



Seroprevalence of *Helicobacter pylori* in female Vietnamese immigrants to Korea

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Abstract

AIM: To investigate the seroprevalence of *Helicobacter pylori* (*H. pylori*) and its relationship to nutritional factors in female Vietnamese immigrants to Korea.

METHODS: A total of 390 female immigrants from Vietnam and 206 Korean male spouses participated in the study. Blood samples from 321 female immigrants and 201 Korean male spouses were analyzed for *H. pylori* antibodies. Data on age, sex, alcohol consumption, smoking status, dietary nutritional factors and gastrointestinal symptoms were collected using questionnaires. The daily intakes of the following nutrients were estimated: energy, protein, niacin, lipid, fiber, calcium, iron, sodium, potassium, zinc, folate, cholesterol, and vitamins A, B1, B2, B6, C and E.

RESULTS: The prevalence of *H. pylori* positivity was lower in the immigrants than in age-matched Korean

females (55.7% vs 71.4%, respectively; $P < 0.0001$) and the domestic population of Vietnam. The prevalence of *H. pylori* positivity among married couples was 31.7% for both spouses. There were no statistically significant differences in the incidence of smoking, amount of alcohol consumed, or nutritional factors between the *H. pylori*-positive and negative groups.

CONCLUSION: The prevalence of *H. pylori* positivity was lower among female Vietnamese immigrants than among Korean females. Nutritional factors did not differ between the *H. pylori*-positive and negative groups.

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Key words: Vietnam; Immigration; South Korea; *Helicobacter pylori*; Diet

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INTRODUCTION

Helicobacter pylori (*H. pylori*) infection is a major cause of gastric diseases such as chronic gastritis, peptic ulcer disease, and gastric malignancy^[1]. *H. pylori* infection can be transmitted from mouth to mouth between family members^[2]. Immigrants could be a source of *H. pylori* transmission.

In Korea, immigration has increased since 2000, and the number of marriages between young immigrant females and Korean males has increased rapidly. Official records show that there were 35 142 marriages between

immigrant females and Korean males in 2009^[3]. Female Vietnamese immigrants are involved in 20.6% of marriages between immigrants and Koreans and are the second most common group of immigrant newlyweds after Chinese females. The number of marriages between immigrant Vietnamese females and Korean males increased by 42.5% in 2009^[3]. Although the increase in the number of immigrants may have affected the prevalence of infectious and inherited diseases in Korea, a study on *H. pylori* infection of immigrants has not been conducted.

We conducted a serological study on the prevalence of *H. pylori* positivity and compared the prevalence of *H. pylori* infection among female Vietnamese immigrants with that of Korean females. We also evaluated the relationship between *H. pylori* infection and nutritional factors in female Vietnamese immigrants.

MATERIALS AND METHODS

Subjects

This survey involved 399 asymptomatic female Vietnamese immigrants and was conducted from March 2006 to August 2007 at the Ewha Mokdong University Hospital. In total, 321 immigrant females and 202 Korean male spouses were enrolled for serological testing for *H. pylori* antibodies. A total of 202 married couples were involved. Questionnaires were completed by the immigrant females with the help of a translator. Demographic data (age, sex, and past history of gastrointestinal disease) and lifestyle data (smoking, alcohol consumption, and dietary intakes) were obtained using the questionnaire. The same questionnaire was completed by the Korean spouses.

Serological analysis

A 5-mL blood sample was collected after an 8-h fast and centrifuged for 10 min at 3000 g, and the serum stored at -70 °C. *H. pylori* infection was determined according to the presence of serum *H. pylori* immunoglobulin (IgG) antibodies using an enzyme-linked immunosorbent assay (ELISA) kit, Genedia® (Noksymja, Seoul, South Korea). The sensitivity and specificity of this assay were reported to be 93.2% and 83.5%, respectively^[4]. The prevalence of *H. pylori* infection among the immigrants was compared with that determined from a national survey of *H. pylori* in Koreans. Associations between *H. pylori* prevalence and gastrointestinal symptoms, smoking, exercise, and alcohol consumption were analyzed.

