Seropositivity to *Helicobacter pylori* among university students and their families. A comparative cross-sectional study

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**ABSTRACT**

**Objective:** to associate serologic response to *Helicobacter pylori* (*Hp*) among seropositive university students and their families in western Mexico.

**Methods:** we conducted a comparative transversal study, and randomized 30 nuclear families of 14 *Hp*-seropositive university students and 14 *Hp*-seronegative university students. We carried out seropositivity measurements (IgG) to *Hp* using the ELISA method. An analysis was performed utilizing the chi-squared and Mann-Whitney U tests, with the aid of EPI INFO 2000 and SIGMA STAT 3.2 software.

**Results:** global seropositivity in the families of infected students was 57 vs. 13% of the relatives of non-infected students (p = 0.000002). In families of *Hp*-positive students we found the following frequencies: parental (father and mother) 70%, mother 71%, and siblings 42%, while for seronegative individuals incidences were: parental 17% (p = 0.00005), mother 12% (p = 0.001), and siblings 10% (p = 0.0076).

**Conclusions:** there is a greater prevalence of antibodies against *Hp* in the relatives of seropositive students.

**Key words:** *Helicobacter pylori*. University students. Familial seroprevalence. Familial transmission.

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**RESUMEN**

**Objetivo:** asociar la respuesta serológica a *Helicobacter pylori* (*Hp*) entre estudiantes universitarios seropositivos y sus familias en el occidente de México.

**Métodos:** estudio transversal comparativo aleatorizado de 30 núcleos familiares de 14 estudiantes universitarios seropositivos para *Hp*, y 14 seronegativos. Se realizó determinación de seropositividad (IgG) a *Hp* por método de ELISA. El análisis se hizo utilizando chi cuadrado y U de Mann Whitney, con la ayuda de los programas EPI INFO 2000 y SIGMA STAT 3.1.

**Resultados:** la seropositividad global del núcleo familiar de los estudiantes infectados fue del 57% vs. el 13% de los familiares de los estudiantes no infectados (p = 0,000002). En las familias de los estudiantes positivos a *Hp* se encontró una frecuencia de: binomio paterno (padre y madre) 70%, madres 71%, hermanos 42%, mientras que en los seronegativos fue: binomio paterno 17% (p = 0,00005), madres 12% (p = 0,001), hermanos 10% (p = 0,0076).

**Conclusiones:** existió mayor prevalencia de anticuerpos a *Hp* en los familiares de los alumnos seropositivos.

**Palabras clave:** *Helicobacter pylori*. Estudiantes universitarios. Seroprevalencia familiar. Transmisión familiar.

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INTRODUCTION

Ever since 1983, the year in which *Helicobacter pylori* (*Hp*) was successfully isolated (1), this has been the most widely studied bacillus in the world, revolutionizing the clinical and physiopathological focus of gastroduodenal diseases (2). *Hp* has been found in 70-80% of cases of gastritis and in up to 100% of cases of peptic ulcer (after excluding cases due to non-steroidal anti-inflammatory drugs [NSAIDs] and Zollinger-Ellison syndrome) (3).
Recent epidemiological and histopathological studies have proposed the association of chronic *Hp*-related infection with the development of pre-malignant lesions such as chronic atrophic gastritis and intestinal metaplasia (4,5). It is considered that *Hp*-associated infection is an important co-factor for the development of gastric cancer, increasing by 3-8 times the risk of this disease in carrier patients (primarily, CagA phenotypes) (6,7); similarly, the risk for mucosa-associated lymphoma tissue (MALT) growths is 6 times higher in *Hp*-infected patients (8,9).

The probability has been established that the infection could take the oral-oral or the fecal-oral pathway (10,11); nonetheless, there are no conclusions pertaining to this due to the great diversity of factors, such as the host agent in different areas worldwide and the groups studied. The infection is acquired with greater frequency during childhood (1-5 years of age), persisting in chronic fashion probably through the lifetime of the individual (12,13).

*Hp*-related infection has been associated with the presence of low socioeconomic and educational levels, with age, overcrowding, and close contact among persons (14,15) (above all within the family), and residence in orphan-asylum and psychiatric hospitals, and also entails greatest predominance in subjects from developing countries (10), reaching seroprevalences of 30-72.5% (10,22), to 95% confidence interval [95% CI], and of 10-51.7% in the university student population (19-21).

The greatest frequency of infection has been demonstrated in children when the mother and siblings are affected (22). On the other hand, children with both parents affected by *Hp* present with a higher prevalence than those with solely a contaminated father or sibling (10,23). It is important to highlight that 70% positivity has been communicated among family members when some of the children are infected with *Hp* (24).

Certain publications have afforded little importance to co-habitation within the family, co-habitation with a partner, or close contact with classmates as an important factor for *Hp* infection, rather citing other risk factors (place of origin of the subjects, type of strain, age, intake of potentially contaminated food outside the home, etc.) as probable contagion causes (25-27).

To date, no reference has been found that depicts the association of *Hp* presence with family co-habitation with their adult offspring. Thus, the objective of this study was to seek an association between *Hp* seropositivity in university students and in their families.

