Seroprevalence of Helicobacter pylori in school-aged Chinese in Taipei City and relationship between ABO blood groups

Tzee-Chung Wu, Liang-Kung Chen, Shinn-Jang Hwang

AIM: To explore the seropositive rate of antibodies against H. pylori (anti-HP) in Taipei City and to compare the relationship of ABO blood groups and H. pylori infection.

METHODS: In 1993, high school students in Shih-Lin District were randomly selected for blood samplings by their registration number at school. In addition, similar procedures were performed on the well-children clinics of Taipei Veterans General Hospital. Besides, randomly selected sera from the subjects who took the physical examination were recruited for evaluation. Informed consents were obtained from all the subjects before blood samplings and parents were simultaneously informed for those who were younger than 18-year-old. Blood tests for anti-HP and ABO blood groupings were performed by enzyme-linked immunosorbent assay. Chi square tests were used for the comparisons between seroprevalence of H. pylori and ABO blood groups.

RESULTS: Totally, 685 subjects were recruited (260 children aged 1-14 years, 425 high school students aged 15-18 years) were evaluated, and another 88 adult healthy volunteers were studied as well for comparison. The age-specific seropositive rate of anti-HP was 1.3% at age 1-5 years, 7.7% at age 6-10 years, and 11.5% at age 11-14 years. The seroprevalence of H. pylori infection was abruptly increased in young adolescence: 18.6% at age 15 years, 28.1% at age 16 years, 32.4% at age 17 years and 41.0% at age 18 years, respectively. In the 425 high school students, ABO blood groupings were performed, which disclosed 48.5% (206/425) of blood group O, 24% (102/425) of blood group A, 21.8% (93/425) of blood group B and 5.6% (24/425) of blood group AB. In comparison of the subjects with blood group O and the other blood groups, no statistical significance could be identified in the seroprevalence of H. pylori (P=0.99).

CONCLUSION: The seroprevalence of H. pylori infection in Taipei City in adults is similar to the developed countries, and the abrupt increase of H. pylori during high school may be resulted from marked increase of interpersonal social activities. Although blood group O was reported to be related to H. pylori infection in previous literature, we found no association between H. pylori infection and ABO blood groups.

INTRODUCTION

Helicobacter pylori (H. pylori) infection is the most common chronic bacterial infection in the world. Previous seroepidemiologic studies indicated that about 50% of adults in the developed countries and nearly 90% of adults in the developing countries were positive of serum antibodies against H. pylori[1, 2]. Chronic H. pylori infection may be related to several conditions, including chronic gastritis[3, 4], primary gastric lymphoma (mostly mucosa-associated lymphoid tissue, MALToma)[5, 6], and gastric adenocarcinoma[7, 8].

The seroprevalence of H. pylori infection of adults in Taiwan varied from 54.4% to 59% in previous reports, which was similar to developed countries[9-11]. However, the seroprevalence of H. pylori infection was low in the preschool children in Taiwan. The seropositive rate of antibodies against H. pylori was 8.1% in 2,551 healthy preschool children aged 3-6 years[12], and it was significantly increased to 21.1% in young adolescence[13]. Therefore, marked increase of interpersonal social activities during the school age was proposed to be the most likely source of H. pylori infection.

People with blood group O have been noted to be more susceptible to peptic ulcer disease for decades without appropriate explanations[14]. In 1993, Boren et al[14] reported that people with blood group O had more H. pylori receptors, and Lewis antigens mediated the attachment of H. pylori to the gastric mucosa. Furthermore, higher density of colonization of H. pylori was noted in the gastric mucosa of people with blood group O[15]. However, absence of correlation between H. pylori infection and ABO blood groups was reported in some following studies[16, 17].

In Taiwan, blood group O was reported to correlate with the prevalence of H. pylori infection in patients with gastroduodenal diseases[18], but it remained unknown for those asymptomatic individuals who were infected by H. pylori. Therefore, we conducted a study to evaluate the relationship between H. pylori and ABO blood groups in those healthy volunteers in Taipei City to clarify the possible association.

