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Prevalence of *Helicobacter pylori* in Relation to Promotive Factors among Human Urban Population of Bahawalpur District, Pakistan

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Abstract: A causal relationship between *Helicobacter pylori* (HP) infection and the occurrence of digestive diseases in adults and children has been proven. The present study was carried out to determine prevalence of HP in relation to sex, age and promotive factors among human urban population of Bahawalpur-district, Pakistan for a period of 10 months (Feb. 01, 2004 to Nov. 30, 2004). HP-positive (serum IgG antibodies) participants were interviewed regarding past and current socioeconomic indicators; demographic characteristics; nutritional and behavioral habits and history of gastrointestinal symptoms of family members. HP-infection was ascertained through the ^{13}C-UBT. The population (5-65 years) was divided into three age groups; adult (>50 years), mature (10-50 years) and child (<10 years). The results from present study indicated that among the observed urban population of Bahawalpur (n = 3846), prevalence of HP was 45.66%. HP prevalence when studied in different age groups of both sexes, it was found maximum (47.43%, n = 875) in adult male as compared to mature males (46.00%, n = 924) and child males (39.27%, n = 545). The higher prevalence (49.60%, n = 631) in adult females as compared to mature females (47.71%, n = 547) and child females (39.51%, n = 324) was observed. Data showed higher prevalence of infection in female groups in comparison to respective male groups. Analysis of socioeconomic status, indicated a higher HP infection (44.70%, n = 3246) in the individuals from families with a low socioeconomic level and a high rate of overcrowding. The prevalence of bacteria (HP) was 37.78% (n = 953), 35.63% (n = 1625) and 64.43% (n = 1268) in fresh, stored inside house and water users from other sources, respectively. The infection was higher in those whose parents/family members had suffered from gastroduodenal disease. HP-infection was more frequent (66.83%, n = 1643 and 52.38%, n = 2167) in toilet user outside the home and smokers, respectively. The infection with HP was common among population of Bahawalpur district which was linked to age, sex, smoking, history of gastrointestinal symptoms of family members, deprived socioeconomic conditions and poor sanitation.

Key words: *Helicobacter pylori*, gastrointestinal-disorder, population, sex, age, bacteria, smoking, socioeconomic condition, sanitation

INTRODUCTION

Helicobacter pylori (HP) have been found to be associated with gastrointestinal disorders like gastric and duodenal ulcers as well as gastric cancer (Shiotani *et al*., 2000; Beales *et al*., 2000; Karima *et al*., 2006). It has also been associated with growth retardation in children (Patel *et al*., 1994) and increases the risk of adult coronary heart disease (Mendali *et al*., 1994; Patel *et al*., 1995; Murray *et al*., 1995).

Other species, including genus Helicobacter; *H. cinaedi*, *H. fennelliae* and *H. mustelae*. The *H. cinaedi* and *H. fennelliae* were initially isolated from homosexual men with proctitis, proctocolitis and/or enteritis while *H. mustelae* was isolated from ferrets. *H. cinaedi* and *H. fennelliae* may colonize the GI-tract without causing disease. *H. cinaedi* has been found to be the primary cause of bacteraemia in AIDS patients (Graham, 1989; Wotherspoon *et al*., 1991).

Acquisition of HP infection seems to occur in the early age of childhood and to persist throughout life (Mcgraud, 1993). Prevalence in childhood ranges from 5-10% in developed countries and 80-90% in developing countries (Goodman and Correa, 1995). Variation in prevalence within populations seems to be largely associated with socioeconomic factors. Low socioeconomic status and poor living and housing conditions are clearly related to infection status (Mendali *et al*., 1992). The prevalence of HP infection varies both among and within populations and is inversely related to standard of living and sanitary practice (Nurgalieva *et al*., 2002). Although, infection with HP occurs in all parts of the world but increased risk of acquisition of the infection is especially high among those living in developing and under developed countries (Lindkvist *et al*., 1998). The risk is multifactorial that may include interaction with potentially contaminated environmental sources as local drinking water and the

ingestion of fecally contaminated vegetables have all been reported as risk factors for the acquisition of HP infection (Sasaki *et al*., 1999; Santos *et al*., 2005). In addition, HP has been reported to be able to survive in water (West *et al*., 1992). Current knowledge implies various pathways of agent transmission, favoring a person-to-person mode of transmission early in life. Both fecal-oral as well as oral-oral transmission may occur and may be of different relevance among various populations (Leandro *et al*., 2005; Soonami *et al*., 2006).