METHODS

Study population

We carried out a comparative cross-sectional study in which the study universe comprised students at Centro Universitario del Sur, Universidad de Guadalajara (UdeG), and “Instituto Tecnológico de Ciudad Guzmán”, Jalisco (4,565 students), both institutions localized in western Mexico, and their respective families.

Inclusion criteria were the following: university students 18-26; asymptomatic for gastric pathology; without *Hp* eradication treatments (both students and their families) at least 6 months prior to study initiation; residing in the study’s urban zone; living in the home of their relatives, and previous written authorization.

Sample size was determined with the formula for comparing two proportions (28) (intrafamilial prevalence of 30-72.5% (10,22), to 95% confidence interval [95% CI], and a study power of 80%), resulting in a total of 14 individuals per group.

In the first study stage we carried out a simple randomized selection of 70 university students at “Centro Universitario del Sur”, Universidad de Guadalajara (UdeG), and at “Instituto Tecnológico de Ciudad Guzmán”, from whom we took 5 mL of cephalic-vein blood for measuring IgG antibodies against *Hp* (dependent variable) and to obtain the independent variables (gender, ages of students and their relatives, number of persons living in the family, and their relationship to the student); after obtaining the serological result, we proceeded to perform new simple random samplings among these students until the sample size calculated for both groups, i.e., one group of 14 seropositive students and their relatives, and another group of 16 seronegative students and their relatives, was complete. Later we visited the remaining family members at their domiciles, and obtained 5 mL blood samples to determine their *Hp* serology using the same method previously used for students.

ELISA method

The determination of anti-*Hp* IgG in the blood was performed by the ELISA method using a *Helicobacter pylori* IgG reagent (MICROWELL ELISA, Diagnostic Automation Inc., Calabasas, CA, USA). Determinations were conducted by expert personnel trained and certified in the P2900 Series Chem Well automated processor (Awareness Technology, Inc., Palm City, FL, USA), which was equipped with software for providing results automatically. Intrasample variation was < 5% (29).

Statistical analysis

A description of variables was performed with absolute, relative, mean, standard deviation, and range frequencies. To compare the frequency of familial seropositivity, gender, and overcrowding we utilized the chi-squared test with Yates’ correction and Fisher’s exact test, whereas we conducted a Mann-Whitney U determination for the comparison of age and number of family members. Statistical significance was considered at p < 0.05. We employed the
EPI INFO 2000 and SIGMA STAT 3.2 computational software for the study.

Ethical aspects

The work was accepted by “Comité de Investigación y Postgrado, Centro Universitario del Sur”, UdeG, at the “Ciudad Guzmán”, Jalisco, Mexico, campus. A written informed consent was required (for students as well as for family members) for the participation of study subjects.

RESULTS

The global prevalence of \( H_p \) infection in 70 university students of the first randomization was 27%, without there being statistically significant differences between the two genders (Table I) or the general characteristics (gender, number of participating relatives, and economic income of the family) of the groups of students and their families in the second randomization (Table II).

The difference of \( H_p \) seropositivity among family members was statistically significant \((p = 0.0002)\), because 100% of the families of the seropositive student group had at least one positive family member, in comparison with seronegative students, among whom only 37.5% of family members had \( H_p \) seropositivity.

![Table I. Seropositivity to \( H. pylori \) in university students at Ciudad Guzmán, Jalisco](image)

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 70</td>
<td>n/%</td>
<td>n/%</td>
</tr>
<tr>
<td>Male</td>
<td>20</td>
<td>6 (30)</td>
<td>14 (70)</td>
</tr>
<tr>
<td>Female</td>
<td>50</td>
<td>13 (26)</td>
<td>37 (74)</td>
</tr>
<tr>
<td>Total</td>
<td>70</td>
<td>19 (27)</td>
<td>51 (73)</td>
</tr>
</tbody>
</table>

Chi-squared Yates correction, \( p = 0.97 \).

Regarding the total number of family members positive for \( H_p \), we also found statistical significance \((p = 0.000002)\); in the case of families of seropositive students, we found 29 (56.86%) positive individuals in comparison with only seven (13.2%) family members for seronegative students; relatives of seropositive students had an odds ratio (OR) of 8.66 (95% confidence interval [95% CI], 3.01-25.85). Similarly, relatives of \( H_p \)-seropositive students had a greater frequency of positivity, with a statistically significant difference in the following variables: total members \((p = 0.000002)\); participating women \((p = 0.002)\); seropositive mothers \((p = 0.003)\), seropositive fathers \((p = 0.049)\), and seropositive siblings \((p = 0.019)\), in comparison with the family members of \( H_p \)-seronegative students (Table III).

