Original Article

Prevalence and risk factors of Helicobacter pylori infection among Pakistani population

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ABSTRACT

Objective: Prevalence of *H. pylori* infection is higher in developing countries including Pakistan. The basic purpose of this study was to investigate the prevalence of *H. pylori* infection and determination of possible risk factors.

Methodology: A prospective epidemiologic survey of *H. pylori* infection was accomplished in 2008 and 2009 involving 516 asymptomatic individuals of Barakaho, Islamabad, Pakistan. Data were obtained by questionnaire and *H. pylori* positivity was checked by ^{13}C UBT.

Results: A total of 516 individuals participated in the study of which 384 (74.4%) were positive for *H. pylori* infection. The prevalence was 73.5% in males and 75.4% in females ($p = 0.622$) and increased with increasing age ($p < 0.001$). Presence of household animals ($p = 0.004$) and more family members ($p = 0.025$) were significantly correlated with *H. pylori* prevalence while no association was seen with other risk factors such as education level, drinking water source, number of rooms in house and monthly family income.

Conclusions: High prevalence of *H. pylori* infection in Pakistani population is comparable to the data of developing countries. *H. pylori* infection was significantly associated with presence of household animals and more family members.

KEY WORDS: Prevalence, *H. pylori*, ^{13}C UBT, Risk factors.

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INTRODUCTION

Helicobacter pylori persistently colonizes gastric mucosa of humans and plays an important role in gastrointestinal diseases, especially peptic and duodenal ulcers as well as gastric cancer.[1-3] The *H. pylori* infection has emerged as one of the most common chronic bacterial infections worldwide and affects nearly 50% of the world's population, with most of the infections occurring in the first decade of life.[4] It has been demonstrated that risk of *H. pylori* infection in developing countries with low socioeconomic status is much higher (> 80%) than that in developed countries (< 40%).[5,6]

Although the route(s) of transmission of *H. pylori* infection remain uncertain, potential mechanisms can be ascertained by collecting and analyzing epidemiological data related to *H. pylori* infection. The aim of the present study was to estimate the prevalence and determine the association of *H. pylori* infection with potential risk factors. Study of the prevalence of *H. pylori* infection will help the health-care authorities to understand the disease burden in our population and take appropriate remedial measures to tackle *H. pylori* associated diseases.

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METHODOLOGY

Study was approved by Ethics Committee of Pakistan Institute of Nuclear Science and Technology (PINSTECH) and informed consent was obtained from subjects or parents/guardians of the subjects.

Subjects: Asymptomatic healthy individuals residing at Barakaho in the vicinity of Islamabad, were invited to participate in the study. Subjects having any chronic illness or on medication were excluded and a total of 516 urea breath test samples were collected.

Questionnaire: The subjects were interviewed at home by one of the authors using a pre-tested questionnaire, while data about young children was collected from an elder member of the family (one of the parents or an elder brother/sister). Questionnaires contained information on name, age, gender, monthly family income, education level, number of persons in household, number of living rooms, source of drinking water and presence of household animals etc.

^{13}C Urea Breath Test: *H. pylori* infection was defined by a positive ^{13}C urea breath test (^{13}C UBT) performed on an empty stomach early in the morning. Baseline breath sample was collected in a glass vial by blowing through a straw. Subjects were then given 75 mg ^{13}C urea (Isotec, Miamisburg, Germany) with orange juice and second breath sample was collected 30 minutes later. The two vials were capped securely and transported to the BreathMAT Lab, Nuclear Medicine, Oncology and Radiotherapy Institute (NORI), Islamabad. Sample vials were stored at room temperature until analyzed for $^{13}CO_2/^{12}CO_2$ ratio using BreathMAT^{plus} mass spectrometer (Thermo, Finnigan, Germany) and positive result was defined by a cut-off of more than 5‰.[7]

Statistical Analysis: Statistical analysis was performed using the SPSS 15.0 statistical software program (SPSS Inc, Chicago, USA). Differences in infection prevalence among different groups were analyzed using χ^2 test. Odds ratio (OR) of *H. pylori* infection in the presence of a particular factor were used as a measure of association and are presented with a 95% confidence interval (CI). Variables with p value less than 0.05 were considered significantly associated with *H. pylori* infection.

