Lifestyle factors associated with atrophic gastritis among *Helicobacter pylori*-seropositive Japanese-Brazilians in São Paulo

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**Abstract**

**Background.** Studies of lifestyle factors related to gastric atrophy development in *Helicobacter pylori*-infected individuals are limited. The present cross-sectional study aimed to examine the associations between lifestyle factors and serum pepsinogens (PGs) among anti-*H. pylori* antibody-seropositive Japanese in Brazil, where gastric cancer mortality was reported to be as high as in Japanese in Japan, and seropositive individuals were still frequently detected.

**Methods.** The subjects were 291 seropositive individuals (129 males and 162 females; age, 30 to 69 years) out of 656 Japanese-Brazilian volunteers in São Paulo city. Information on lifestyle factors was obtained using a self-administered questionnaire. Atrophic gastritis was defined as a PG1 serum level less than 70 ng/ml and PG1/PG2 ratio less than 3.

**Results.** The prevalence of atrophic gastritis was 31.9% (95% confidence intervals, 26.6%–37.6%). The proportion of subjects with atrophic gastritis increased with age, but there were no significantly marked differences in the proportions of subjects with atrophic gastritis among the three generations studied (first generation [Issei], second generation [Nisei], and third generation [Sansei]) for any 10-year age group. The associations with smoking and alcohol drinking were not significant. Length of education was inversely associated with gastric atrophy, while infrequent rice intake was preventive; the odds ratio relative to everyday rice intake was 0.13 (95% confidence intervals, 0.39–0.46) on multivariate analysis.

**Conclusion.** The present study demonstrated that frequent rice intake was a risk factor for atrophic gastritis among the *H. pylori*-infected Japanese-Brazilians, suggesting that diet including rice plays a role in the step from *H. pylori* infection to gastric atrophy.

**Key words** Atrophic gastritis · Lifestyle · *Helicobacter pylori* · Japanese-Brazilians

**Introduction**

It is hypothesized that carcinogenesis in the great majority of gastric cancers has at least three steps: *Helicobacter pylori* infection, gastric atrophy, and gastric cancer. Each step may be influenced by different factors, as well as common factors, so that studies of the factors for each step are required to understand the whole picture of the carcinogenesis. In regard to risk factors for *H. pylori* infection, lifestyle and genetic factors have been partly elucidated. In contrast, studies of the next step – the development of gastric atrophy among *H. pylori*-infected subjects – are relatively rare. There are areas with high *H. pylori* seroprevalence where gastric atrophy is rare. Even with in one area, individuals with and without atrophic gastritis coexist. These findings indicate the importance of environmental and genetic factors in the development of gastric atrophy.

Gastric atrophy is defined histologically or gastroscopically, but in epidemiologic studies pepsinogens (PGs) have been commonly employed because of the convenience. The combination of a low pepsinogen PG1 level and a low PG1-to-PG2 ratio in serum has been shown to be strongly associated with atrophic gastritis in healthy subjects. In mild inflammation, circulating levels of PG1 and
PG2 increase. As gastritis progresses, the PG1 level decreases but the PG2 level is maintained. Consequently, the PG1/2 ratio is thought to be an indicator of mucosal atrophy.1 Because H. pylori infection is the strongest factor related to gastric atrophy, and because individuals with atrophy are rare among the uninfected, it is wise to study the factors relating to atrophy among the infected.

The present study aimed to examine the associations between gastric atrophy, based on PG levels and lifestyle factors such as smoking, alcohol drinking, and dietary habits among Japanese-Brazilians living in Sào Paulo city. Brazil has the world’s largest population of Japanese outside Japan. According to a report of the Japanese Ministry of Foreign Affairs, the Brazilian population of Japanese descent was estimated to be 1.3 million. Gastric cancer mortality among Japanese-Brazilians was reported to be as high as that in Japanese in Japan, and it was more than 50% higher than that in non-Japanese Brazilians.4 Seropositivity for H. pylori was still high among Japanese-Brazilians.10,11

Subjects and methods

Subjects

Our study was conducted in apparently healthy Japanese-Brazilians from Sào Paulo city, aged 30 to 69 years, who voluntarily participated, from April to May 2001. About 350,000 people of Japanese descent reside in Sào Paulo, where there are 47 associations named for each prefecture of Japan (Kenjin-kai), and Japanese cooperative societies, country clubs for Japanese-Brazilians, and many other non-profit Japanese associations have been founded.

In Sào Paulo, where there are more than 100 Japanese associations, the 12 that responded to a first call in a predetermined period were selected, after the approval of the directors. The members of these associations were invited to participate in the study, through a standardized letter informing them of the study aims, procedure, and confidentiality. After written informed consent was obtained in terms of the kind of tea (green, black, mate, and others).

Laboratory tests

A 10-ml sample of venous blood was obtained from each participant. The blood samples were centrifuged and plasma was frozen at −20°C according to an identical protocol used for all samples. An anti-H. pylori IgG antibody test, High-molecular-weight Campylobacter-associated-protein (HM-CAP) enzyme-linked immunosorbent assay (ELISA; Enteric Products, Westbury, NY, USA) was used for the identification of H. pylori-infected participants.12,13 The test was conducted at SRL, Tokyo, Japan, where routine measurements of the IgG antibody have been established. An ELISA value of 2.3 or more was regarded as H. pylori infection-positive. Serum PG1 and 2 levels were measured by E-plate “Eiken” Pepsinogen I and II (Eiken, Tokyo, Japan) at Mitsubishi Kagaku, BCL (Tokyo, Japan). The degree of atrophy was classified as follows: PG1, 70 ng/ml or more; or PG1/2 ratio, 3.0 or more for no atrophy; and PG1 less than 70 ng/ml and PG1/2 ratio less than 3.0, excluding severe atrophy, for moderate atrophy.

Statistical analysis

The 95% confidence intervals (95% CIs) of percentages were calculated by a binomial distribution. The sex-age-adjusted odds ratio (OR) and 95% CI were calculated by an unconditional logistic model. These calculations were conducted with the computer program STATA version 7 (STATA, College Station, TX, USA).14

Ethical issues

This study was approved by both the Ethics Committee of Aichi Cancer Center, Japan (no. 11-6), and the Ethics Committee of the School of Medicine of the University of Sào Paulo, Brazil (protocol no. 393/01).

Results

The prevalence of atrophic gastritis among the 291 H. pylori-seropositive Japanese-Brazilians is shown, by sex, age, and generation, in Table 1. The prevalence of atrophic gastritis was 38.9% (95% CI, 31.3%–46.8%) in the 162 women and 23.3% (95% CI, 16.2%–31.5%) in the 129 men;

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