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Risk Factor Assessment of *Helicobacter pylori* Infection in a Rural Community of People with Gastritis: A Community Based Cross-Sectional Study

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Authors' contributions

This work was carried out in collaboration among all authors. Author SJ designed the study, performed the statistical analysis, wrote the protocol, managed the literature searches and wrote the first draft of the manuscript. Authors BRT and DCS managed the analyses of the study. All authors read and approved the final manuscript.

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ABSTRACT

Aim: The purpose of this study was to detect the incidence and risk factors of *H. Pylori* infections in patients with gastritis.
Study Design: A community-based cross-sectional study.
Place and Duration of Study: Mahagadhimai-5, Province 2 in a rural setting of Nepal from November 2019 to March 2020.
Methodology: Stool samples were collected from the gastritis patients and were subjected to detection of the *H. pylori* stool antigen following the procedures recommended by the manufacturer. A questionnaire was completed by the investigators with the cooperation of each participant for the potential risk factors as designed and completed.
Results: Out of 150 participants, 82 (54.7%) were female and 68 (45.3%) were male participants. Out of 150 participants, 32.7% (49) were positive for *H. pylori* antigen. No significant association

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was seen with sex, age group while others did not show significant relation with socio-demography. Association of food habits with *H. pylori* antigen has significant association with smoking habits with P-value 0.049 OR 0.518 at 95% CI (0.249- 1.080) while others did not show significant relation.
Conclusions: Nearly one-third of the population was infected with *H. pylori* in Mahagadhimai-5, Province 2. The socio-demographic profiles, socio-economic factors and lifestyle are worth taking into consideration to prevent diseases associated with *H. pylori* infection.

Keywords: Gastritis; serological testing; Helicobacter pylori.

1. INTRODUCTION

Helicobacter pylorus is the chief etiologic agent involved in gastric diseases in humans with worldwide distributions [1]. In 2005, *H. pylori* were identified as a microbiologic contaminant of water, and its role in gastric diseases was further assessed [2-4]. Improvements in sanitary conditions and higher human development indices have reduced the prevalence rate of *H. pylori* infection in developed countries. However, the prevalence rate in developing countries remains high [1,5].

H. pylori are transmissible; however, the exact route of transmission is not known [6,7]. Person-to-person transmission by either the oral-oral or fecal-oral route is most likely. *H. pylori* may also be spread orally through fecal matter through the consumption of contaminated water. Many of the reported factors for *H. pylori* infection included poor hygiene, deficient sanitation, and crowded living conditions [8,9].

Serological screening is the most rapid and appropriate way of obtaining an image of the incidence of *H. pylori* infection in a population, but the assays used need to be validated in the population studied [10,11,12]. A majority of serological studies are now conducted with commercial kits that have been evaluated in developed countries. These commercial kits are often too expensive for developing countries, and the use of a validated in-house assay based would seem preferable.

Various serological tests, mainly IgM-IgG-based combo Rapid detection test (RDT) kit, have been validated in adult populations in comparison with invasive methods, with acceptable sensitivity and specificity antibody in serum for clinical use [13,14]. Similarly, Rapid detection test kit *H. pylori* antigen can be done from stool with acceptable sensitivity for clinical use.

There has been no previous sero-epidemiological study of the Nepalese population living in rural areas; however, the prevalence of upper digestive pathologies appears to be increasing, based on reports from private and public medical practitioners.

Therefore, the primary aim of this study was to evaluate the risk of *H. pylori* infection in the Nepalese population in a rural environment. The secondary aims were to determine the association of risk factor like family status of infected individuals, and the influence of individual demographic variables and socio-economic family characteristics on the risk of infection.

2. METHODOLOGY

Design: A community-based cross-sectional study of *H. pylori* epidemiological prevalence was conducted among people with gastritis in a rural setting of Nepal. Written informed consent was obtained from the participation in the study, and the study protocol was approved by the Institutional Review Committee, Pokhara University, Nepal. The study was performed in southern, Nepal and included residents of rural area Bagdampur, Mahagadhimai-5, Province 2, characterized by the least developed place in this area, including 3 villages where the economy is based on agriculture and animals rearing. Bagdampur has 2000 inhabitants with 1 middle school. High schools are not present.

A questionnaire was completed by the investigators with the cooperation of each participant to obtain demographic information, including the age and sex of the participants, place of residence, occupation, family status, family numbers, family income, food habits, smoking, alcohol consumption, and hygiene conditions.

