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Relationship Between Serum Ferritin, TIBC Level and *Helicobacter pylori* Infection

Kaveh Tari,[1] Zahra Shamsi,[1] Arezou Rahimi,[2] and Amir Atashi[1,*]

[1]Department of Hematology, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, IR Iran
[2]Department of Immunology, Faculty of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran

[*]*Corresponding author*: Amir Atashi, Department of Hematology, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, IR Iran. E-mail: atashia@gmail.com

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Abstract

Background: In iron deficiency anemia (IDA), serum ferritin level is decreased and total iron binding capacity (TIBC) is increased
Objectives: In this study the relationship between *H. pylori* infection and iron deficiency anemia were studied.
Methods: This research was a cross-sectional study. TIBC and ferritin levels were measured in 133 patients, suspected to *H. pylori* infection, then serum levels of IgM and IgG antibody against *H. pylori* infection were measured
Results: From 133 patients, 97 were females (72.93%) and 36 males (28.07%), 36 of them (23 women and 13 men) have a TIBC levels more than 400 ug/dL and ferritin levels were less than 12ng/dL. Twenty patients had IgG antibodies and 5 patients had IgM against *H. pylori*.
Conclusions: The results show the association between *H. pylori* infection and increased levels of TIBC and decreased serum ferritin.

Keywords: Ferritin, Total Iron binding Capacity, Iron Deficiency Anemia, *Helicobacter pylori* Infection

1. Background

Iron deficiency anemia is the most common cause of anemia in the worldwide and due to iron deficiency for erythropoiesis. Its prevalence is high in children and during growth [1]. There are several factors in incidence anemia. The main reason is the lack of iron in the diet of children (dietary iron); in adult males is almost result from chronic blood loss due to gastrointestinal bleeding (gastrointestinal lesions leading to blood loss include peptic ulcers) and menstrual bleeding in women [2, 3]. Clinical and laboratory characteristics may helpful to detect of this anemia. Common symptoms of anemia include fatigue, lethargy, decreased exercise tolerance, weakness, weight loss, reduced growth and the specific symptoms such as unusual desire to eat food (pica) [4]. Most significant laboratory finding including decreased MCV (mean cell volume), MCHC (mean cell hemoglobin concentration) and levels of serum ferritin and increased TIBC (total iron binding capacity). Peripheral blood of patients is hypochromic microcytic RBC (red blood cell) [5]. *Helicobacter pylori* infection is causes chronic gastritis, peptic ulcer and gastric carcinoma. In addition, it have extra gastric symptom. Various methods used to identify patients infected with *H. pylori*, invasive procedures such as endoscopic mucosal biopsy and tissue culture, noninvasive techniques include urea breath test and evaluation of serum antibodies against *H. pylori*. Humoral immune response to *H. pylori* infection with production of IgA and IgG, IgM antibodies. Antibodies can be measured and detected by serologic tests [6]. Various studies are suggesting that *H. pylori* infection as a risk factor for iron deficiency anemia. Probably mechanisms include decreased secretion of HCL (Hydrochloric acid), achlorhydria in gastric mucosa that reduces the absorption of iron, also absorbed iron by *H. pylori* bacteria is the one of the mechanism [7, 8].

2. Objectives

In this study the relationship between *H. pylori* infection and iron deficiency anemia were studied.

3. Methods

In this cross-sectional study, 133 patients who complained of digestive problems, abdominal pain, nausea and vomiting were referred to Imam Khomeini hospital laboratory of Tehran were selected. These patients were suspected to infection with *H. pylori*. At first TIBC and ferritin levels were measured. TIBC level measured by biochemical BT3000 autoanalyzer (Biotechnica instruments.USA). Up to 400 μg/dL was considered the increased level and serum ferritin levels were measured by ELISA method by protocol of kit Pishtazteb (IRAN) and less than 12 ng/dL was considered reduced level. Then the people

with reduced levels of serum ferritin and TIBC increased were considered as sample, and the others as control and IgM and IgG antibodies against *H. pylori* were measured in them. Finally, statistical analysis by using SPSS-22 software and χ^2 and t-tests were performed.

4. Results

Of 133 patients that referred to laboratory, 97 of them were women and 36 were men. The most age range was 44 - 35 years.