Dietary survey

Trained dietitians interviewed the subjects using a quantitative food frequency questionnaire. The subjects were asked to recall their usual dietary intakes of foods. The energy and nutrient content of each food item were estimated using the Korean Foods and Nutrients Database^[5]. The daily intakes of vitamins in the form of supplements were calculated according to their frequency of consumption, dosage, and vitamin content. The nutritional factors assessed were energy, protein, lipid, sugar, fiber, calcium, iron, sodium, potassium, zinc, folate, cholesterol, and vi-

tamins A, B1, B2, B6, C and E. Associations between *H. pylori* prevalence and nutritional factors were analyzed.

Statistical analysis

The statistical significance of the difference in the prevalence of *H. pylori* between female Vietnamese immigrants and Korean females was evaluated. All data were analyzed using SAS version 9.1 (SAS institute, Cary, NC, United States) and SPSS version 10.0 (SPSS Inc, United States). A *P* value of less than 0.05 was considered significant.

RESULTS

General characteristics and *H. pylori* positivity in female Vietnamese immigrants

The mean age of female Vietnamese immigrants was 24.7 ± 6.4 years in the *H. pylori*-positive group and 25.0 ± 6.3 years in the *H. pylori*-negative group. The age of the female Vietnamese immigrants ranged from 18 to 60 years, and 40% had gastrointestinal symptoms. The most common symptom was epigastric pain (19.0%), followed by constipation (17.0%).

The incidence of *H. pylori* positivity was 55.7% among the 321 female Vietnamese immigrants, 57.7% among those aged 11-20 years, 57.8% among those aged 21-30 years, and 48.5% among those aged 31-50 years. *H. pylori* positivity did not increase markedly with age. The prevalence of *H. pylori* positivity was lower among female Vietnamese immigrants of all ages than among Korean females (55.7% *vs* 71.4%, respectively; *P* < 0.0001) and among Korean females aged 21-30 years (57.8% *vs* 85.2%, respectively; *P* = 0.006) and older than 30 years (48.6% *vs* 75.6%, respectively; *P* < 0.0001) (Table 1). The prevalence of *H. pylori* positivity was lower in female Vietnamese immigrants than in the corresponding age groups for Korean females.

Influence of lifestyle factors on *H. pylori* positivity

We analyzed whether *H. pylori* positivity was affected by smoking, exercise, history of gastrointestinal disease, or gastrointestinal symptoms (Table 2). The *H. pylori*-positive group had a lower incidence of history of gastrointestinal disease than that of the *H. pylori*-negative group (8.1% *vs* 15.1%, respectively; *P* = 0.042). Direct or indirect smoking, alcohol consumption, and frequency of exercise had no effect on *H. pylori* positivity.

H. pylori positivity in female Vietnamese immigrants and their spouses

The prevalence of *H. pylori* positivity among the male spouses of the immigrants was 64.3%. In the female Vietnamese immigrants, *H. pylori* positivity was highest at 21-30 years of age (57.8%), whereas in the Korean male spouses, it was highest at 31-50 years of age (64.8%) (Table 3). The mean *H. pylori* positivity for both spouses among the 202 married couples was 31.7%.

H. pylori positivity and its relationship to nutrition

None of the nutritional factors examined had a statisti-

Table 1 *Helicobacter pylori* positivity according to age *n* (%)

Age (yr)	Korean Females	Female Vietnamese immigrants	<i>P</i> value
11-20	10 (47.6)	23 (57.5)	0.462
21-30	23 (85.2)	122 (57.8)	0.006
31-50	167 (75.2)	34 (48.6)	< 0.0001
Total	200/280 (71.4)	179/321 (55.7)	< 0.0001

Table 2 Seropositivity/negativity for *Helicobacter pylori* of female Vietnamese immigrants *n* (%)

Characteristics (<i>n</i>)	<i>H. pylori</i> positive	<i>H. pylori</i> negative	<i>P</i> value
Smoking (<i>n</i> = 338)			
None	171 (98.8)	165 (100)	0.261
Yes	2 (1.2)	0 (0)	
Alcohol drink (<i>n</i> = 323)			
None	151 (93.2)	152 (94.4)	0.178
Yes	11 (6.8)	9 (5.6)	
Exercise (<i>n</i> = 338)			
None	124 (71.3)	125 (76.2)	0.301
Yes	50 (28.7)	39 (23.8)	
Gastrointestinal disease (<i>n</i> = 338)			
None	159 (91.9)	140 (84.9)	0.042
Yes	14 (8.1)	25 (15.1)	