RESULTS

The population characteristics and prevalence in various age categories has been published before as a brief account however, briefly, the study participants consisted of children and adults (age range 2-70 years, mean 21.36±14.48) with 268 (51.9%) males and 248 (48.1%) females. The prevalence of *H. pylori* infection in the participants was 74.4% (384/516) with 73.5% males and 75.4% females infected with *H. pylori* infection (p = 0.622). It was observed that prevalence of infection increased with age in all subjects starting from children (63.5%) to adolescents (78.8%, p = 0.003) and maximum in adults (81%, $p < 0.001$).[8]

In the study, no significant association was found between *H. pylori* infection and education levels of asymptomatic adults that were categorized in groups of illiterate (83.3%, 30/36), primary school (84.0%, 42/50), middle school (77.6%, 38/49), high school (76.9%, 40/52) and college and university (88.9%, 16/18) with p value 0.720 as shown in Table-I.

Prevalence of *H. pylori* infection among city water consumers was found to be (74.0%, 77/104) as compared to user of boring water (73.1%, 106/145) and well water (75.3%, 201/267), though no significant association was seen for source of drinking water (p = 0.885) as shown in Table-II.

This infection was significantly high in those asymptomatic subjects, who had household animals including cat, dog, goat, buffalo, cow, hen or parrot (80.2%, 202/252) than those who had no animals (68.9%, 182/264) in their houses with significant difference (p = 0.004), results are shown in Table-II. The prevalence of *H. pylori* infection in the group with six or less than six family members (69.8%, 169/242) was lower as compared to the group

Table-I: Relationship between H. pylori infection with education levels in adults.

Education Levels	*Subjects*	*UBT+ (%)*	*OR (95% CI)*	*p value*
				0.720[a]
Illiterate	36	30 (83.3)	1.50 (0.50-4.45)	0.464
Primary School	50	42 (84.0)	0.63 (0.23-1.71)	0.368
Middle School	49	38 (77.6)	0.96 (0.38-2.44)	0.940
High School	52	40 (76.9)	1.00 (1.00-1.00)	1.000
College and University	18	16 (88.9)	2.40 (0.48-11.9)	0.274

Note: [a]χ^2 test among all groups, OR: odds ratio, CI: confidence interval

Table-II: Association of H. pylori infection with study variables.

Variables	*Subjects*	*UBT+ (%)*	*OR (95%CI)*	*p value*
Source of Drinking Water				0.885a
City water	104	77 (74.0)	1.04 (0.59-1.85)	0.869
Well water	267	201 (75.3)	0.89 (0.56-1.41)	0.628
Boring water	145	106 (73.1)	1.00 (1.00-1.00)	1.000
Presence of Household Animals				
Yes	252	202 (80.2)	1.82 (1.21-2.72)	0.004
No	264	182 (68.9)	1.00 (1.00-1.00)	1.000
Number of Family Members				
≤6	242	169 (69.8)	1.00 (1.00-1.00)	1.000
≥7	274	215 (78.5)	1.57 (1.05-2.34)	0.025
Number of Rooms				
1-3	333	244 (73.3)	1.00 (1.00-1.00)	1.000
≥4	183	140 (76.5)	1.18 (0.78-1.80)	0.421
Monthly Family Income				0.537a
≤3000	35	26 (74.3)	1.18 (0.78-1.80)	0.421
4000-9000	252	186 (73.8)	1.00 (1.00-1.00)	1.000
≥10000	229	172 (75.1)	1.07 (0.71-1.61)	0.744

Note: [a]χ^2 test among all groups, OR: odds ratio, CI: confidence interval

with seven or more than seven members (78.5%, 215/274), with significant statistical difference (p = 0.025, Table-II).

Asymptomatic subjects were categorized into two groups with respect of number of rooms in house as shown in Table-II. The prevalence of *H. pylori* infection in the group with one to three rooms in house (73.3%, 244/333) was comparatively lower than that in the group with four or more than four rooms (76.5%, 140/183), with insignificant association (p = 0.421).

