Helicobacter pylori Infection in Adults from a Poor Urban Community in Northeastern Brazil: Demographic, Lifestyle and Environmental Factors

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We investigated the prevalence and the risk factors for infection with *Helicobacter pylori* in a randomly-selected population of adults from a low-income community in Northeastern Brazil. *Helicobacter pylori* infection was determined by ELISA. Risk factors were assessed using a structured interview. Two hundred and four individuals were included in the study, including 49 males and 155 females, ranging from 18 to 80 years old. Overall, 165 of 204 participants (80%) were *H. pylori* positive, without significant gender differences (p= 0.49). The infection rate was of 84.7% in subjects 18 to 30 years of age, increasing to 92% in subjects 46-60 years old. Above 60 years old, the prevalence decreased slightly. As a whole, the prevalence of infection did not increase significantly (p=0.147) with age. There were no significant differences in the prevalence of *H. pylori* infection, when patients were classified by age, smoking habit, educational level, alcohol consumption, the number of persons per room, the number of children per household, the number of adults per household, cup-sharing, household pets, toilet location, number of persons per bed and medical history of antibiotic and raw vegetable ingestion. In conclusion, no risk factors associated with infection was found in these adults, suggesting that the infection, even in a poor population, may be acquired predominantly during childhood; the relatively high prevalence that we observed may be more due to a cohort effect than to acquisition of infection during adulthood.

Key Words: *Helicobacter pylori*, prevalence, risk factors, northeastern Brazil.

Helicobacter pylori is one of the most common human bacterial infections worldwide [1,2]; it plays a significant role in the etiology and pathogenesis of chronic active gastritis, peptic ulcer disease and gastric cancer [3]. However, the mode of transmission of the infection is not completely elucidated, although most of the evidence supports person-to-person transmission.

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Childhood appears to be the critical period during which *H. pylori* is acquired, especially in areas of overcrowding and socioeconomic deprivation [4,5]. However, adults can also become infected with *H. pylori*, and in developed countries this has been reported to occur at a rate of around 0.3% to 0.5% per year [6]. Studies of *H. pylori* infection among the low-income adult population in developing countries have also shown that the prevalence of the infection increases with age, although slightly [7-10]. Adult factors associated with prevalence of *H. pylori* are poorly characterized and, in particular, it is unclear whether socioeconomic conditions, lifestyle and household overcrowding in later life are independent predictors of infection.

There have been studies in Brazil evaluating the prevalence of *H. pylori* infection in the general

population in different regions of the country. Nevertheless, few studies have been conducted investigating the risk factors for infection during adulthood [11,8]. Population-based studies on the prevalence of *H. pylori* infection and associated risk factors in local settings are of value in Brazil, a developing country.

We examined the prevalence and risk factors for *H. pylori* infection in adults in a random selection of households in a poor urban community in Northeastern Brazil.

Material and Methods

This study was approved by the Committee for Clinical Investigation of the Federal University of Ceará, Brazil. The study was done in Parque Universitário, an urban low-income community of Fortaleza, the capital of the state of Ceará, in Northeastern Brazil. Parque Universitário Community has approximately 1,000 households and about 4,000 inhabitants. The population is permanently settled, all residents have been in the area in excess of one year. There is no sewer system serving the area, but most dwellings are supplied with treated city water.

We made a cross-sectional, randomized study, between March 2000 and April 2001. Houses in the community had been previously numbered, and the households were chosen by means of a table of random numbers. A questionnaire was applied, requesting information about age, gender, family income, overcrowding (total number of people in the household and number of rooms, number of persons per bed) type of water consumed, cup sharing, location of toilets, pets in the home, smoking and alcohol consumption.
Blood samples were collected by trained personnel and then centrifuged for 10 min at 1,200 x g; the resulting sera were frozen at –20°C for later assay for IgG. *Helicobacter pylori* antibodies were assayed with Cobas Core anti-*H. pylori* IgG EIA (Roche Diagnostic Systems, Basel, Switzerland), a second-generation EIA that employs a well characterized and highly immunogenic purified *H. pylori*-specific multi-component antigen preparation containing urease and free of cross-reacting flagellar proteins. The test had previously been standardized for the Brazilian population with 95.4% sensitivity and 100% specificity for adults [12]. This test was used according to manufacturer's instructions.

