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Prevalence of Helicobacter pylori infection in healthcare workers

Maliheh METANAT1, Batool SHARIFI-MOOD1, Shahrokh IZADI2

Aim: Helicobacter pylori (H. pylori) is a major factor in inflammatory and malignant diseases of the gastrointestinal tract. The epidemiologic pattern of this infection varies among developed and developing countries, and is related to the general standards of living in each region. In view of the importance of this infection and its different prevalence in different regions of Iran, as well as its long-term complications, this study was conducted to investigate the prevalence of H. pylori infection and its contributing factors in Zahedan.

Materials and methods: Ninety-seven healthcare workers without digestive symptoms or a history of H. pylori eradication were randomly selected. Infection was diagnosed by measuring IgG levels using the ELISA method, which has a sensitivity and specificity of 94% and 98%, respectively. Data, including age, gender, level of education, and type of water consumed, were collected using a questionnaire and analyzed by SPSS (version 13). Descriptive statistics, chi-square, Pearson correlation coefficient, and linear regression were used to interpret the results.

Results: The total frequency of the infection was 34% with a relative frequency of 36.4% and 32.8% in men and women, respectively. No relation was observed between gender, age, family dimension, education attained, and antibody titer in linear regression analysis (P = 0.965). The level of education was statistically related to antibody titer; in the group with high school and an associates science education, 75% had negative titer and 25% had positive titer (P = 0.040).

Conclusion: The presence of H. pylori infection in asymptomatic individuals and its ensuing complications necessitates health education, careful control of water sources, and strict control of infection.

Key words: Helicobacter pylori, serology, Zahedan

Introduction

H. pylori infection is one of the most common infections in humans. H. pylori is a microaerophilic gram negative curved bacillus with a terminal flagellum that is found in the mucous layer lining the gastric epithelium. Humans are the known major host. The majority of the infected are asymptomatic, but a limited number develop digestive symptoms. Some 30% to 60% of duodenal ulcers and 70% of gastric ulcers are associated with H. pylori infection that can eventually lead to gastric adenoma and lymphoma. The prevalence of H. pylori infection is about 30% in America and increases with age so that it reaches 50% at 50 years of age. This pattern is different from that observed in developing countries where 80% of the population become infected by 20 (1). In these populations, colonization occurs at very young ages, and before school (2). Evidence shows that infection at a young age is a risk factor for gastric cancer later in life (3).

Transmission of H. pylori occurs from person to person through fecal-oral and oral-oral route, as well as through consumption of contaminated water (4). Risk factors for H. pylori infection include birth or residence in developing countries, low socioeconomic and health status, improper
handling of swage, and illiteracy (5). *H. pylori* infection is more commonly found in gastroenterologists, endoscopy staff, intensive care nurses, groups of healthcare workers, and those caring for developmentally disabled individuals (6-11).

The organism can be identified by various methods such as culture, urease breath test, and histological studies of biopsy specimens; however, most of these methods are invasive and costly. Serologic methods seem to be useful in the screening of large populations (12). A large number of serologic studies in developing and developed countries have been performed on certain groups of patients (blood donors, health programs, and patients presenting to medical centers (13)).

In a study in Kazakhstan, the epidemiology of *H. pylori* and the effect of water resources and environmental hygiene were investigated. Results showed that transmission of *H. pylori* could occur through contaminated water, as well as improper hygienic conditions (14).

In another study on pre-school aged children in Taiwan in 1999, the total prevalence of *H. pylori* infection was reported to be 8.1%; moreover, seropositivity of *H. pylori* infection increased with increasing age, family dimension, unhealthy water supply, improper swage system, and sanitary conditions (15).

The prevalence of *H. pylori* infection was reported as 48% in 700 patients assessed by the ELISA method in Semnan, Iran, in 1999 (16).

In another research in Sari in 2001, which involved 394 patients, the prevalence of *H. pylori* infection was observed to be 64.3% using the ELISA method. While researchers noted a relation to age and gender, they failed to document any relation between the prevalence of infection and parental level of education, socioeconomic, or health status (17).

Yet another study focused on the prevalence of *H. pylori* infection among children and adolescents, aging 7 to 18 years, in Sari in 1999. The prevalence measured by ELISA was 19.3% in 400 participants. A correlation was observed between the prevalence of infection age, educational level, and family dimension, in contrast to gender, occupation, and type of water consumed (18).

