Relationship between helicobacter pylori infection estimated by ^{14}C-urea breath test and gender, blood groups and Rhesus factor

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Key words: Helicobacter pylori
- Age -Gender
- ABO blood group
- Rh factor

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Received:
19 October 2010
Accepted revised:
3 January 2011

Abstract

The *aim* of this study was the detection of helicobacter pylori (HP) infection and estimation of this infection relationship with age, gender, blood groups and Rhesus factor, as well as the assessment of the accuracy of the method. *A total of 227 patients* with gastritis were examined. Blood ABO groups and Rh positivity were determined using standard tests. Infection by HP was proved by ^{14}C-urea breath test and gastric biopsy. Patients were aged 20-81 years (X=51.7 years) and the presence of HP was not related to the age (P >0.05). From the total number of patients, 25/69 males and 68/158 females were HP positive. There was no significant difference between genders and HP infection (P>0.05). From the 227 investigated patients, 69 (30%) belonged to blood group O, 96 (42%) to A, 40 (18%) to B and 22 (10%) to AB. HP was detected in 27/69 patients with blood group O, 45/96 patients with blood group A, 16/40 patients with blood group B and 5/22 patients with blood group AB. There was no statistically significant difference (P>0.05) in the incidence of HP infection between these groups (proving that HP infection did not depend upon the blood groups). Also, there was no significant correlation between the presence of particular blood group in HP + patients related to the reported frequency of the blood groups in Serbian population (0- 38%, A-42%, B-15%, AB-5%). HP was found in 16/36 Rh- and in 77/191 Rh+ patients without statistical difference (P>0.05). Also, there was no significant correlation of the presence of the Rh factor in the HP positive patients to the frequency of the Rh factor in the Serbian population (84% Rh+ and 16% Rh-). *The basic value* of the HP+ test was slightly, but not significantly lower in comparison to the HP- patients (P>0.05). On the contrary, test values showed a highly significant difference (P<0.01) in HP+ and HP- patients. *In conclusion,* in adults HP infection does not depend upon the patient's age, gender, blood group type or Rh factor. In clinical terms, there were 93 true positive (TP), 129 true negative (TN), 5 false negative (FN) and 0 false positive (FP) patients. Sensitivity of the method was 94.9%, specificity 100%, positive predictive value 100%, negative predictive value 96.3% and accuracy 97.8%.

Hell J Nucl Med 2011; 14(1): 21-24 *Published on line: 5 March 2011*

Introduction

Gastric helicobacter pylori (HP) infection is quite frequent with an incidence up to 50% in some parts of the world [1]. Development of symptoms after infection depends also to the immune response, the physical status and the eating habits of the patients [2]. Long-term consequences can include chronic superficial gastritis (with or without progressive atrophy), duodenal or gastric ulceration, gastric adenocarcinoma and mucosa associated lymphoid tissue lymphoma. Also, the presence of HP can be related with some non-digestive diseases, such as ischemic heart disease, autoimmune diseases, late puberty, delayed grow-up etc. [3-5].

H. pylori has a unique way of adapting in the stomach environment. It goes through the mucous layer to infect gastric epithelial cells, and produces enzymes that break down substances contained in gastric juices. The most important of these enzymes is urease. Urease converts urea from saliva and gastric juices into bicarbonate and ammonia, which are strong bases and thus protect bacteria from stomach acidity. Carbon dioxide is absorbed into the bloodstream and excreted by the lungs. Urease is found in much higher concentrations in infections from HP than from any other bacteria, thus enabling the HP test. Thus, when an infected patient swallows a dose of urea labeled with a radioactive carbon-14 (^{14}C), HP in his gastric mucosa breaks down the labeled urea to ammonia and labeled carbon dioxide, which is being absorbed and exhaled through the lungs. After the collection of a certain amount of $^{14}CO_2$, its activity is measured by beta counter [6-11].

During the last few decades, some authors considered that there was a relation between HP attachment to gastric epithelium and only blood group O [12-17] while others found no such correlation between HP and blood groups [18, 19].

In this paper we studied the relationship between HP gastric infection and ABO blo-od groups, Rhesus (Rh) factor, patient's age and gender as well as the clinical importance of the test, in different gastrointestinal disorders.

Patients and methods

The total of 227 patients with gastritis was studied. Blood ABO groups and Rh factor positivity were studied using standard routine tests (reaction of hemagglutination using microgel technique – Diamed, Switzerland). Gastric infection by HP was proved by the ^{14}C-urea breath test using a commercially available kit (37kBq/dose) produced by the Institute for Nuclear Sciences, Vinca, Serbia, as well as by gastric biopsy.

