Intrafamilial clustering of *Helicobacter pylori* infection in Saudi Arabia

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**AIM:** To study the pattern of *Helicobacter pylori* infection among family members in the Saudi population.

**METHODS:** A cross-sectional, population-based, seroepidemiological study of family members was undertaken in a Saudi population using saliva *H pylori* immunoglobulin (Ig) G antibodies (Helisal kit).

**RESULTS:** A total of 42 families comprising 271 children and 84 parents were studied (355 subjects; mean age 23 years, SD 19 years) The overall frequencies of *H pylori* IgG antibodies in mothers, fathers and children were 67%, 64% and 23%, respectively. There was no significant difference in the infection rate between mothers and fathers, or between boys and girls. The infection rate among children increased when one or both parents were seropositive, and the infection rate among parents was proportionally related to the number of infected children per family. The frequency of *H pylori* antibodies was significantly higher in spouses of seropositive parents than in spouses of seronegative parents (45% compared with 19.2%).

**CONCLUSIONS:** These data confirm that the intrafamilial clustering of *H pylori* infection in Saudi Arabia occurs in a similar pattern to that described in the developed countries, and that living conditions and social conditions lead to person to person transmission of *H pylori* infection.

**Key Words:** Familial clustering; Helicobacter pylori; Saudi Arabia

**Caractère intrafamilial de l’infection à *Helicobacter pylori* en Arabie Saoudite**

**BUT :** Étudier l’évolution de l’infection à *Helicobacter pylori* parmi les membres de différentes familles dans la population saoudienne.

**MÉTHODE :** On a procédé à une étude transversale, séroépidémiologique, fondée sur la population, parmi les membres de différentes familles au sein de la population saoudienne à l’aide des immunoglobulines (Ig) G anti-*H. pylori* présentes dans la salive (trousse Helisal).

**RÉSULTATS :** En tout, 42 familles comptant 271 enfants et 84 parents ont participé à l’étude (355 sujets; âge moyen : 23 ans, écart type : 19 ans). La fréquence globale des anticorps IgG contre *H. pylori* chez les mères, les pères et les enfants était respectivement de 67 %, 64 % et 23 %. On n’a pas observé de différence significative des taux d’infection entre les mères et les pères ou entre les filles et les garçons. Le taux d’infection chez les enfants augmentait lorsqu’un parent ou les deux étaient séropositifs, et le taux d’infection chez les parents était proportionnel au nombre d’enfants infectés par famille. La fréquence des anticorps anti-*H. pylori* était passablement plus élevée chez les conjoints de parents séropositifs que chez les conjoints de parents séronégatifs (45 % contre 19,2 %).

**CONCLUSION :** Les données confirment le caractère intrafamilial de l’infection à *H. pylori* en Arabie Saoudite, comparable à celui décrit dans les pays développés, et montrent que les conditions de vie et les conditions sociales favorisent la transmission de l’infection à *H. pylori* entre les personnes.

**Helicobacter pylori** infection is well accepted to be a cause of peptic ulcer disease and gastric cancer (1-3), and is particularly common in developing countries, where more than 90% of the adult population may be infected (4). However, some aspects of the epidemiology of *H pylori* infection are not well studied, particularly in developing countries, where most of the research efforts are directed toward communicable diseases. Infection with *H pylori* is considered to be acquired during childhood, and is thus affected by childhood living conditions and the socioeconomic status of the family (5,6). Moreover, studies of the intrafamilial clustering of *H pylori* infection in the developed countries have sug-
suggested that the infection spreads from person to person, and have added more information about the possible mode of transmission of this infection (7,8). Because H pylori status was shown to be accurately determined by serology for H pylori immunoglobulin (Ig) G antibodies in blood or saliva (9), we used this easy noninvasive test to study the prevalence of H pylori IgG antibodies among family members in a community in southern Saudi Arabia because, to our knowledge, no such study has been previously conducted in a developing Arab country.