Regarding the high prevalence of *H. pylori* infection in Iran, the inconsistency in its statistics, and the possibility of a higher prevalence in Zahedan (due to water resources and hygienic conditions), as well as the long-term complications of such infection, this study was carried out to determine the prevalence of *H. pylori* infection using the ELISA method (sensitivity of 94% and specificity of 98%) (19). The present prospective study evaluated the prevalence of *H. pylori* infection in health-care workers in primary-care clinics. The underlying factors contributing to the infection were also studied.

### Materials and methods

In a cross-sectional design, a descriptive analytical study was performed in volunteer healthcare workers in the Zahedan health center in 2006-2007. The study was approved by the Institutional Ethics committee of the university. Participants lacked gastrointestinal symptoms such as heartburn, dyspepsia, gastric pain, history of recent peptic ulcer, gastric cancer, and use of antacids, antibiotics, and proton pump inhibitors (PPIs). Considering the reported prevalence of at least 60%, randomized cluster sampling was used, and the sample size was calculated to be 96 considering the design effect (sample size × 1.5 = 96). Considering the setting and facilities, 6 cases were assigned to each cluster; dividing the sample size by the size of each cluster yielded 16 as the number of clusters needed. This covered approximately the half of health centers located in the city.

After obtaining consent, a questionnaire containing questions about age, gender, family dimension, level of education, and type of consumed water was completed by the workers. Five milliliters of blood was drawn from each case, and after separating the plasma, it was sent for measurement of *H. pylori* IgG under cold chain conditions (-20 °C). Levels of IgG were measured by the ELISA method using the Q-1DIAPLUS kit manufactured in Iran. Levels above 20 U/mL were considered positive. Data were analyzed using SPSS (version 13; SPSS, Chicago, IL, USA). For univariate analysis the odds ratios, their 95% confidence intervals, and chi-square tests were used. Adjusted residuals were used to complete the chi-square tests. An adjusted residual that exceeds
about 2 or 3 in absolute value indicates lack of fit for null hypothesis in that cell (20). Linear regression was used for multivariate analysis.

**Results**

Ninety-seven asymptomatic healthcare workers who did not have a history of *H. pylori* treatment were studied, including 33 men (34%) and 64 women (66%). Mean age was 43 ± 7 years with a range of 21 to 57 years. The majority were between 31 and 40 years of age (41.3%). Mean level of education was 12.2 ± 3.5 years in men and 12.7 ± 3.5 years in women. The majority had a high school diploma or an associate’s of science (61.8%). In general, 33 cases had a positive antibody titer (≥ 20 U/mL), which is equivalent to a frequency of 34% in the studied population. Range of age was 21-57 years. The frequency of *H. pylori* infection was highest in the age group of 31-40 years (33.4%) and lowest in the group of 51-60 years (9.2%). Peak frequency of *H. pylori* infection was observed in the group with an educational level of diploma and AS (45.4%); however, the frequency was 27.3% in both the under diploma, and BS to PhD groups. The highest frequency of *H. pylori* infection was noted in families with 3 to 5 members (63.7%). A high frequency of infection was also noted in those subjects who only consumed tap water (93.9%). In univariate analysis only the level of education was shown to have a meaningful relation in the chi-square test (P = 0.040) (Table 1); however, no relation was observed between antibody titer, age, gender, family dimension, level of education, and type of consumed water in multivariate linear regression (P = 0.965).