Table 3 *Helicobacter pylori* positivity in female Vietnamese immigrants and their male Korean spouses *n* (%)

Age	Female Vietnamese immigrants (<i>n</i> = 321)	Spouses (<i>n</i> = 199)
11-20	23 (57.3)	0 (0)
21-30	122 (57.8)	1 (50)
31-50	34 (48.6)	127 (63.8)
Total	179 (55.7)	128 (64.3)

cally significant effect on *H. pylori* positivity among female Vietnamese immigrants (Table 4). The consumption of vitamin C and vitamin E was higher in the *H. pylori*-positive group than in the *H. pylori*-negative group, but the difference was not statistically significant. Among the male spouses, fiber consumption was higher in the *H. pylori*-positive group than in the *H. pylori*-negative group (*P* = 0.01). The mean sodium intake was 3378.9 mg in the *H. pylori*-positive group. The mean sodium intake of the Korean spouses (4661.2 mg) was higher than that of the female Vietnamese immigrants.

DISCUSSION

The most important environmental factors implicated in the pathogenesis of gastric cancer are diet and *H. pylori* infection^[1,6]. *H. pylori* infection is also correlated with gastrointestinal diseases such as gastric and duodenal ulcerations^[7]. As immigration to Korea is increasing, *H. pylori*-infected immigrants could spread these diseases among the Korean community. Until now, no information has been available on the prevalence of *H. pylori* infection among female Vietnamese immigrants.

Detection of *H. pylori* antibody in serum is the simplest method of evaluating whether *H. pylori* infection is present. *H. pylori* IgG has been used as a prevalence index in epidemiological studies. Although the *H. pylori* IgG method has lower sensitivity and specificity for detecting *H. pylori* infection than the *Campylobacter*-like organism (CLO) test, it is useful for the screening of asymptomatic patients and for health checkups^[8]. The *H. pylori* IgG ELISA used in this study had 93.2% sensitivity and 83.5% specificity among Koreans^[4], but its sensitivity and specificity differ among countries^[9]. Vietnam and Korea are both in East Asia, and *H. pylori* variants in both countries have the same CagA3' motif (CAGTF/CAGJR, CAGJF/CAGTR)^[10].

In Korea, the prevalence of *H. pylori* positivity was 46.6% among asymptomatic patients in 2000^[4] and 62.4% among Korean females older than 16 years^[4]. This estimate is lower than that reported by Song et al. in 1997 for a study involving 477 Korean females (72.5%)^[11]. In the present study, the incidence of *H. pylori* positivity among the female Vietnamese immigrants was 55.7%, which is much lower than that recorded among Korean females (71.4%) (*P* < 0.0001) in the Korean national survey. The prevalence of *H. pylori* positivity was also much lower in immigrant females aged 21-30 years than in the corresponding age group for Korean females.

In Korea, the prevalence of *H. pylori* positivity in the domestic population increased with age and was highest (74%) at 30-40 years of age^[4], but in female Vietnamese immigrants, it was higher at 20 years of age than at 30. In developing countries, the prevalence of *H. pylori* infection increased between 10 and 20 years of age and remained constant at about 80% thereafter^[12]. In our study, the prevalence of *H. pylori* positivity among female Vietnamese immigrants did not increase between 10 and 20 years of age. The *H. pylori* positivity of the immigrants was lower than that of age-matched Korean females and that of the domestic population of Vietnam, which was 74.6%^[13]. The prevalence of *H. pylori* infection showed differences between Vietnamese cities and was 78.8% in Hanoi, the capital of Vietnam, but in rural areas such as Hatay, it was as low as 69.2%^[13]. The prevalence of *H. pylori* infection of female population was 79.4% in Hanoi and 72.8% in Hatay^[13]. The region of origin of the female Vietnamese immigrants could have influenced the results of our study, but these data were not collected. The lower prevalence of *H. pylori* infection among female Vietnamese immigrants compared with that among Korean females was probably due to differences in race and local region of immigration origin.