As for the association of prevalence and monthly family income, in the three groups (with an average level of Rs 12,892/- per month = approximately USD 151), it was found that individuals with a monthly family income of Rs. ≤3000 had 74.3% (26/35) while those with monthly family income of Rs. 4000 to 9000 and ≥10000 had 73.8% (186/252) and 75.1% (172/229) of *H. pylori* infection, respectively, and the difference was also insignificant (p = 0.537, Table-II).

DISCUSSION

The variation in the prevalence of *H. pylori* infection between different populations suggests that different parameters such as socioeconomic status[9] and environmental factors[10] play a key role in the acquisition of *H. pylori* infection. Examination of different populations in which some of these factors are relatively constant should provide important information regarding the epidemiology and transmission of *H. pylori* infection.

In last few years, risk factors of *H. pylori* infection have been investigated around the world.[11,12] *H. pylori* infection was usually considered to be associated with socioeconomic status with contradictory results[13,14] and for this reason the risk factors of *H. pylori* infection are still not clear.[15]

In the past two years, the Life Science Group, IAD, PINSTECH conducted an epidemiologic survey in order to discern the overall picture of *H. pylori* prevalence and the related risk factors in Barakaho, Islamabad. In the study presented, we have reported high prevalence of *H. pylori* infection (74.4%) in this region, which was similar to the reports of other authors of same region i.e. 76.7%[16], 79.0%[17] and 84.6.[18] *H. pylori* infection is acquired early in childhood and has an association with increasing age.[10] Similarly in our present study, the prevalence of *H. pylori* infection increased with age and significant association between *H. pylori* infection and increasing age in all subjects was observed.

There is a general trend in which higher education status is associated with a lower prevalence of *H. pylori* infection.[19,20] But in our study, we found that prevalence of *H. pylori* infection was not affected in adults with different education levels.

In studied area, drinking water is obtained from different sources including municipal supply, shallow well or boring. The shallow well or boring are usually situated inside the house and sometimes near to the open toilet. Impurities from the surface can easily reach water sources whereas municipal authorities in Pakistan have inadequate

purification systems[21] that make water more susceptible to contamination. It has been reported that contaminated water can transmit number of diseases and a waterborne route is a possible mode of transmission of *H. pylori* infection.[22] But, in current study no significant association was found between *H. pylori* infection and the source of drinking water ($p = 0.885$), though prevalence of *H. pylori* infection was high among city, boring and well water consumers. This was consistent with the report from India, in which authors found high prevalence of *H. pylori* infection among consumers of city (74.8%) and well water (92.0%)[23] whereas no association was observed between *H. pylori* prevalence and tube well water in Bangladesh.[24]

Frequent contact with domestic animals has been identified as a risk factor for the acquisition of *H. pylori* infection[25] and we found significant association of *H. pylori* infection with the presence of household animals in houses of studied individuals. This may be due to the reason that current study site was the area of low income residents where, they got contact with domestic animals like buffalo, cow, goat, birds, etc used for milk, meat and other economical benefits.

It is generally thought that risk factors for *H. pylori* infection include more family members.[26] In the current study, *H. pylori* infection was relatively more prevalent in those households with seven or more than seven members as compared to six or less than six family members, with significant statistical difference that is in agreement with the other report[27] suggesting congestion in family is a risk factor for acquisition of *H. pylori* infection.

In addition, no association was observed between prevalence of infection and the number of living rooms in a house. Similarly, the monthly family income had no association with the prevalence of *H. pylori* infection.

In conclusion, high prevalence of *H. pylori* infection (74.4%) in the asymptomatic residents of Barakaho, Islamabad, Pakistan was seen. No significant difference was seen between *H. pylori* infection and gender while statistically significant association was found with increasing age. Presence of household animals and more family members were significantly associated with *H. pylori* infection while no apparent association with other risk factors such as education, source of drinking water, number of rooms and monthly family income was found in the current study. Given its complications including gastritis and gastric cancer, *H. pylori* infection endangers public health. These prevalence results may be helpful in defining high risk population of Islamabad, Pakistan and will provide clues to estimate the *H. pylori* associated disease burden of our future population. Healthcare planning through educational programs on topics like transmission routes of *H. pylori* infection and relevant preventive measures could be implemented and facilitated. The current study is the first step to demonstrate the prevalence and identification of risk factors of *H. pylori* infection while there is need of extensive work to develop a full-blown population based screening and treatment program in Pakistan.

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