.9%)	14.767	0.001*
Never	75(17.5%)	108(28.8%)	183(22.8%)		
Sometimes a week	141(32.9%)	111(29.6%)	252(31.3%)		
Fried foods					
Everyday	156(36.4%)	162(43.2%)	318(39.6%)	12.049	0.002*
Never	3(0.7%)	12(3.2%)	15(1.9%)		
Sometimes a week	270(62.9%)	201(53.6%)	471(58.6%)		

*= Significant (P≤0.05) **= Not Significant (P>0.05)

Table 5: Association of substance abuse with *H. pylori* antibody test.

	Serum antibody for <i>H. pylori</i>		Total	Chi- square value	P-value	OR (95% CI)
	-ve (Negative) (n=429)	+ve (Positive) (n=375)				
Alcohol						
No	261(60.8%)	234(62.4%)	495(61.6%)	0.206	0.650**	0.936(0.704-1.245)
Yes	168(39.2%)	141(37.6%)	309(38.4%)			
Smoking						
No	315(73.4%)	264(70.4%)	579(72.0%)	0.909	0.340**	1.162(0.854-1.581)
Yes	114(26.6%)	111(29.6%)	225(28.0%)			

*= Significant (P≤0.05) **= Not Significant (P>0.05)

Table 6: Association of hygiene practice with *H. pylori* antibody test

	Serum antibody for <i>H. pylori</i>		Total	Chi-square value	P-value	OR (95% CI)
	-ve (Negative) (n=429)	+ve (Positive) (n=375)				
Types of drinking water						

Hand pump	381(88.8%)	333(88.8%)	714(88.8%)	2.755	0.252**	-
Public	30(7.0%)	33(8.8%)	63(7.8%)			
Well	18(4.2%)	9(2.4%)	27(3.4%)			
Toilet facility						
No	54(12.6%)	36(9.6%)	90(11.2%)	1.796	0.180**	1.356(0.868-2.119)
yes	375(87.4%)	339(90.4%)	714(88.8%)			
Hand washing after toilet						
Always	396(92.3%)	354(94.4%)	750(93.3%)	1.398	0.237**	0.712(0.404-1.253)
Less frequent	33(7.7%)	21(5.6%)	54(6.7%)			
Hand washing before meal						
Always	390(90.9%)	345(92.0%)	735(91.4%)	0.304	0.582**	0.870(0.529-1.430)
Less frequent	39(9.1%)	30(8.0%)	69(8.6%)			
Using finger to eat						
Always	396(92.3%)	345(92.0%)	741(92.2%)	0.026	0.871**	1.043(0.623-1.747)
Less frequent	33(7.7%)	30(8.0%)	63(7.8%)			

*= Significant ($P \leq 0.05$) **= Not Significant ($P > 0.05$)

5. DISCUSSION

The present study was the first epidemiological study of *H. pylori* infection in a rural setting in Nepal. A prevalence of 46.6% was observed among the population of the rural community. This prevalence seems lower in comparison to other studies carried out in another country, which have reported rates of 50–90%.¹⁷⁻²¹ This rate is higher than that in Europe and North America,^{22,23} where the prevalence is 30-45%. In developing countries, the onset of infection is thought to take place during childhood²⁴. No significant association between *H. pylori* infection and gender was found. Similar observations have been made previously.^{25,26} The risk of infection appeared highest in households where many people were in a single house. Confined living conditions are known risk factors for infection⁵. In the present study, the highest prevalence was observed in low-income households, in agreement with other reports that have identified poverty as a risk factor predisposing to infection.²⁶ The infection rate was marginally higher in some religious groups, but this was not found to be an independent predictor. Further studies using a different design are needed to examine the role of religious groups in susceptibility to *H. pylori* infection. No significant association between *H. pylori* infection and source of drinking water from a hand pump was identified. In Nepal, people are in the habit of handling and storing potable water from the hand pump in the same way as water from a well, which might explain this result. No association was seen with the consumption of alcohol and smoking habits as similar to other studies. Association of food habits with the result of *H. pylori* showed significant association with consumption of vegetables, similarly, consumption of onion and garlic, milk and meat products consumption, spicy foods and fried foods while consumption of fruits did not show any significant

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6. CONCLUSION AND RECOMMENDATION

A prevalence of 46.6% was observed among the population of the rural community. Even though the prevalence of *H. pylori* is lower than other countries still has a higher prevalence than developed countries in the rural area and the risk factors in food habits the result of our research recommends the periodic screening and checkup of the patients to detect the infecting agent among active gastritis patients. Awareness campaigns should be focused on remote areas where education is not primary.

7. AUTHORS CONTRIBUTION STATEMENT

Mr. Suresh J conceptualized and gathered the data with regard to this work. Dr. Bishnu Raj T and Dr. Dinesh C S analyzed these data and necessary inputs were given towards the designing of the manuscript. All authors discussed the methodology and results and contributed to the final manuscript.

8. CONFLICT OF INTEREST

Conflict of interest declared none.

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