Table 1. The relation between antibody titer, age, gender, family dimension, level of education, and type of consumed water.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Positive antibody titer</th>
<th>Negative antibody titer</th>
<th>Odds ratio</th>
<th>CI (Confidence interval)</th>
<th>P/value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>12</td>
<td>36.4%</td>
<td>21</td>
<td>63.6</td>
<td>0.9</td>
</tr>
<tr>
<td>female</td>
<td>21</td>
<td>32.8%</td>
<td>43</td>
<td>67.2%</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 30</td>
<td>10</td>
<td>30.3%</td>
<td>12</td>
<td>18.8%</td>
<td>0.5</td>
</tr>
<tr>
<td>Over 30</td>
<td>23</td>
<td>69.7%</td>
<td>62</td>
<td>81.3%</td>
<td></td>
</tr>
<tr>
<td>Type of water consumed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filtered tap water</td>
<td>31</td>
<td>93.9%</td>
<td>62</td>
<td>96.9%</td>
<td></td>
</tr>
<tr>
<td>Filtered tap water + tanker water</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>3.1%</td>
<td>-</td>
</tr>
<tr>
<td>Filtered tap water+ mineral water</td>
<td>2</td>
<td>6.1%</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Family dimension</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 3</td>
<td>3</td>
<td>9.1%</td>
<td>6</td>
<td>9.4%</td>
<td></td>
</tr>
<tr>
<td>3 to 5</td>
<td>21</td>
<td>63.7%</td>
<td>38</td>
<td>59.4%</td>
<td></td>
</tr>
<tr>
<td>More than 5</td>
<td>9</td>
<td>27.3%</td>
<td>20</td>
<td>31.3%</td>
<td></td>
</tr>
<tr>
<td>Level of education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below diploma</td>
<td>9</td>
<td>27.3%</td>
<td>12</td>
<td>18.8%</td>
<td></td>
</tr>
<tr>
<td>Diploma and AS</td>
<td>15</td>
<td>45.4%</td>
<td>45</td>
<td>70.3%</td>
<td></td>
</tr>
<tr>
<td>BS to PhD</td>
<td>9</td>
<td>27.3%</td>
<td>7</td>
<td>10.9%</td>
<td></td>
</tr>
</tbody>
</table>

*Exact test.
In order to assess the significance of the level of education, the adjusted residual test was used (AR > 2.2 is considered significant). Analysis showed that the greatest difference existed in the diploma and associate’s of science educational group (AR = 2.4). In this group, 75% had positive antibody titer and 25% had negative antibody titer (Table 2).

Discussion and conclusion

In our study, the total frequency of \textit{H. pylori} infection was 34% among healthcare workers in Zahedan; that is lower when compared to studies performed in other cities in Iran, including Semnan, Sari, and Kerman. In the mentioned cities, the reported frequencies were, 48%, 64.2%, and 61.6%, respectively (16,17,21). This may be attributed to the difference in socioeconomic status of the studied population (healthcare workers of rural health centers in our study), as well as the difference in demographic characteristics.

The frequency of \textit{H. pylori} infection in men (36.4%) and women (32.8%) was not significantly different in our study (P = 0.727); this is compatible with results obtained in studies performed in Taiwan, Albania, Semnan, and Sari (11,15,16,18). However, in another study in Sari, the frequency was higher in women, and in one study in China, men were more frequently infected (17,22).

In the current study, the highest frequency was observed in the third decade of life (33.4%), but the lowest frequency was observed in the fifth decade (9.1%) with no significant difference (P = 0.198). In the studies of Sari and Taiwan, the frequency of \textit{H. pylori} infection increased with age, while in a study in Kerman, the frequency of infection did not differ among various age groups (15,17,21). This shows that an infection with \textit{H. pylori} follows the pattern observed in other developing parts of the world, and occurs mainly in early childhood. However, the under 20 population, who have the highest rate of acquisition of the infection, was not studied here.

In the present study, families with 3 to 5 members had the highest frequency of infection (63.7%), while families with more than 5 members were least commonly infected (27.2%); however, the noted difference was not significant statistically (P = 0.913). In contrast, in the studies in Taiwan and Sari, \textit{H. pylori} infection was more prevalent in families with more than 5 members (15,18).

No significant difference was observed among various types of consumed water regarding the frequency of infection (P = 0.215), similar to results reported in the study in Sari (18). In contrast, the prevalence of infection was shown to decrease with improvement of the hygienic index of water in Kazakhstan (14). This is probably due to the fact that virtually all the participants in our study consumed filtered water.

The only statistically significant correlation observed in this study was between frequency of \textit{H. pylori} infection and level of education (P = 0.040). The highest difference was observed in the diploma and AS group, according to the AR test. This group had the lowest frequency of positive antibody titer (25%).

Suggestions

In light of the high frequency of \textit{H. pylori} infection, and since infection most commonly occurs during childhood (especially at the school age), further

<table>
<thead>
<tr>
<th>Level of education</th>
<th>Positive Ab* titer</th>
<th>Negative Ab titer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Under high school diploma</td>
<td>12</td>
<td>57.1</td>
</tr>
<tr>
<td>High school diploma</td>
<td>45</td>
<td>75</td>
</tr>
<tr>
<td>AS†</td>
<td>7</td>
<td>43.8</td>
</tr>
</tbody>
</table>

* antibody, † associate’s of science, ‡ bachelor of science
studies focusing on seroepidemiology of other age groups with more detailed information about demographic data like place of residence, socioeconomic status, presence of pet animals, and smoking, are necessary.

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