After consent was obtained from the head of the village, an elected chief person is responsible for giving consent. Stool samples were obtained from the participants from November 2019 to March 2020 and similarly, they were given a

screw tight container for the collection of morning stool samples.

Serologic testing: *H. pylori* sero status was evaluated by use of a commercial rapid Diagnostic test kit for antigen *H. pylori* kit, according to the manufacturer's directions (CTK Biotech; China) for detection of *H. pylori* antigen from the stool. The test has been validated and has been used by many laboratories in Nepal.

The diluted stool sample with the given diluents in the kit were analyzed serologically by IRT using a commercial kit (Antigen kit) of sensitivity 96.4% and specificity 100% as per manufacturer's specification. Using a dropper, five drops of dilution 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 5minute 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].

Statistical analysis: The frequency and distribution of participants were calculated. The chi-square test was used to assess associations between each independent factor included in the study and the prevalence of *H. pylori* infection. Univariate and multivariate analyses were performed, and age-adjusted ORs and 95% Confidence interval were calculated for the association between *H. pylori* status and the study variables. A *P* value of 0.05 was considered to be statistically significant. Data were analyzed using SPSS software version 21.

3. RESULTS

A community based cross-sectional study was carried out in a rural village of Nepal. Out of 150 participants who were problematic with gastritis were enrolled in the study, 82 (54.7% were female and 68 (45.3%) were male participants. Age group less than 20 were 7 (4.7%), 20 to 40 were 55 (36.7%), 41-60 were 57 (38%) and more than 60 were 31 (20.7%). Similarly, there were 2 (1.3%) widow, 139 (92.7%) married and 9 (6.0%) unmarried participants. There were 39 (26.0%) participants who less than 10 and more than 5 family members, 104 (69.3%) less than 5, and 7 (4.7%) more than 10 total family members. 15 (10.0%) were businessman 33 (22.0%) were employee, 91 (60.7%) were farmer and 11 (7.3%) were housewife as participants. 93 (62.0%) were illiterate, 28 (18.7%) had primary education, 17 (11.3%) had secondary education and 12 (8.0%) were university graduates. 94 (62.7%) had income less than 1 lakh per annum, 53 (35.3%) had 1 lakh to 2.5 lakh and 3 (2.0%) had 2.5 to 5 lakh per annum income.

Out of 150 participants, 37 (24.7%) had eating habits of vegetables everyday 112 (74.7%) had only sometimes a week and 1 (0.7%) never ate the vegetables. 26 (17.3%) ate the fruits daily while 120 (80.0%) sometimes a week and 4 (2.7%) never ate the fruits. 9 (6.0%) were those who took milk and meat products daily while 121 (80.7%) sometimes a week and 20 (13.3%) never took these products. 65 (43.3%) took onion and garlic daily used while 83 (55.3%) sometimes a week and 2 (1.3%) never took onion and garlic as their food supplement. 57 (38.0%) took fried foods daily while 90 (60.0%) took sometimes a week and 3 (2.0%) never took fried foods. 50 (33.3%) took spicy foods daily while 47 (31.3%) took sometimes a week and 53 (35.3%) never took spicy foods. 72 (48.0%) were alcohol consumers and 78 (52.0%)did not consume alcohol similarly 58 (38.7%) were smokers and 92 (61.3%) were not smokers.

In the study in hygiene practice,131 (87.3%) had always hand washing habits before meals while 19 (12.7%) had less frequent hand washing before meals. 132 (88.0%) had hand pumps as a source of drinking water while 13 (8.7%) were public supply users of drinking water and 5 (3.3%) were users of well water. 129 (86.0%) had a toilet facility in their house and 21 (14.0%) did not have a toilet facility. 135 (90.0%) always washed their hands after the use of the toilet and 15 (10.0%) had less frequent washing hands after the use of the toilet.

For serological examination of *H. pylori* antigen while 67.3% (101) were negative as shown in Table 1. Association with the result of H. pylori antigen did not show significant relation with socio-demography as in Table 2. Association of food habits with *H. pylori* antigen has a significant association with smoking habits with P-value 0.049 while other did not show significant relation as shown in Table 3. Association of hygiene practice with *H. pylori* antigen result did not show significant relation as shown in Table 4.

