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ORIGINAL ARTICLE

Iron deficiency in *Helicobacter pylori* infected patients in Baghdad

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ABSTRACT

Objectives: Recent studies have suggested an association of *Helicobacter pylori* and iron deficiency (ID).

Materials and methods: To examine an association between *H.pylori* infection and ID, blood sampling and a data collection survey were performed in 78 *H.pylori* infected patients and 22 healthy subjects as control. Serum ferritin and iron were measured by ELISA and direct enzymatic method techniques respectively.

Results: The result showed that 24 of the patients (30.7%) have serum ferritin and iron concentrations below the normal range indicating iron deficiency, with no significantly difference between women and men. ID was more pronounced in patients with stomach ulcer (58.3%) than those without stomach ulcer (41.7%) respectively.

Conclusions: The conclusion was that *H.pylori* infection might have a role in iron deficiency and subsequently iron deficiency anemia. *J Microbiol Infect Dis 2011; 1(3):114-117*

Key words: Iron deficiency, anemia, *H.pylori* infection, ferritin

Bağdat'ta Helicobacter pylori ile enfekte hastalarda demir eksikliği

ÖZET

Amaç: Son zamanlarda yapılan çalışmalar *Helicobacter pylori* ile demir eksikliği arasında bir ilişki ileri sürdüler.

Materyal ve metot: *H.pylori* enfeksiyonu ile demir eksikliği arasındaki birlikteliği araştırmak için 78 *H.pylori* hastasından ve kontrol olarak 22 sağlıklı kişiden kan örnekleri ve anket çalışması yapıldı. Serum ferritin ve demir, sırasıyla, ELISA ve direk enzimatik metot tekniğiyle çalışıldı.

Bulgular: Sonuçlar 24 hastada (% 30,7) serum ferritin ve demir konsantrasyonlarının normal değerlerden düşük olduğunu ve erkek ve kadın cinsleri arasında farklılık olmadığını gösterdi. Demir eksikliği mide ülseri olan hastalarda (% 58,3) olmayanlara (% 41,7) göre daha belirgindi.

Sonuç: Sonuç olarak H. pylory enfeksiyonları demir eksikliğinde rol oynayabilir ve bu demir eksikliğiyle sonuçlanabilir.

Anahtar kelimeler: Demir eksikliği, anemi, *H.pylori* enfeksiyonu, ferritin

INTRODUCTION

Helicobacter pylori are gram-negative urease producing organisms that are found throughout the world. Infection with *H.pylori* produces chronic gastritis. It may also predispose patients to develop duodenal ulcers, gastric lymphoma or carcinoma.[1,2] Many studies postulated that *H.pylori* may disturb normal biochemistry like increase in plasma fibrinogen a modification of the serum lipid profile.[3,4] Recent evidence suggests that *H.pylori* is associated with iron deficiency and anemia. Several cross-sectional studies have found an association between *H.pylori* and low body iron stores and iron deficiency anemia and a reduced response to iron supplementation.[5-11] Weyermann et al found that pregnant women infected with *H.pylori* had lower mean hemoglobin (Hb) level at the beginning of pregnancy and a greater decrease in the mean Hb level at the end of pregnancy.[12] In Kenya, anemic children had a 2.5-fold higher proportion of elevated IgM antibody titers against *H.pylori* than non-anemic children.[13]

Iron deficiency, defined as decreased total body iron content, is among the most common

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nutritional deficiencies in the world. Iron deficiency results in impairments in immune, cognitive, and reproductive functions, as well as decreased work performance. Iron deficiency develops through three stages: 1) iron depletion, 2) iron-deficient erythropoiesis, and 3) iron-deficiency anemia (IDA).[1] Although the mechanisms remain unclear, clinical and epidemiologic studies suggest that infection with *H.pylori* is associated with iron deficiency and IDA.[14] Barabino hypothesized that gastritis increased levels of neutrophil-derived lactoferrin, and since *H.pylori* has a lactoferrin-binding protein receptor, the infection would result in increased iron losses related to bacterial turnover.[15] A study of children in Alaska showed that anemia responded to oral iron replacement but recurred when iron therapy was discontinued, suggesting that mild chronic bleeding was involved.[16] It seems likely that the pathogenesis is multifactorial, including combinations of reduced iron absorption related to decreased acid secretion, increased iron loss from microbleeding, and utilization by bacteria. The purpose of this study is to investigate the role of *Helicobacter pylori* gastritis in iron-deficiency (ID) in some Iraqi patients.