SUBJECTS AND METHODS

This cross-sectional, population-based study was conducted in a random sample of households in a small town in southern Saudi Arabia. This community (approximately 2000 people) enjoys modern facilities such as clean water and electricity, and the people living there have similar socioeconomic, cultural and dietary habits. The representative sample was chosen randomly with the help of the local health care register, which had detailed information about households and residents. The father in the family was interviewed by the authors, and the demographic and medical data of the family members were collected. A sample of saliva was obtained from each family member in a special container for the analysis of H pylori IgG antibodies using a quantitative indirect immunosassay (Helisal 224c14, Cortis Diagnostics, United Kingdom). The saliva samples, which were collected in a special container supplied with the kit, were vortex-mixed, pipetted and transferred to antigen-coated test plates shortly after being collected. According to the manufacturer’s instructions, during each run, a standard curve was plotted, incorporating the calibrated controls supplied with the kit. The optical densities of the test specimens were then read against the standard curve and directly converted into IgG units. Samples with values above 1.1 were considered positive for specific H pylori IgG. Data were analyzed by an advanced SPSS package (SPSS Inc, USA) using simple descriptive statistics – the two-tailed student t test for the detection of differences in mean values. P<0.05 was considered significant.

RESULTS

A total of 42 families comprising 84 parents and 271 offspring were studied (mean age 23 years, SD 19 years, range two to 97 years). The overall frequencies of positive H pylori saliva IgG antibodies in mothers and fathers were 67% (28 of 42) and 64% (27 of 42), respectively. Of the 271 offspring, there were 116 boys and 155 girls, and the frequencies of positive H pylori saliva IgG antibodies among them were 28% and 30%, respectively. However, the frequency of acquisition of H pylori infection in the children under the age of five years was 16%, rose to 21% in those aged five to 10 years and 25% in those aged 11 to 15 years, and then increased thereafter at a rate of 1.1% to 2% in adults up to the age of 60 years. There were no significant differences in the prevalence of H pylori antibodies between mothers and fathers (P=0.7) or between boys and girls (P=0.6). Table 1 shows the prevalence of H pylori infection (IgG seropositivity) in children according to the H pylori IgG status of the parents. It is evident that the infection rate in children is closely related to the H pylori infection status of the parents, particularly of the mothers. Moreover, this trend of intrafamilial clustering of H pylori infection was further confirmed because the frequency of H pylori IgG seropositivity in the parents rose steadily with the rising number of infected children per family (Table 2).

Analysis of H pylori IgG antibody clustering in parents revealed that 19 (45%) husbands of the 28 mothers who were positive for H pylori IgG antibodies were also positive, while only eight (19%) husbands of the remaining 14 H pylori-negative wives had H pylori IgG antibodies (P=0.012). Similarly, 19 (45%) wives of the 27 H pylori-positive husbands had H pylori IgG antibodies compared with only nine (21%) H pylori-positive wives of the 15 H pylori-negative husbands (P=0.02). Thus, H pylori acquisition is significantly higher in either parent if the other one has H pylori antibodies, further confirming that intrafamilial clustering occurs in this society. On the other hand, population density, defined as the number of persons per room, was positively related to the frequency of H pylori IgG antibodies in the study population (P<0.0001).

DISCUSSION

There is universal agreement that there is a higher prevalence of H pylori infection in developing countries (80% to 90%) than in the developed world (1). In the present study, the overall frequency of H pylori infection was 37%, much higher than that of hepatitis B (8% to 10%) and hepatitis C