Table 1. *H. pylori* antigen detection

Variables	Frequency(n)	Percentages (%)
Result (Antigen)		
Negative	101	67.3
Positive	49	32.7
Total	150	100.0

Table 2. Association of socio demography with *H. pylori* antigen test

	Stool antigen for *H. pylori*		Total	Chi square value	P value
	-ve (Negative) (n=101)	+ve (Positive) (n=49)			
Sex					
Female	52(51.5%)	30(61.2%)	82		
Male	49(48.5%)	19(38.8%)	68	1.263	0.171
Age Group					
less than 20	3(3.0%)	4(8.2%)	7		
21 to 40	35(34.7%)	20(40.8%)	55		
41 to 60	44(43.6%)	13(26.5%)	57		
more than 60	19(18.8%)	12(24.5%)	31	5.282	0.152
Marital Status					
Married	96(95.0%)	43(87.8%)	139		
Unmarried	4(4.0%)	5(10.2%)	9	2.606	0.272
Widow	1(1.0%)	1(2.0%)	2		
Occupation					
Business	10(9.9%)	5(10.2%)	15		
Employee	23(22.8%)	10(20.4%)	33		
Farmer	60(59.4%)	31(63.3%)	91	0.313	0.957
Housewife	8(7.9%)	3(6.1%)	11		
Total Family numbers					
less than 10 and more than 5	27(26.7%)	12(24.5%)	39		
less than 5	68(67.3%)	36(73.5%)	104		
more than 10	6(5.9%)	1(2.0%)	7	1.319	0.517
Education					
Illiterate	62(61.4%)	31(63.3%)	93		
Primary school	20(19.8%)	8(16.3%)	28		
Secondary school	11(10.9%)	6(12.2%)	17		
University	8(7.9%)	4(8.2%)	12	0.288	0.962
Total income per year					
1lakh to 2.5 lakh	35(34.7%)	18(36.7%)	53		
2.5 to 5 lakhs	3(3.0%)	0(0.0%)	3		
less than 1 lakh	63(62.4%)	31(63.3%)	94	1.500	0.472

For sex OR 0.672 at 95% CI (0.336-1.346)

4. DISCUSSION

The present study was the first study of *H. pylori* infection in rural areas focusing on province 2 in Nepal. A prevalence of 32.7% was observed among the gastritis population in rural communities. This prevalence is lower in comparison with other studies carried which have reported rates of 50–90% [15,16,17–19]. This rate is higher than that in Europe and North America [20,21], where the prevalence is 25–30%. In developing countries, the onset of infection is thought to take place during childhood. No significant association between *H. pylori* infection and gender was found. Similar observations have been made previously [22,23], although other studies have reported a higher prevalence of infection among men [24,25]. There is no apparent biological reason why males should have greater exposure or susceptibility to infection. However, in certain populations, more frequent antimicrobial treatment in women with uro-genital tract infections could simultaneously eliminate *H. pylori* infection.