The prevalence of simultaneous *H. pylori* positivity in female Vietnamese immigrants and their Korean male spouses was 31.7%, which is lower than that published for Korea (77%-88%)^[14]. This discrepancy may have been because of differences in the sample populations used as the published data involved only 26 CLO-positive patients and their spouses. In a study of a Western population, *H. pylori* positivity was 83.3% among spouses with

Table 4 Analysis of the association between *Helicobacter pylori* positivity and nutritional factors in female Vietnamese immigrants and their male spouses

	Female Vietnamese immigrants			Male spouses		
	<i>H. pylori</i> positive (n = 172)	<i>H. pylori</i> negative (n = 164)	P value	<i>H. pylori</i> positive (n = 125)	<i>H. pylori</i> negative (n = 72)	P value
Calorie (kcal)	1410.4 (677.3)	1430.96 (409.6)	0.739	1802.2 (573.7)	1691.5 (603.4)	0.202
Plant protein (g)	27.4 (1.8)	28.8 (10.4)	0.253	38.6 (15.6)	35.6 (10.7)	0.109
Animal protein (g)	31.9 (89.5)	26.8 (16.1)	0.464	31.9	39.8	0.061
Total protein (g)	59.3 (92.3)	55.6 (20.1)	0.615	70.5 (27.4)	75.4 (38.0)	0.448
Plant lipid (g)	15.1 (10.8)	15.0 (9.9)	0.949	21.5 (15.3)	25.2 (48.8)	0.535
Animal lipid (g)	17.3 (14.9)	18.6 (14.2)	0.392	22.7 (17.5)	22.8 (16.5)	0.967
Total lipid (g)	33.4 (20.5)	33.6 (17.9)	0.539	44.2 (24.4)	48.0 (23.5)	0.191
Sugar (g)	221.7 (73.1)	228.1 (62.7)	0.393	275.7 (81.6)	271.9 (101.4)	0.786
Fiber (g)	14.8 (7.3)	15.1 (6.5)	0.659	21.4 (8.5)	18.6 (6.7)	0.01*
Calcium (mg)	381.7 (324.8)	400.9 (240.2)	0.539	520.7 (256.5)	684.6 (1075.9)	0.207
Iron (mg)	9.4 (4.6)	9.9 (3.7)	0.282	14.8 (11.1)	90.3 (462.)	0.170
Sodium (mg)	3378.9 (3272.2)	3333.7 (1458.2)	0.869	4661.2 (1700.7)	4801.6 (2086.3)	0.609
Potassium (mg)	2212.8 (3104.0)	2041.6 (822.2)	0.486	2654 (1002.2)	2537.2 (946.6)	0.413
Zinc (mg)	8.5 (23.1)	6.9 (2.4)	0.367	9.2 (5.5)	9.3 (6.2)	0.963
Vitamin A (μg RE)	404.8 (384.0)	441.8 (358.9)	0.363	693.7 (526.6)	771.7 (839.1)	0.478
Vitamin B1 (mg)	1.0 (0.5)	1.0 (0.4)	0.662	1.1 (0.58)	1.2 (0.6)	0.341
Vitamin B2 (mg)	0.8 (0.6)	0.8 (0.4)	0.591	1.0 (0.5)	1.4 (2.3)	0.136
Vitamin B6 (mg)	1.5 (0.9)	1.5 (0.7)	0.626	2.0 (0.9)	4.0 (14.0)	0.219
Niacin (mg NE)	12.9 (18.2)	12.2 (4.9)	0.615	16.0 (7.0)	26.0 (50.6)	0.099
Vitamin C (mg)	127.0 (116.5)	123.0 (136.5)	0.770	123.6 (100.5)	99.2 (85.8)	0.086
Folate (μg DFE)	187.7 (155.8)	173.8 (88.2)	0.314	260.0 (137.6)	240.6 (137.9)	0.340
Vitamin E (mg ATE)	10.2 (20.6)	9.3 (5.7)	0.550	13.4 (8.9)	11.4 (6.5)	0.068
Cholesterol (mg)	330.5 (1393.0)	218.3 (214.0)	0.298	264.9 (191.0)	319.3 (299.9)	0.173

Data are presented as mean (SD). * $P < 0.05$, *Helicobacter pylori* (*H. pylori*) positive group vs *Helicobacter pylori* negative group in Korean male spouses.

H. pylori-positive partners and 28.5% among spouses with *H. pylori*-negative partners^[14].

Smoking and alcohol consumption were not significantly related to *H. pylori* positivity in our study, which is in agreement with the results of another study^[15].