4.1. Results of Serum Ferritin and TIBC Level

Of 133 patients, 36 patients have serum ferritin levels less than 12 ng/dL and TIBC levels more than 400 μg/dL. Finally significant relationship between sex and TIBC and ferritin not found.

4.2. Serological Results of H. pylori Test

H. pylori infection serological results showed that of 36 patients with icreased serum TIBC level and decreased serum ferritin level, 20 of them were positive titer for IgG (up to 100) and 5 of them were positive titer for IgM (up to 20) and in control group who serum TIBC and ferritin levels were normal, one case was positive titer for IgG (up to 100) antibodies against *H. pylori*.

4.3. Results of Stastical Analysis

T-test results has shown significant relationship between the serum TIBC and ferritin level and *H. pylori* infection (P = 0.05). Also, no significant relationship was found between gender and *H. pylori* infection.

Table 1. Distribution of Gender

Gender	Frequency	Percent
Female	97	72.9
Male	36	27.1
Sum	133	100

Table 2. Results[a]

Results	TIBC←, Ferittin←	TIBC↑, Ferittin↓
HP/IgG	1	20
HP/IgM	0	5
HP/IgG, IgM	96	11

Abbreviation: HP: *Helicobacter pylori*.
[a]normal: ← , increase: ↑, decrease: ↓.

5. Discussion

Iron deficiency anemia is the most common cause of anemia in the worldwide. The anemia is usually seen when the amount of iron in food cannot compensate iron requirement or there is an external hemorrhage. This anemia is classified into three stages: iron depletion stage, iron deficient along with erythropoiesis and the last stage is iron deficiency. In blood loss, iron storage used and then ended iron stores, erythropoisis limited and finally lead to iron deficiency anemia [9]. In this study, the patient had a decrease in ferritin and control group did not have any inflammatory disease, so the effect of inflammation on serum ferritin levels was removed. Many studies [3, 5, 7, 10] have shown the relationship between *H. pylori* infection and iron deficiency anemia. Mozon et al. in the study had results similar to our results, in this study patients with *H.pylori* infection and IDA were treated for *H. pylori* and in patients treated significantly improve IDA were observed, therefore concluded that the infection can cause IDA that was consistent with our results [11]. Konno et al. in two separate study showed that in patients with iron deficiency anemia, treatment of *H.pylory* infection can improve IDA, therefore IDA associated with infection which this results showed that are consistent with the our results [12].

The main mechanism including chronic bleeding, iron intake by bacteria and reduce stomach achorhydria and decrease iron absorption. In this study used IDEAL ELISA kit (Iran) for the diagnosis of *H. pylori* which has a sensitivity of 96.8% and specificity of 73%. Antibody against *H. pylori* IgG and IgM were measured. The IgG antibodies in 94% - 95% of patients, approximately 2 months after the entry into body will be positive and after eradication bacteria and infection remains positive up to a year or more, also the antibodies of the IgM class insensitive indicator of acute infection. In this study indicated that no significant relationship between gender with serum TIBC and ferritin level and *H. pylori* outbreak. Several studies have shown that *H. pylori* infection leads to decreased serum ferritin level. The study also showed that *H. pylori* infection can lead to decreased of serum ferritin and increased of TIBC levels. Parkinson et al. and Berg et al. in two studies have shown that *H. pylori* infection cause decrease in serum ferritin level that consistent with our results [10, 13]. Also Choe et al. have shown that *H. pylori* result in IDA [8]. Milman et al. show *H. pylori* infection affects iron metabolism in humans [14] and Seo et al. show serum ferritin levels are reduced in children with *H. pylori* infection therefore the *H. pylori* infection may lead to iron deficiency in children [15].

Many studies [3, 7, 11, 13] have shown the relationship between *H. pylori* infection and reduced serum ferritin levels and other studies have not confirmed this relationship.

This study show this relationship, therefore its seems important to assess the digestive tract for the management of patients with IDA. *H. pylori* with or without gastric body atrophy should always be considered as a possible cause of IDA. It is recommended that further studies on other parameters of iron deficiency anemia done.

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Footnotes

Authors' Contribution: All authors had equal role in design, work, statistical analysis and manuscript writing

Conflict of Interest: The authors declare that they have no conflict of interest in this work.

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