The HP investigation was carried out under fasting conditions, in patients who had not taken proton pump inhibitors or sucralphates during the last four weeks and were not to take these for another two weeks after treatment.

Two samples of radioactivity in the exhaled air were collected and measured. The first, for the determination of the basic values and the second, 30min after ingestion of the ^{14}C-urea capsule for the determination of test values. The rise of activity in the test value of 80% in comparison to basic value was considered as positive finding for HP infection.

Using samples obtained by gastric biopsy the fact urease test was performed using solution of urea with a pH indicator showing the color changes in the presence of HP infection. Histopathology of gastric mucosa was also performed.

Descriptive and analytical statistical methods were performed (mean, standard deviation, T-test, Chi-square test and Spearman's correlation).

Results

Patients were of a very heterogeneous age group (20-81 years, X=51.7). T test showed that the presence of HP did not depend upon the patient's age (P >0.05) (Fig. 1).

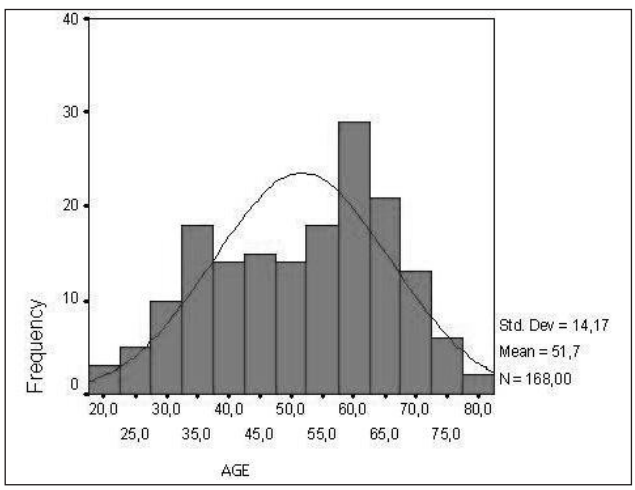

Figure 1. Age distribution in helicobacter pylori positive patients.

Sixty nine of the patients, (30.4%) were males and 158 (69.6%) females, while 25/69 (36%) males and 68/158 (30%) females were HP+. There was no significant difference between gender and HP infection (P>0, 05).

From the total of 227 patients, 69 (30%) belonged to blood group O, 96 (42%) to group A, 40 (18%) to B while 22 (10%) to AB. The presence of HP was found in 27/69 (39%) patients with blood group O, 45/96 (47%) patients with blood group A, 16/40 (40%) patients with blood group B and 5/22 (23%) patients with blood group AB (Fig. 2).

Chi-square test showed no statistically significant difference (P>0.05) in the incidence of HP infection between these groups, indicating that HP infection did not relate to any particular blood group. Also, Spearman's test showed that there was no significant correlation between any particular blood group and HP+ patients. Blood groups in the studied group were similar to those of the Serbian population (0- 38%, A-42%, B-15%, AB-5%) [20].

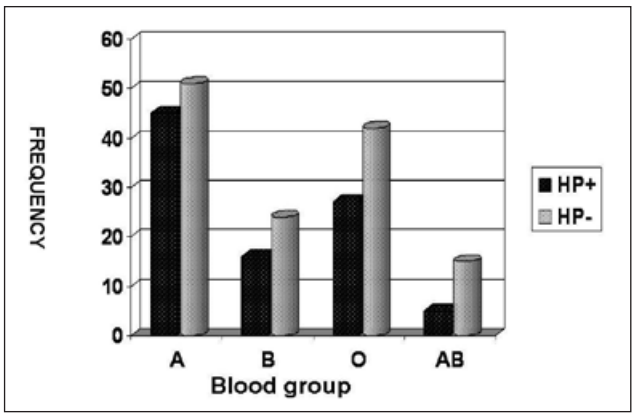

Figure 2. ABO blood group distribution in helicobacter pylori positive and negative patients.

From the total number of patients, 36 (16%) were Rh-, and 191 (84%) were Rh+, while 16/36 (44%) Rh- patients and 77/191 (40%) Rh+ patients were HP+. Chi square test showed no statistically significant difference (P>0.05) in the above mentioned groups, indicating that the presence of HP did not relate to the Rh factor. Also, Spearman's test showed no significant correlation of the presence of Rh factor in the HP+ patients in comparison to the frequency of Rh factor in the Serbian population (84% Rh+ and 16% Rh-) , (Fig. 3) [20].