MATERIALS AND METHODS

We conducted a cross-sectional survey among senior high schools in the Shih-Lin District, Taipei City in 1993. All the recruited subjects were randomly selected in each age group (from 15 to 18) according to the registration number in schools. Blood samplings were performed after the informed consents were signed by themselves or their parents (if the subjects were younger than 18-year-old). In addition, children at age 1 to 14 years from the well-children clinics of Taipei Veterans General Hospital were recruited if their parents agreed with the study.
and signed the informed consents. Moreover, we randomly collected the sera of adults who underwent physical examinations from the Department of Physical Examination to evaluate the seroprevalence of *H. pylori*. This study was evaluated and approved by the Ethical Committee of Taipei Veterans General Hospital.

The blood samples were centrifuged and the sera were stored in aliquot at -80 °C until analysis. The serum antibodies against *H. pylori* were tested by the commercial enzyme-linked immunosorbent assay (ELISA) kit (HEL-P test, AMRAD, Sydney, Australia). In addition, ABO blood groupings were also done by the ELISA test (Gamma Biologicals, Houston, TX, USA). ABO blood groupings were not performed in children from the well-children clinics because we reserved the sera from the blood samplings in the beginning, which were not possible for ABO blood groupings by the commercial kit.

Data of the recruited individuals were expressed in categories. The comparisons of seroprevalence of *H. pylori* between each ABO blood group were evaluated by chi-square test or Fisher’s exact test if appropriate. A *P* value of less than 0.05 would be considered statistically significant. All the available data were analyzed by a computer program (SPSS, Chicago, IL, USA).

**RESULTS**

Totally, 685 subjects were recruited, including 260 children aged 1-14 years from the Well-children Clinic, and 425 young adolescents aged 15-18 years from high school students in Shih-Lin District, Taipei City. In addition, sera of 88 randomly selected subjects from the Department of Physical Examination were evaluated for the referential seroprevalence of *H. pylori* in adults (Table 1).

**Table 1** Age and sex distribution of seroprevalence of antibodies against *Helicobacter pylori* (anti-HP), and comparisons between sex and age groups

| Age       | Blood group | Anti-HP (+)/n (%) | Anti-HP (-)/n (%) | **p** |
|-----------|-------------|-------------------|-------------------|------|
| 1-5       | 0/26        | 0                 | 1/42              | 2.4  |
| 6-10      | 4/39        | 10.3              | 2/39              | 5.1  |
| 11-14     | 9/53        | 17.0              | 3/51              | 5.9  |
| Subtotal  | 13/118      | 11.0              | 6/132             | 4.5  |
| 15        | 7/34        | 20.6              | 1/63              | 17.5 |
| 16        | 9/38        | 23.7              | 2/70              | 30   |
| 17        | 21/65       | 32.3              | 2/74              | 32.4 |
| 18        | 14/41       | 34.1              | 1/20              | 50   |
| Subtotal  | 51/179      | 28.5              | 73/246            | 29.7 |
| Adults    | 27/49       | 55.1              | 19/39             | 48.7 |
| Total     | 91/346      | 26.3              | 98/417            | 23.5 |

The age-specific seropositive rate of antibodies against *H. pylori* was 1.3 % at age 1-5 years, 7.7 % at age 6-10 years, and 11.5 % at age 11-14 years. The seroprevalence of *H. pylori* infection abruptly increased in young adolescence: 18.6 % at age 15 years, 28.1 % at age 16 years, 32.4 % at age 17 years and 41.0 % at age 18 years, respectively. In randomly selected adults, the seropositive rate of anti-HP reached 52.3 % (Figure 1).

In the 425 randomly selected high school students, ABO blood groupings were performed, which disclosed 48.5 % (206/425) blood group O, 24 % (102/425) blood group A, 21.8 % (93/425) blood group B and 5.6 % (24/425) blood group AB. Further analysis on the ABO blood groupings and seroprevalence of *H. pylori* demonstrated that seropositive rate of anti-HP was 27.7 % (57/206) in blood group O, 31.4 % (32/102) in blood group A, 30.1 % (28/93) in blood group B, and 29.2 % (7/24) in blood group AB (Table 2). In comparison of the subjects with blood group O with the other blood groups, no statistical difference could be identified in the seroprevalence of *H. pylori* (*P*=0.98). Neither was the difference significant among the groups as for being vulnerable to *H. pylori* infection.