Most previous studies have been carried out in clinical settings and sample sizes were small in most studies. There is limited evidence concerning the prevalence, determinants and mode of infection in representative population samples. Moreover, data is not available about the current status of HP-infection in Pakistani population. Therefore, a cross-sectional study among the population of Bahawalpur district, Pakistan was conducted where the prevalence and promoting factors of HP-infection were determined.

MATERIALS AND METHODS

This was a population-based cross-sectional study which was carried out from Feb. 01, 2004 to Nov. 30, 2004. A total of 3846 peoples (2344 male, 1502 female) of different age groups of urban areas of Bahawalpur, Pakistan were screened for HP-infection and promoting factors.

Healthy individuals of either sex, age (5-65 years) without any previous diagnosis were included in this study. The population was divided into three age groups i.e., adult male/female (age above 50 years), mature male/female (age 10-50 years) and child male/female (age below 10 years). The male and female of same age were grouped separately. A willingness certificate for co-operation in carrying out the purpose of present study was obtained, singed by each individual and/or his/her guardian(s) before their inclusion in the study (Tassaduqe *et al*., 2004; Maria *et al*., 2005).

The seropositivity for HP infection was considered a dependent variable. The independent variables in relation to the volunteer were age, gender, kind of housing, access to water, garbage disposal, regular use of toilets, crowded homes, family income (in minimum wages), complaint by any person living in the same house of gastrointestinal pain and previous history of dyspepsia or peptic ulcer and smoking (both individual or his/her companion(s). The researcher conducted an interview with the volunteers and their guardian or parent to fill out the questioner (Nurgalieva *et al*., 2002).

The IMMUNOCOMB-kit II *Helicobacter pylori* IgG and ELISA technique (enzyme linked immunosorbent assay) by Orgenics were used for the serological test with the aim of detecting IgG antibodies for HP in the serum/plasma, based on the principle of solid phase immunoassay, according to the manufacturer's recommendations. The cutoff point was obtained for each kit separately. The test was considered positive when staining was equal to or higher than 20 IU mL^{-1} (maximum limit of 160 IU mL^{-1}). In order to obtain the result, the intensity of staining was compared with the CombScale reference card (Nurgalieva *et al*., 2002).

The presence of infection was confirmed by the isotope technique, the ^{13}C-Urea Breath Test (^{13}C-UBT) (Cambridge Isotope Laboratories Inc., Massachusetts, USA) (Zubillaga *et al*., 1999; Santos *et al*., 2005).

RESULTS

Prevalence of *H. pylori* infection: A total of 3846 volunteers (1506 adult, 1471 mature and 869 children) participated in the study. The prevalence of HP was 47.43% and 49.60% among adult of male and female groups, respectively. 46.00%, 47.71% prevalence was found in mature while 39.27%, 39.51% in child groups of both male and female, respectively. The overall HP-infection was 45.66% in the observed population (Table 1).