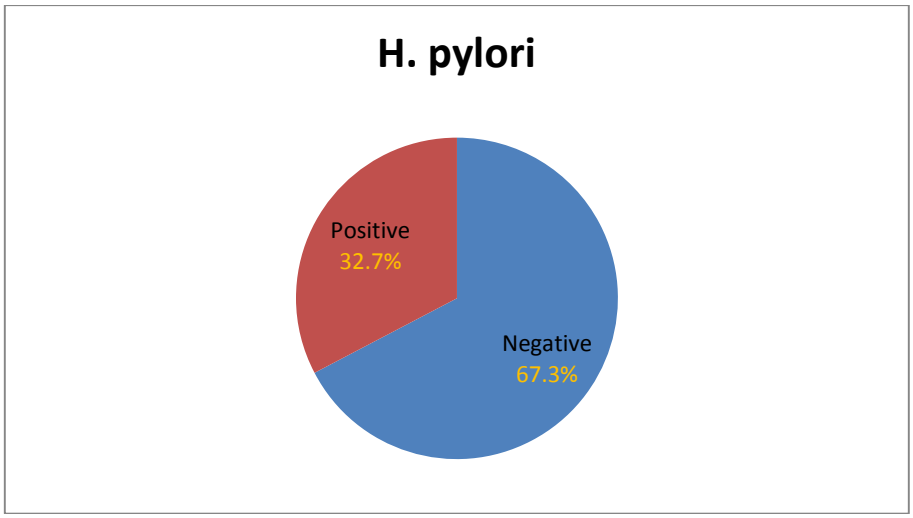

Fig. 1. *H. pylori* antigen detection

Table 3. Association of food habits with *H. pylori* antigen test

	Stool antigen for *H. pylori*		Total	Chi square value	P value
	-ve (Negative) (n=101)	+ve (Positive) (n=49)			
Fruits					
Everyday	19(18.8%)	7(14.3%)	26		
Never	3(3.0%)	1(2.0%)	4		
Sometimes a week	79(78.2%)	41(83.7%)	120	0.620	0.734
Frequency of vegetables					
Everyday	23(22.8%)	14(28.6%)	37		
Never	0(0.0%)	1(2.0%)	1		
Sometimes a week	78(77.2%)	34(69.4%)	112	2.783	0.249
Onion & garlic					
Everyday	43(42.6%)	22(44.9%)	65		
Never	1(1.0%)	1(2.0%)	2		
Sometimes a week	57(56.4%)	26(53.1%)	83	0.382	0.826
Milk, Meat					
Everyday	8(7.9%)	1(2.0%)	9		
Never	12(11.9%)	8(16.3%)	20		
Sometimes a week	81(80.2%)	40(81.6%)	121	2.399	0.301
Spicy foods					
Everyday	36(35.6%)	14(28.6%)	50		
Never	35(34.7%)	18(36.7%)	53		
Sometimes a week	30(29.7%)	17(34.7%)	47	0.798	0.671
Fried foods					
Everyday	39(38.6%)	18(36.7%)	57		
Never	2(2.0%)	1(2.0%)	3		
Sometimes a week	60(59.4%)	30(61.2%)	90	0.049	0.976
Alcohol					
No	51(50.5%)	27(55.1%)	78		
Yes	50(49.5%)	22(44.9%)	72	0.281	0.362
Smoking					
No	57(56.4%)	35(71.4%)	92		
Yes	44(43.6%)	14(28.6%)	58	0.518	0.05*

*For smoking OR 0.518 at 95% CI (0.249- 1.080) *Significant*

Table 4. Association of hygiene practices with *H. pylori* antigen test

	Stool antigen for H. pylori		Total	P value	OR	95% CI
	-ve (Negative)	+ve (Positive)				
	(n=101)	(n=49)				
Consumption of drinking water						
Hand pump	91(90.1%)	41(83.7%)	132			
Public	6(5.9%)	7(14.3%)	13	0.205	Ref.	Ref.
Well	4(4.0%)	1(2.0%)	5			
Toilet facility						
No	15(14.9%)	6(12.2%)	21			
yes	86(85.1%)	43(87.8%)	129	0.666	1.250	(0.453 - 3.449)
Hand washing after toilet						
Always	90(89.1%)	45(91.8%)	135			
Less frequent	11(10.9%)	4(8.2%)	15	0.601	0.727	(0.219 - 2.412)
Hand washing before meal						
Always	90(89.1%)	41(83.7%)	131			
Less frequent	11(10.9%)	8(16.3%)	19	0.348	1.596	(0.598 - 4.265)
Using finger to eat						
Always	89(88.1%)	40(81.6%)	129			
Less frequent	12(11.9%)	9(18.4%)	21	0.283	1.669	(0.651 - 4.278)

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].

No significant association between *H. pylori* infection and the supply of drinking water from wells was identified. In Bagdampur, people are in the habit of handling and storing potable water from the hand pump and in the same way as water from a well, which might explain this finding.

Association with the result of H. pylori antigen did not show significant relation with socio demography. Association of food habits with *H. pylori* antigen has significant association with smoking habits with P value 0.049 while other did not show significant relation. Association of hygiene practice with *H. pylori* antigen result did not show significant relation.

5. CONCLUSION AND RECOMMENDATION

Though people were on PPI drugs, still the incidence of *H. pylori* in these individuals is found higher. The findings of our research suggest the episodic screening and examination of the patients in order to detect the infecting agent among the rural areas' patient. Anti *H. pylori* drugs are required for treating infective gastritis for complete treatment. A great deal of community awareness and health training programs should be conducted to aware the public about gastritis. Awareness movements should be focused on rural areas where education is not primary.

CONSENT AND ETHICAL APPROVAL

An ethical permission was obtained from the Institutional Review Committee, Pokhara University for ethical clearance (Ref no.97/076/077). The permission was obtained from the Bagdampur, Mahagadhimai-5, ward office, Bara District, Nepal. Participants were verbally informed about the study and written consents were taken from the eligible participants.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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