Statistical analysis

Data were analyzed statistically by the chi-square test to examine the association between *H. pylori* infection and age and gender. Differences were considered significant when $p < 0.05$.

Results

Based on the questionnaire data, 99% of the families had an average annual income of R$ 3,600 (around US$ 1,450). Ninety percent of the houses were made of bricks, 71.1% had more than 2 rooms. There was no sewage system serving the area, but most dwellings were supplied with treated city water; nevertheless, 82% of the population used water from local wells and fountains.

Two hundred and four individuals participated in the study, 49 males and 155 females, with ages ranging from 18 to 80 years. Overall, 165 of 204 participants (80%) were *H. pylori* positive, with no significant gender differences ($p = 0.49$). The infection rate was 84.7% in subjects 18 to 30 years of age, and 92% in subjects 46-60 years. Above 60 years old, the prevalence decreased slightly. As a whole, the prevalence of infection did not increase significantly with age ($p=0.14$, Table 1).

Age, smoking, educational level, and alcohol consumption had no significant effect on the prevalence of *H. pylori* infection (Table 1). The prevalence of infection was also not significantly affected by the number of persons per room, the number of persons per bed, the number of children or adults per household, cup-sharing, household pets, toilet location, medical history of antibiotic use, or raw vegetable ingestion (Table 2).

Table 1. Prevalence of *Helicobacter pylori* in adults classified according to age, sex, smoking habit, alcohol, school education and medical history of antibiotic use

Variables	Infected [no. (%)]	Not infected [No. (%)]	Total	P-value
Sex				0.49
Male	38 (77.6)	11 (22.4)	49	
Female	127 (81.9)	28 (18.9)	155	
Age (years)				0.14*
18–30	72 (84.7)	13 (15.3)	85	
31–45	60 (74.1)	21 (25.9)	81	
46–60	23 (92)	2 (8)	25	
>60	10 (76)	3 (23.1)	13	
Smoking				0.88
Yes	40 (81.6)	9 (18.4)	49	
No	125 (80.6)	30 (19.4)	155	
Alcohol		0.95		
Yes	29 (80.6)	7 (19.4)	36	
No	136 (81)	32 (19)	168	
School education				0.66
Illiterate	21 (77.8)	6 (22.2)	27	
< 9 years	144 (81.4)	33 (18.6)	177	
Antibiotic ingestion				0.82
Yes	10 (83.3)	2 (16.7)	12	
No	155 (80.7)	37 (19.3)	192	

Pearson Chi-square test, * Chi-square for trends, p= <0.05.

Discussion

Helicobacter pylori is considered a public health problem, especially in developing countries where bacterial transmission is facilitated by poor hygiene and sanitation conditions. Infection begins predominantly during childhood, but several studies have shown that the risk of new infections continues during adulthood [6,7]; this might reflect the multiple sources of infection to which individuals are exposed, especially in developing countries. The importance of studying the risk factors associated with this disease in adulthood is also reinforced by the higher rates of reinfection after *H. pylori* eradication reported in developing countries [13], when compared with "first world countries" [14]. This survey was carried out in a low-income urban community, representative of the low-income urban community in Fortaleza City. *Heliobacter pylori* status was determined by an ELISA test that uses second-generation antigens, consisting of highly immunogenic purified *H. pylori* protein. Rocha et al. showed that this ELISA has high sensitivity and specificity in the adult Brazilian population [12].