MATERIALS AND METHODS

The patients were referred to Digestive System Center where *H.pylori* infection was diagnosed endoscopically and the other part of the patients were referred to Immunology Department in Central Public Health Laboratories where *H.pylori* was diagnosed serologically by using anti-H. pylori IgG antibodies Elisa kit. Totally, 22 anti-*H. pylori*-IgG seronegative subjects were used as a control group. Epidemiological data such as age, sex, smoking habits, and drug treatment were recorded for all of the patients.

Sample Collections

Five milliliters (ml) venous blood was obtained from the subjects. All blood samples were dispensed into dry glass test tubes for clotting and retraction to take place. Sera were obtained after samples were centrifuged at 2000 g for five minutes and stored at -20°C until assayed for laboratory investigations.

Laboratory Investigations: Ferritin is a very good marker for iron deficiency but since ferritin is an acute phase protein, it can be elevated in inflammation conditions that a normal serum ferritin may not always exclude iron deficiency, so iron is measured too as another indicator for iron deficiency. Ferritin was detected by ELISA; this assay system utilizes one rabbit anti-ferritin antibody for solid phase immobilization and a mouse monoclonal anti-ferritin antibody in the antibody-enzyme (horseradish peroxidase) conjugate solution. The normal range of ferritin as recommended by BioCheck is 20-250ng/ml for male and 10-120ng/ml for female. Serum iron concentration were investigated by direct enzymatic method; after dissociation of iron- transferring bound in acid medium, ascorbic acid reduces Fe+3 iron into Fe+2 iron. The absorbance measured at 600 nm is directly proportional to the amount of iron in the specimen. The normal rang of iron as recommended by BIOLABO is 11.6-31.1 µmol/L for male and 9.0-30.4 µmol/L for female.

Statistical Analysis

All values were expressed as mean ± SD. Statistical analyses were done using the Student's t-test to assess differences among study groups. The level of significance was set at $P < 0.05$.

RESULTS

A total of 78 patients (36 women and 42 men) with infected *H.pylori* were enrolled in this study. Mean ±SD age of the 78 female/male patients was 41.2±13.4/43.4±14.9 years, range 15-68/18-75 years, respectively. Of the 78 patients, 32 (41.0%) have stomach ulcer 14 female/18 male (43.8%/56.3% respectively). Table 1 shows the lifestyle and clinical characteristics of subjects (women and men). Of the 78 *H.pylori* patients 24 (30.7%) (11 female and 13 male, 45.5%/54.2% respectively) showed low concentration of both ferritin and iron. In general median serum ferritin and iron levels were significantly lower than the normal ranges in *H.pylori* infected patients than in anti- *H.pylori*-IgG seronegative control group as it showed in figures.[1,2]

There was no significant difference in median concentrations of both iron and ferritin between in women and men. The decrease of serum ferritin and iron levels was more significantly pronounced in patients with stomach ulcer than those with no ulcer and 14 (58.3%) of the 24 patients with low

ferritin and iron concentrations were having stomach ulcer.