Table 1: Prevalence of *Helicobacter pylori* (HP) in different age groups of population

Type	Age (year)	Sex	N	Normal	HP positive
Adult	>50	Male	875	460	415 (47.43%)
Mature	10-50	Male	924	499	425 (46.00%)
Child	<10	Male	545	331	214 (39.27%)
Adult	>50	Female	631	318	313 (49.60%)
Mature	10-50	Female	547	286	261 (47.71%)
Child	<10	Female	324	196	128 (39.51%)
Total			3846	2090	1756 (45.66%)

Table 2: Distribution of HP infection according to the study variables among population

Variable		N	Normal	HP positive	%age
Socioeconomic status	High	136	104	32	23.53
	Middle	464	191	273	58.84
	Lower	3246	1795	1451	44.70
Crowding (No of person/room)	1-2	328	95	233	71.04
	3-4	1279	736	543	42.46
	>4	2239	1259	980	43.77
Source of drinking water	Fresh	953	593	360	37.78
	Stored in home	1625	1046	579	35.63
	Stored outside	1268	451	817	64.43
Toilet inside the home	Yes	2203	1545	658	29.87
	No	1643	545	1098	66.83
Gastrointestinal symptoms in any person inside home	No symptom	2471	2076	402	15.27
	Dyspepsia	546	5	541	99.08
	Peptic ulcer	829	9	820	99.91
Smoking	Yes	1967	932	1035	52.62
	Living with smokers	1479	984	495	33.47

Effect of different factors on *H. pylori* infection: The prevalence of HP infection was 23.53% (n = 136), 58.84% (n = 464) and 44.70% (n = 3246) among the subjects with the high, middle and low socioeconomic status. Home crowding indicated 71.04% (n = 328) infection in those residing 1-2 person per room, 42.46% (n = 1279) and 43.77% (n = 2239) infection living 3-4 and more than 4 persons per room, respectively. The prevalence of infection among fresh water drinkers (n = 953) was 37.78% compared with 35.63% among those who drank stored (inside home) water (n = 1625) and 64.43% who used water from other sources (n = 1268). The individuals used toilets inside the house (n = 2203) suffered from infection 29.87% in comparison to 66.83% who used toilets outside of home (n = 1643). The presence of patient suffering from dyspepsia and/or peptic ulcers inside home caused 99.08% (n = 546) and 99.91% (n = 829) HP-infection, respectively. Smoking yielded 52.62% (n = 1967) and non-smokers living with smokers suffered 33.47% (n = 1479) from infection with HP (Table 2).

DISCUSSION

In the present study the prevalence of *Helicobacter pylori* (HP) infection was investigated by determining the IgG against HP and ^{13}C-urea breath test in a population-based sample of healthy urban population of Bahawalpur, district of Pakistan. A total of 3846 individuals were tested for the presence of HP-infection out of which 1756 were infected (Fig. 1). The study exhibited an overall 45.66% prevalence (Table 1). This figure is higher than the prevalence of infection detected in population-based studies conducted in developed countries like Australia (30.6%) (Peach *et al*., 1997), England (27.6%) (Moayyed *et al*., 2002) and United States (32.7%) (McQuillan *et al*., 2004) and similar to prevalence rates detected in developing settings in South America, Africa and parts of Asia (Pounder and Ng, 1995).

The data presented a maximum prevalence of HP-infection in the adults (>50 years) both in male and female groups of population followed by matures (10-50 years) groups (both sexes). But the prevalence of infection in child groups (male and female) was 39.36% (n = 869) which remained minimum in comparison to adults and matures (Fig. 2). Many reports have been indicated that HP-infection acquires in childhood and prevalence has been increased with increase in age (Francesco *et al*., 1997; Baena *et al*., 2002; Nguyen *et al*., 2006). The findings of this study further indicated the higher prevalence of infection in female groups in comparison to the respective male groups (Table 2) which was found in agreement with Karima *et al*. (2006) findings.