The *H. pylori*-negative group had a higher incidence of history of gastrointestinal disease than the *H. pylori*-positive group. The association between gastrointestinal disease and *H. pylori* infection is controversial^[16]. The lower incidence of history of gastric disease among *H. pylori*-positive immigrant females should be verified using an objective endoscopic method. The incidence of gastrointestinal symptoms and *H. pylori* positivity was 60% and was similar in both *H. pylori*-positive and negative groups.

There were no statistically significant differences in the intakes of energy, protein, lipid, sugar, fiber or vitamins between the *H. pylori*-positive and negative groups. Another report showed that *H. pylori* positivity is higher among people who ingest roasted food more than twice daily than in people who ingest roasted food once daily or less^[15]. However, the consumption of spices, dairy products, and fresh fruit and vegetables was not related to *H. pylori* positivity^[15].

Nutritional factors were not related to *H. pylori* positivity among the female Vietnamese immigrants. The mean sodium intake was 3378.9 mg in the *H. pylori*-positive group. The mean sodium intake of the Korean spouses (4661.2 mg) was higher than that of the female Vietnamese immigrants. Koreans have a relatively high sodium intake, and patients with gastric cancer have a

higher sodium intake than healthy subjects^[17]. The female Vietnamese immigrants consumed less salt than the Koreans. Tsugane^[18] reported that the incidence of gastric cancer among Japanese immigrants in the United States could be explained by the extent to which migrants continued to maintain a high consumption of salt. The incidence of gastric cancer among Vietnamese immigrants needs to be investigated.

Fiber intake was higher in the male spouses of the *H. pylori*-positive group ($P = 0.01$), and there was no statistically significant difference in vitamin C intake ($P = 0.086$). It has been reported that *H. pylori*-positive subjects had a low concentration of vitamin C in gastric juice and that vitamin C levels increased after eradication of *H. pylori*^[19]. *H. pylori* positivity and the severity of gastritis were associated with the concentration of vitamin C level in gastric juice^[19]. There was no significant relationship between *H. pylori* positivity and vitamin C intake in this study. Other studies have stated that the consumption of vitamin C increases serum and gastric juice concentrations of vitamin C, resulting in a lower prevalence of gastric cancer when combined with *H. pylori* eradication^[20]. An analysis of dietary micronutrients (vitamin C, vitamin E, carotenoids, fiber, flavonoids, and selenium) commonly considered protective against gastric cancer yielded conflicting results^[6]. *H. pylori* positivity was not affected by smoking, alcohol, or nutritional factors.

In conclusion, the prevalence of *H. pylori* positivity among the female Vietnamese immigrants was lower than that among Korean females, and nutritional fac-

tors showed no significant difference between the *H. pylori*-positive and negative groups. More studies on the transmission of *H. pylori* infection in immigrants are warranted.

COMMENTS

Background

Helicobacter pylori (*H. pylori*) infection is correlated with gastrointestinal diseases such as gastric cancer, gastric or duodenal ulcerations. As immigration to Korea is increasing, a difference in the prevalence of *H. pylori* infection between immigrants and the native population could affect the spread or prevalence of infectious disease.

Research frontiers

The prevalence of *H. pylori* positivity among female Vietnamese immigrants was lower than among Korean females, and nutritional factors showed no significant difference between *H. pylori*-positive and negative groups.

Innovations and breakthroughs

There have been few studies on the health or disease status of immigrants. Tsugane reported that the incidence of gastric cancer among Japanese immigrants in the United States could be explained by the extent to which migrants continued to maintain a high consumption of salt. There has been no report on the health of Vietnamese immigrants in Korea. The prevalence of *H. pylori* positivity was different between female Vietnamese immigrants and Korean females. Also, there were differences in the prevalence of *H. pylori* infection within Vietnam. The prevalence was lower in the female Vietnamese immigrants than in Korean females and the domestic female population of Vietnam. Nutritional factors did not show statistical differences related to *H. pylori* positivity.

Applications

H. pylori infection could be a source of infectious disease in family members. Investigation of *H. pylori* infection in immigrants could lead to further knowledge of gastric diseases such as gastric cancer or ulceration.

Peer review

This is an interesting comparison between two apparently relatively similar cohorts of females, who nevertheless have different infection rates with *H. pylori*. Interestingly, dietary factors do not appear to play a role-at least in adults. In view of this, it would be interesting to offer some speculation on the mode of infection with *H. pylori* in these cohorts of women!

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