**DISCUSSION**

*H. pylori* infection is the most prevalent chronic bacterial infection in the world. Despite of the worldwide infection, the transmission pattern remains uncertain. *H. pylori* infection is rare before first two decades of life in developed countries, ranging from 6 % to 16 %.[22-24]. However, children in Gambia and Nigeria are almost all infected by *H. pylori* at age of 5 years[25,26]. According to the previous reports, the seroprevalence of *H. pylori* infection in Taiwanese preschool children (3-6 years old) was 8.1 %, with the age-dependent progression (4.5 % in 3-year-old children, 4.4 % in 4-year-old children, 9.4 % in 5-year-old children, and 11.7 % in 6-year-old children)[27]. Furthermore, the seropositivity of antibodies against *H. pylori* was reported to be 21.1 % in adolescents[28,39], and 54.4 % in adults over 30-year-old in Taiwan[29]. Moreover, age-specific prevalence of *H. pylori* infection in patients with gastroduodenal diseases was 11.1 % in those aged 1 to 20, 73.1 % at age 21-30, and 79.8 % at age 51-60 in Central Taiwan[23]. In this seroepidemiological study, we also found a similar pattern of age-dependent progression. However, the seroprevalence of *H. pylori* in this study (1.3 % at age 1-5 years, 7.7 % at age 6-10 years, and 11.5 % at age 11-14 years) was significantly lower than that in the Taiwan islandwide survey. The better socioeconomic status in Taipei City may account for the differences of seroprevalence of *H. pylori* infection. However, the seroprevalence of *H. pylori* infection among adults in Taipei City was about the average of the Taiwan islandwide survey.

The transmission pattern of *H. pylori* currently remains uncertain, but the role of fecal-oral route seems to be minor[28,39]. The genotypic study did not support oral-oral transmission.
pattern of *H. pylori* infection, either[39]. Intrafamilial and person-to-person transmission has been shown being more important in *H. pylori* infection[31-32]. Risk factors analysis of *H. pylori* infection has been extensively performed including gender, race, family income, type of housing, location of housing, water supply, health status, and keeping pets, but only the socioeconomic status was better confirmed[33-36]. Broutet et al[37] proposed that male gender deserve more attention in epidemiological studies of *H. pylori* infection. In this study, the male predominance of *H. pylori* infection was observed. However, similar findings were not supported in previous epidemiological reports despite of different areas, ethnicity, and age[38-41]. The sex difference of *H. pylori* infection at age 11-14 years was unclear, which deserves further investigations.

The seropositive rate of anti-HP increased abruptly in subjects at age 15 years to 18 years (18.6 % to 41.0 %) in this study. The estimated annual incidence was 7.5 % in this cross-sectional survey, which might be resulted from the extensive social activities at this stage. On the other hand, smoking is an important factor in *H. pylori* infection, particularly in young adults[42,43]. Most smokers start smoking at their young adolescence. Therefore, smoking may be another explanation of such an abrupt increase of *H. pylori* infection among people aged 15 to 18.

People with blood group O were found more susceptible to peptic ulcer disease for decades without known cause until the correlation between *Lewis* antigens and blood group O patients with gastroduodenal diseases in adults was not supported in some reports[21,22]. Nevertheless, Lin et al[23] demonstrated the close relationship between *H. pylori* infection and blood group O patients with gastroduodenal diseases in Central Taiwan. In this study, healthy individuals rather than symptomatic patients with blood group O were not particularly vulnerable to *H. pylori* infection.

In conclusion, the abrupt increase of *H. pylori* infection in high school students was noted with the estimated yearly incidence to be 7.5 %. Subjects with blood group O do not increase clinical susceptibility to *H. pylori* infection than those with other blood groups.

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Edited by Xu XQ