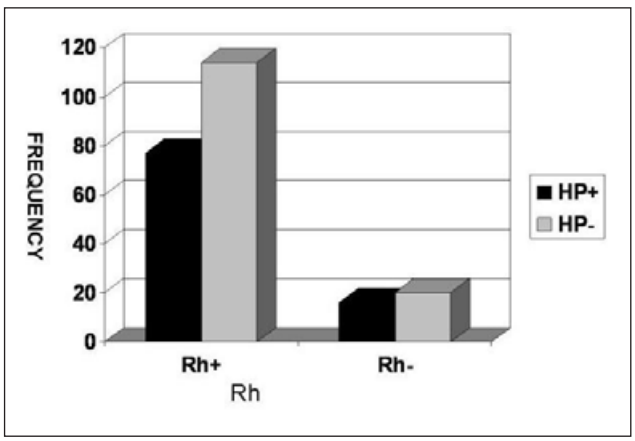

Figure 3. Rh factor distribution in helicobacter pylori positive and negative patients.

Basic and test values of the measured counts in the exhaled air, were estimated in all patients. Basic values were measured before ingestion of the ^{14}C-urea capsule, while

test values were measured 30min after ingestion of the capsule. Mean basic value was 74 counts/min (range 43-142 counts/min), while mean test value was 142 counts/min (range 92-2057 counts/min). Out of the 227 patients, 93 were HP positive (41%), (HP present in their gastric mucosa), while 134 were HP negative (59%). As basic values we consider the number of counts per minute obtained from the bottle with the trapped exhaled air initially, and as reference values we consider the value obtained with the same procedure 30min after ingestion of the radioactive capsule.

Basic value of the test in the HP+ patients was slightly lower (X=73.9counts/min) in comparison to HP- (X=75.6counts/min). T test showed no statistically significant difference (P>0.05) in the basic values of the ^{14}C breath test in positive patients in comparison to negative ones.

Related to the test values, T test showed a highly (P<0.01) significant difference in the actual values of the ^{14}C breath test measured in positive and negative patients. In clinical terms, there were 93 true positive (TP), 129 true negative (TN), 5 false negative (FN) and 0 false positive (FP) patients. Sensitivity of the method was 94.9%, specificity 100%, positive predictive value 100%, negative predictive value 96.3% and accuracy 97.8%. Thus, we can conclude that this test was highly accurate.

Discussion

According to others, blood group is not a risk factor for acquiring HP infection [18, 21]. In other studies, although the most prevalent blood group was blood type O (43%), subjects with blood group O did not show increased susceptibility to HP infection than those with other blood groups (P>0.05) [22, 23].

Also, HP positivity was not related to gender, ABO blood groups and Rh factor and gastrointestinal diagnosis, while low social-economic status conditions and living in rural and suburban areas were significantly associated with HP positivity [24]. Others also found no significant correlation between sex, ABO blood groups, consumption of spicy diets, social-economic status and seropositivity with HP positivity [25]. However, excess alcohol consumption was significantly associated with HP serology [25]. Others showed that HP positivity increased with age and also was not related to gender nor the blood groups [26].

On the contrary, other authors showed slightly different results, like a relationship between blood group A and HP infection [27, 28] and suggested that ABO blood groups may partly influence the prevalence of HP infection, especially in males, and that it increased with age [28]. Others found that patients with blood groups A and O were more prone to HP infection, and patients with AB blood group were less prone, and that this HP positivity could also be related to age, gender, and smoking [29]. Others emphasized blood group O as a moderate risk factor for HP [30]. The differences between the frequencies of the ABO blood group phenotypes among HP infected (A 27.0%; B 12.2%; AB 4.0% and O 56.8%) and noninfected patients (A 58.7%; B 13.0%; AB 4.3% and O 24.0%), were considered as indicating a relation between infection by HP and ABO blood groups [31]. Similar to our results, recent studies confirmed the accuracy and validity of this method in clinical work, even in the pediatric population [32-37].

In conclusion, in adults, HP infection does not depend upon the patient's age and gender. Also, HP infection does not depend neither upon blood groups nor upon Rh factor. Also, we can conclude that this test was highly accurate.

Acknowledgement
The investigation was supported by grant No 175018 of the Ministry of Science , Republic of Serbia. Milos and Jelena Petrovic have our thanks for the translation.

All authors declare that of this manuscript in English, they have no conflicts of interest.

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