Table 1. Subjects' lifestyle, and clinical data

Variables	Women (n=26)	Men (n=42)
Age, Mean±SD (Range)	41.2± 13.4 (15-68)	43.4±14.9 (18-75)
Gastric ulceration (%)	13 (36.1)	16 (38.1)
Body mass index		
Normal	20	22
Overweight	12	18
Obese	4	2
Currently smoking (%)	1 (2.8)	20 (45.5)
Chronic diseases (%)	12 (33.3)	18 (42.9)

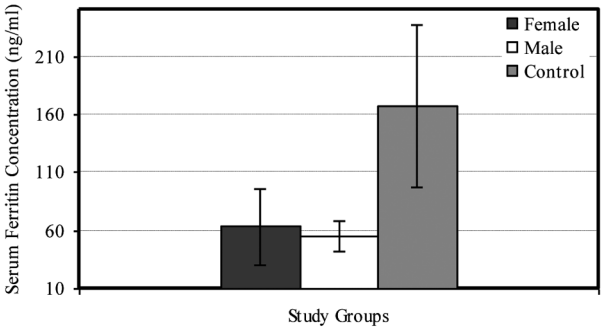

Figure 1. Serum ferritin concentrations in study groups. The bar represents the mean. Vertical line extends between ± 2 SD.

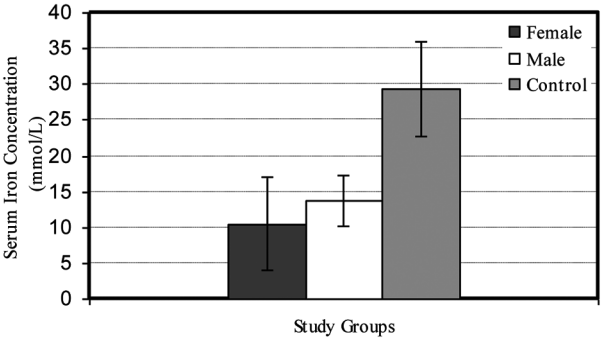

Figure 2. Serum iron concentrations in study groups. The bar represents the mean. Vertical line extends between ± 2 SD.

DISCUSSION

Iron deficiency and IDA are conditions with important health consequences regarding reproduction, immunity, work performance, and possibly cognitive development; it is a simple result of an imbalance between iron loss and absorption.[17] *Helicobacter pylori* associated gastritis has emerged as a potential cause of iron deficiency anemia that is unresponsive to iron therapy.[18] Our results support the proposal that *H.pylori* infection is associated with ID, this proposal is achieved by many studies with different explanation of the mechanisms by which *H.pylori* affect iron absorbance. Baysoy, et al. has investigated *H.pylori* related-changes in gastric physiology and histology in children. They have reported that *H.pylori* infection is associated with low serum iron levels and with a decrease in gastric juice ascorbic acid concentration.[18] Capurso, et al. has demonstrated that *H.pylori* infected IDA subjects have a higher intragastric pH and serum Gastrin level. They have suggested that *H.pylori* infection may be the cause of atrophic gastritis leading to aclorhydria and gastric hypoacidity.[19] A study including 2080 adult patients in Alaska, where there is a high prevalence of *H.pylori*, have suggested a significant correlation between *H.pylori*–IgG positivity and low serum ferritin levels.[20] They have suggested that ulceration causes bleeding which leads to IDA and this result was confirmed by our own study. The blood loss in chronic gastritis, and bleeding from duodenal or gastric ulcers related to H pylori infection, plays an important role in the development of iron deficiency in adults. In response to *H.pylori* chronic gastric inflammation, the epithelial cells in the mucosa are damaged, leading to detachment and apoptosis. In the absence of bleeding lesions, the possible mechanisms by which *H.pylori* is involved in the development of IDA remain unclear. Preliminary studies suggest that the growth and proliferation of *H.pylori* requires iron from the host and that some *H.pylori* strains have a specific ability to interfere with iron metabolism by binding iron to their outer membrane proteins.[21]

Moreover, Boggs reviewed that eradication of *H.pylori* with a triple therapy consisting of lansoprazole, clarithromycine, and amoxicillin for 14 days leads to serum ferritin levels elevation significantly in both IDA and ID groups without iron supplements, indicating that complete recovery of iron deficiency and iron deficiency anemia can be achieved with the treatment of *H.pylori* infection.[22]

We believe that H.pylori infection might have a role in causing iron deficiency anemia. Hence, H.pylori infection has to be looked for, in cases of

recurrent iron deficiency anemia, as this condition is very common in our country.

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