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Number of seropositive children and Helicobacter pylori status of parents in a cross-sectional, population-based, seroepidemiological study of family members in a southern Saudi Arabian community</th>
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</thead>
<tbody>
<tr>
<td>Seropositive children per family</td>
<td>Number of families</td>
</tr>
<tr>
<td>0</td>
<td>7</td>
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<tr>
<td>1</td>
<td>10</td>
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<tr>
<td>2</td>
<td>6</td>
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<td>≥4</td>
<td>7</td>
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<th>Table 2</th>
<th>Effect of parents’ Helicobacter pylori status on the frequency of seropositivity of 79 children in a cross-sectional, population-based, seroepidemiological study of family members in a southern Saudi Arabian community</th>
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</thead>
<tbody>
<tr>
<td>H pylori status of parents</td>
<td>Positive children (%)</td>
</tr>
<tr>
<td>Mother positive, father negative</td>
<td>18 (22.8)</td>
</tr>
<tr>
<td>Father positive, mother negative</td>
<td>13 (16.4)</td>
</tr>
<tr>
<td>Mother and father positive</td>
<td>43 (54.4)</td>
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<tr>
<td>Mother and father negative</td>
<td>5 (6.3)</td>
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(1% to 4%) in the Saudi population. This population-based, cross-sectional study has attempted to explore an important aspect of H. pylori epidemiology outside the Western World. We used the saliva H. pylori IgG test because it was noninvasive, reliable and acceptable to patients, especially children, in community-based studies (10). We have demonstrated a strong association between H. pylori infection in children and H. pylori infection in their parents, irrespective of the infected index parent because there was no significant difference in the infection rates between fathers and mothers. Moreover, there was also no difference in the H. pylori infection rate between boys and girls, suggesting that H. pylori infection is not sex-dependent. Thus, in a household with at least one seropositive parent, the seropositivity in children was higher than in households in which one or both parents were seronegative for H. pylori IgG antibodies. These data confirm that intrafamilial clustering of H. pylori infection occurs in the Saudi population, and although no similar findings have been previously reported from the Middle East, a number of reports from the developed world have arrived at similar conclusions (8,4,11,12). Also, the annual rate of increase in seroprevalence for H. pylori over five years was similar to that reported from southern China by Mitchell and colleagues (6), and further confirms the early acquisition of H. pylori infection. DNA fingerprints of H. pylori strains can be done if cultures are taken from infected patients, further confirming intrafamilial spread (13), but because of a lack of facilities, we were not able to perform H. pylori genotyping.

We have also shown that H. pylori IgG antibodies were significantly higher in the spouses of infected persons (45% compared with 19.2%, P=0.012) – in agreement with previous reports from developed countries (7). Although this finding may simply confirm the importance of close contact and household living conditions in the transmission of H. pylori infection, one cannot entirely exclude the operation of genetic factors in increasing the susceptibility for H. pylori infection, particularly because marriage of relatives is a common practice in the Saudi society. Moreover, our findings strongly support the hypothesis that H. pylori infection starts early in childhood, possibly within the household, in both developing and developed countries (6,12,14,15) and that certain adverse living conditions, particularly overcrowding, operate as risk factors for this infection (5). Thus, there seems to be strong evidence from the present study and other reports from developed countries in favour of the significant role of socioeconomic status, living conditions and cultural factors, rather than genetic predisposition, as important risk factors for H. pylori acquisition. However, the effect of genetic factors was not totally dismissed because studies on monozygotic and dizygotic twins showed that H. pylori infection is also influenced by genetic factors that also play a role in defining the development of the spectrum of H. pylori infection (16,17). In this regard, positive H. pylori IgG serology has been found to correlate well with the development of H. pylori histological gastritis but cannot predict the occurrence of duodenal ulceration (duodenal and gastric ulcers account for 19% and 4%, respectively, of dyspepsia in the Saudi population); however, anti-H. pylori treatment will certainly improve the symptoms and lead to ulcer healing in patients with duodenal ulcers (18).

CONCLUSIONS

This study confirmed that the detection of saliva H. pylori IgG antibodies is a convenient and easy to use test in population studies, and that intrafamilial clustering of H. pylori occurs in both developing and developed countries. This finding lends support to the theory of person to person transmission of H. pylori, irrespective of geographical variations.

REFERENCES