Studies among the low-income adult population in Brazil have shown a high seroprevalence of *H. pylori* [7], which we also found in our survey (approximately 80%). However, the prevalence was lower in blood donors from other capital cities in Brazil, Belo Horizonte and Salvador, 62% and 68%, respectively [8,11] These differences may be due to different socio-economic conditions.

Although the prevalence of infection increased with age, the differences were not significant. There was an increase from 84.6% in the 18-29 years age group to 92.5% in the 45-60 years age group. These results are

Table2. Association of *Helicobacter pylori* infection with sociodemographic factors

Variables	Infected [No. (%)]	Not infected [no. (%)]	Total	P-value
Persons per household				0.98
1-5	97 (80.8)	23 (19.2)	120	
>5	68 (80.1)	16 (19.1)	84	
Adults per household		0.94		
1-3	132 (81)	31 (19)	163	
>3	33 (80.5)	8 (19.5)	41	
Children per household				0.59
1 - 3	113 (81.9)	25 (18.1)	138	
>3	52 (75.4)	14 (22.2)	69	
Persons per room		0.82		
≤ 2	53 (84.1)	10 (15.9)	63	
>3	112 (79.4)	29 (20.6)	141	
Persons per bed				
1	41 (82)	9 (18)	50	0.81
> 1	124 (80.5)	30 (19.5)	154	
Toilet location		0.58		
Inside of home	105 (82)	23 (18)	128	
Outside	60 (78.9)	16 (21.1)	76	
Use of a shared glass		0.38		
Yes	134 (79.8)	34 (20.2)	168	
No	31 (86.1)	5 (13.9)	36	
Domestic animal		0.86		
Yes	82 (80.4)	20 (19.6)	102	
No	83 (81.4)	19 (18.6)	102	
Raw vegetable ingestion				0.34
Yes	75 (78,1)	21 (21,9)	96	
No	90 (83.3)	18 (16.7)	108	

Pearson's Chi-square test, $p<0.05$.

similar to those reported from southeastern and central south Brazil, and from Africa and India [7-10]. A slight decrease in the prevalence of *H. pylori* was noted in the oldest age group. Others have reported the same findings [1,7]; this has been explained as being due to a reduction in the specific serological response among older individuals and/or to a decreased number of microorganisms as a consequence of gastric atrophy.

As has also been found in other studies made in developing countries, there were no gender differences in the risk of acquisition of infection [15]. Alcohol consumption and smoking were also not associated with infection [16,17]; the same was true for recent antibiotic use and contact with pets [18]. Some epidemiological studies have indicated an association between the ingestion of raw vegetables and *H pylori* infection [19]. We found no such association, nor did Brown et al. [20].

We found no association between *H. pylori* infection and educational level, or family income. However, this population is relatively homogeneous; most of the subjects who were enrolled had a low educational level and low income.

Factors linked to household conditions, such as present family size, were not relevant determinants of *H. pylori* infection status in this adult population, a finding also observed by others, both in developed and in developing countries. In most of these studies, a clear association was seen between socioeconomic status and overcrowding in childhood, but not with present household conditions [21,22,11]. Although we did not evaluate socioeconomic status and overcrowding during the childhood of the subjects involved in this survey, we had previously demonstrated that 75.4% of the children living in this community were infected. When the children of the population were evaluated, the age and number of persons per room were found to be significant risk factors for *H. pylori* infection [23]. In fact, residential crowding is known to facilitate transmission of infection within families [24].

In summary, we evaluated the seroprevalence and risk factors of *H. pylori* infection in an adult population from a poor urban community in Northeast Brazil. We found that the prevalence of infection was high. Different from our previous study made on children, no risk factors were significantly associated with infection in adults, suggesting that infection in these poor populations is acquired predominantly during childhood; the relatively high prevalence that we observed may be due to a cohort effect rather than to the acquisition of infection during adulthood.

In conclusion, our results support the hypothesis that, similarly to what is known from developed countries, *H. pyloris* infection in developing countries is predominantly acquired during childhood.

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