![Table II. General characteristics of the studied population](image)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Seropositive student families</th>
<th>Seronegative student families</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>5</td>
<td>4</td>
<td>0.69**</td>
</tr>
<tr>
<td>Female</td>
<td>9</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Student age</td>
<td>21.21 ± 1.18</td>
<td>20.31 ± 2.05</td>
<td>N.S**</td>
</tr>
<tr>
<td>Father age</td>
<td>53.76 ± 5.55</td>
<td>49.69 ± 5.58</td>
<td>N.S**</td>
</tr>
<tr>
<td>Mother age</td>
<td>51.21 ± 8.86</td>
<td>46.5 ± 4.82</td>
<td>N.S**</td>
</tr>
<tr>
<td>Sibling age</td>
<td>19.2 ± 8.2</td>
<td>14.6 ± 7.6</td>
<td>N.S**</td>
</tr>
<tr>
<td>Family number</td>
<td>3.57 ± 1.16</td>
<td>3.31 ± 1.01</td>
<td>N.S**</td>
</tr>
<tr>
<td>Siblings number</td>
<td>1.64 ± 1.08</td>
<td>1.5 ± 1.03</td>
<td>N.S**</td>
</tr>
<tr>
<td>Family income*</td>
<td>907.88 ± 720.6</td>
<td>1,137.85 ± 975.56</td>
<td>N.S**</td>
</tr>
</tbody>
</table>

* Mexican pesos; ** Fisher’s exact test; *** Mann withney-U.

![Table III. Seroprevalence to \( H. pylori \) in university student families at Ciudad Guzmán, Jalisco](image)

<table>
<thead>
<tr>
<th>Group</th>
<th>Seropositive positive/n</th>
<th>Seronegative negative/n</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Families total</td>
<td>29/51</td>
<td>75/53*</td>
<td>0.000002**</td>
</tr>
<tr>
<td>Family nuclei</td>
<td>14/14</td>
<td>6/16</td>
<td>0.0002***</td>
</tr>
<tr>
<td>Male</td>
<td>12/24</td>
<td>4/22</td>
<td>0.050***</td>
</tr>
<tr>
<td>Female</td>
<td>17/27</td>
<td>3/31</td>
<td>0.002****</td>
</tr>
<tr>
<td>Father</td>
<td>9/13</td>
<td>3/13</td>
<td>0.045****</td>
</tr>
<tr>
<td>Mother</td>
<td>10/14</td>
<td>2/16</td>
<td>0.003****</td>
</tr>
<tr>
<td>Sibling</td>
<td>10/24</td>
<td>2/24</td>
<td>0.019****</td>
</tr>
</tbody>
</table>

* OR = 8.66 (IC 95% 3.01-25.85); ** Chi-squared; **** Fisher; ***** Yates correction.

DISCUSSION

In developing countries, the prevalence of \( H_p \)-associated infection is greater in comparison with developed countries; this number ranges between 10 and 60%, depending on conditions, diagnostic methods, and populations studied \((16,20,21)\).

In university students in developed countries, contradictory results have been reported concerning \( H_p \) prevalence, yielding much higher numbers \((21,30)\) or the opposite, very low numbers \((20,31-34)\), in comparison with the 27% found in the present study. The latter could be due to the population type studied, because with respect to health-area students, similar data exists, with prevalences of 25-38.6% \((19,35,36)\).

The high prevalence of \( H_p \)-related infection worldwide, added to insufficient information on contamination pathways, has given rise to the study of diverse social groups and of their familial nuclei in the face of the possibility of this being the main infection source, thus adjudging close contact among nuclear family members as a possible pathway of contamination; this has become common in some studies conducted in children and their families, in which this association has been found from an epidemiological and molecular viewpoint \((4,10,16)\).
Nonetheless, there have been investigations supporting the contrary (23-25). The latter has generated a need to conduct additional research in this regard, above all in groups of adults whose daily-life conditions expose them to contact with a greater number of factors for risk of infection.

In the present study we found a statistically significant difference in seroprevalence to Hp on comparing the relatives of seropositive students with those of the group of seronegative students, which is similar to that published previously by other authors, in which seropositivity is predominant in mothers and fathers, and to a lesser degree in the siblings of families of Hp-infected children (15-17).

It is important to highlight that studies conducted in other parts of the world (Germany, the U.S., and Japan, among others) on the association of the presence of Hp-related infection and the family have been based on analyses of families of children (16,22) rather than adults, who are subject to a greater number of exposure factors for developing the infection (age, ingestion of potentially contaminated food outside the home, etc.), which would support the hypothesis that the most probable pathways described are oral-orall, gastro-orall, and fecal-orall transmission, which is suggested by the results of this study in which a greater prevalence was found for Hp-associated infection in the families of seropositive students with a significant difference.

Contrary to what has been published on children, among whom the masculine gender has a greater risk for infection (23), in this study of adults it is the feminine gender that had a greater statistically significant frequency in families with seropositive students; this might be explained by the fact that women in the western Mexican population have a tendency to live in close contact with the members of their families, whereas men work outside the home and have no such close contact. This suggests that in the case of the presentation of a seropositive adult female relative, mainly the mother, the risk of contagion would increase in a more continuous manner with family members.

The conclusion of this study is that university students who are seropositive to Helicobacter pylori have greater numbers of positive relatives, which can suggest that close contact within the family, even in adult members, can be a risk factor for the transmission, and probably the recurrence, of Hp-associated infection (23). Thus, there is a need to demonstrate this through new investigations.

REFERENCES