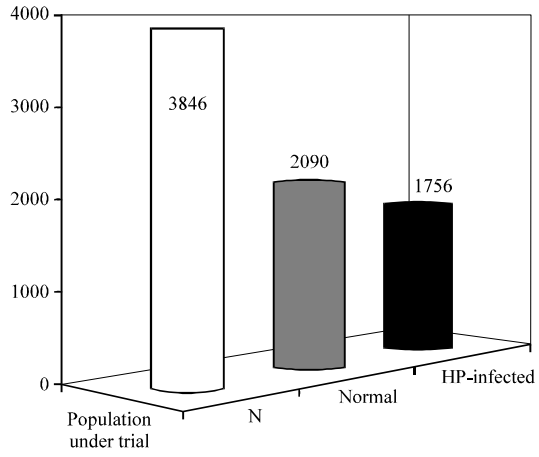

Fig. 1: Prevalence of HP-infection in population

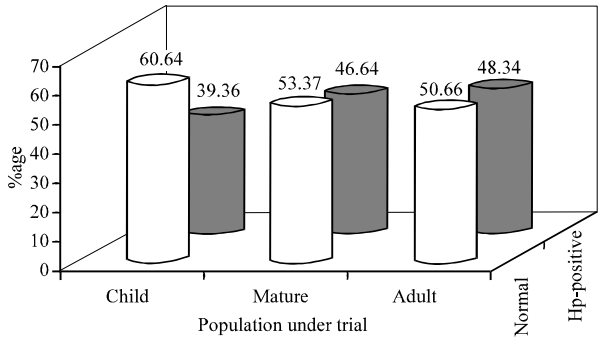

Fig. 2: Prevalence of HP-infection in different groups (male and female) of population

One of the most marked finding of the study was the association between the prevalence of HP-infection and the water use which provides a simple measure of household hygiene. For example, those individuals who consistently boiled water before drinking and who frequently bathed and never reused water had the lowest prevalence of HP. Socioeconomic status is often a surrogate marker for the level of sanitary and hygienic practices and it is a major factor that frequently correlates with the variation in the prevalence of HP-infection (Klein *et al*., 1991). The data showed less rate of infection in the upper socioeconomic levelers. An inverse association between socioeconomic status and HP-infection in the current study, made it less important than the water uses and house hold sanitation. This finding is consistent with a study from Peru which reported that water source was more important than socioeconomic status for *H. pylori* acquisition (Klein *et al*., 1991). Crowding is another indirect measure of household hygiene and it has been reported to be an important

risk factor for HP acquisition (Mendall *et al*., 1992; Webb *et al*., 1994; Malaty *et al*., 1996a,b; McCallion *et al*., 1996; Torres *et al*., 1998; Goodman and Correa, 2000). The findings demonstrated the direct relation of crowding with the spread of infection. The study further indicated that 66.83% of those who used outdoor facilities were HP-infected compared with 29.87% of those with indoor toilets. It has been noted previously that the presence of fecal material near the home is a risk factor for diarrhoeal disease (Van Derslice and Briscoe, 1995). Another major finding of the current study was the higher prevalence of HP-infection among those who had any patient suffering from gastrointestinal symptoms in their home. The dyspepsia and peptic ulcer patients caused 99.08% (n = 546) and 99.91% (n = 829) prevalence, respectively (Table 2), in accord to Karima *et al*. (2006) findings. Smoking also induced the markedly high rate of infection (52.38%, n = 2167) while the companies of smokers found another factor for acquisition of HP-infection (35.44%, n = 1679). The similar relationship between HP-infection and smoking was observed by El-Shahat *et al*. (2005).

Dietrich *et al*. (1998) reported that living conditions or exposure to environmental factors in very early childhood are likely to play the key role in acquiring HP-infection. They further found cultural practices, nutritional factors or sanitary circumstances as relevant factors. As several other studies have shown, poor socioeconomic conditions associated with overcrowding and inadequate hygiene at home are important risk factors for HP-infection (Megraud *et al*., 1989; Mendall *et al*., 1992; Francesco *et al*., 1997). Indeed, in our study a significant correlation was found between socioeconomic conditions, household crowding and HP status, confirming the previously reported data.

In conclusion, our data suggest that transmission of HP is largely opportunistic such that it can result from any route that can deliver the bacterium to the stomach. Enteric infection related to water can be either water borne (such as cholera) or related to poor sanitary practices (water washed). The data suggest that HP can be transmitted either way and that to reduce the rate of transmission, an improvement in overall sanitation will be required including clean water, waste disposal and household hygienic practices.

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