



HELICOBACTER PYLORI INFECTION AND SERUM IRON PROFILE: A CASE CONTROL STUDY AT TERTIARY CARE HOSPITAL NAWABSHAH, SINDH PAKISTAN

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ABSTRACT

OBJECTIVE “Helicobacter pylori (H. pylori) infection is the most common chronic infection. The aim of this cross-sectional study was to determine the association between iron profile, serum iron, ferritin level, and total serum iron binding capacity (TIBC) in adults and adolescents with positive H. pylori infection.

METHODOLOGY This study was conducted this case control study in the Department of Medicine, PUMHSW Nawabshah, Shaheed Benazirabad Sindh Pakistan from April 2022 to March 2023. A total of 200 patients of both sexes with seropositive H. pylori confirmed by the presence of stool specific antigen (HpSAg) or positive antibodies to Helicobacter pylori in the blood were enrolled as group A. Another 200 subjects with negative H. pylori were recruited to adjust for age and sex and designated as group B, aged 18 to 60 years of both sexes. Blood was drawn for hematocrit (Hct), hemoglobin (Hb), and iron profile. Data were noted in a predesigned, prestructured proforma, and confidentiality was maintained. All data variables were analyzed using SPSS 22.0 (USA).

RESULTS Out of 256 subjects, 128 were in case group and 128 in control group. The mean age of case group was 37.8906 ± 11.69510 years and for control it was $37.5000 + 11.56018$. Regarding the gender the 60 (46.9%) were male and 56 (43.8%) were female in case group. In study the mean iron level was $58.9530 + 24.77736$ in H. pylori participants as and those who were negative H. pylori their mean serum iron was 68.1180 ± 18.06080 ; p-value: <0.001 . Serum ferritin level was 112.7328 ± 105.16863 in H. pylori positive group as compared to control group that was $208.5980 \pm$

114.04281ng/dL; p-value: <0.001. The mean total iron-binding capacity was 331.7559 ± 67.79927 ug/dl.

CONCLUSIONS The study results support a positive association between H. pylori and a low serum iron profile. Therefore, we recommended that in H. pylori positive patients should be investigated for iron profile.

Keywords. H-PYLORI SERUM IRON SERUM FERRITIN IRON PROFILE

INTRODUCTION

“Helicobacter pylori (H. pylori) infection is the most common chronic infection” and about half of the world's population is affected by this bacterium. 1 and developing countries (up to 80%) are more severely affected than developed countries (20–50%).² H. pylori is a spiral gram-negative bacterium that causes various gastrointestinal diseases, including chronic gastritis, atrophic gastritis, “peptic ulcers, mucosa-associated lymphoid tissue (MALT -lymphoma), and gastric adenocarcinoma”.³ The mechanisms by which H. pylori can lead to iron deficiency (ID) are to impair iron absorption and increase iron loss.⁴⁻⁵ Gastric acid is critical for iron absorption and chronic atrophic gastritis leading to hypochlorhydria or achlorhydria, ultimately resulting in malabsorption of iron and IDA. 6-7

Studies have also shown its extra- GI manifestations, including iron deficiency (ID), iron deficiency anemia, chronic idiopathic thrombocytopenia, coronary artery disease, migraine, Raynaud's syndrome, and dermatologic disorders. 4,8

A meta-analysis also found an association between H. pylori infection and depletion of iron stores, and after eradication, iron stores are replenished. 4 Further evidence suggests that H. pylori eradication also replenishes blood hemoglobin (Hb) and serum ferritin. 9-10 Other epidemiologic studies have also confirmed this association. 11-12 It has also been noted that individuals found to be positive for H. pylori also had significantly lower serum ferritin levels 13-14.

Study on Danish population,¹⁵ individuals with seropositive H. pylori infection were found to have a 40% increased risk of decreased serum ferritin levels compared with seronegative individuals. Other studies have also found decreased iron levels in patients with positive H. pylori infection. 16-17 However, Collett et al¹⁸ found no statically significant differences in serum ferritin levels between H.pylori positive and H.pylori in either gender in their study. The studies conducted in Pakistan show a positive association between individuals infected with H. pylori and iron deficiency anemia. 19-20 In a study in our setting in Nawabshah, subjects with positive H. pylori infection were also found to have deficient ferritin levels. 21 However, no study has been conducted in our setting in which an association between H. pylori infection and iron profile could be established. Therefore, the aim of our study is to determine the association between iron profile, serum iron, ferritin level, and total serum iron binding capacity (TIBC) in adults and adolescents with positive H. pylori infection in PUMHSW Nawabshah Hospital.

Helicobacter pylori (H. pylori) infection is the most common chronic infection and about half of the world's population is affected by this bacterium. 1 and developing countries (up to 80%) are more severely affected than developed countries (20–50%).² H. pylori is a spiral gram-negative bacterium that causes various gastrointestinal diseases, including chronic gastritis, atrophic gastritis, peptic ulcers, mucosa-associated lymphoid tissue (MALT -lymphoma), and gastric adenocarcinoma. 3 The mechanisms by which H. pylori can cause iron deficiency (ID) are to impair iron absorption and increase iron loss.⁴⁻⁵ Gastric acid is critical for iron absorption and chronic atrophic gastritis leading to hypochlorhydria or achlorhydria, ultimately resulting in malabsorption of iron and IDA. 6-7

MATERIALS AND METHODS

We conducted this case control study in the Department of Medicine, People’s College of Medical & Health Sciences Nawabshah, Shaheed Benazirabad Sindh Pakistan from April 2022 to March 2023. Ethical approval was obtained before the start of the study (JSMU/IRB/2020/31). A total of 200 patients of both sexes with seropositive *H. pylori* confirmed by the presence of stool specific antigen (HpSAg) or positive antibodies to *Helicobacter pylori* in the blood were enrolled as group A. Another 200 subjects with negative *H. pylori* were recruited to adjust for age and sex and designated as group B, aged 18 to 60 years of both sexes. Subjects taking iron supplements, suffering from chronic diseases such as diabetes mellitus, kidney disease, chronic diarrhea, women taking iron supplements, suffering from inflammatory bowel disease and malignant disease, and menstruating women were excluded from the study.

All participants, case or control, were examined by a researcher and a detailed medical history was obtained. After all aseptic procedures, 10 ml of blood was drawn from the cubital vein in the morning for both groups and sent to the PUMHSW Nawabshah Research and Diagnostic Laboratory to determine hematocrit (Hct), hemoglobin (Hb), and iron profile, including serum iron, serum ferritin, and TIBC levels. In addition, all subjects were asked to provide a stool sample in the morning for specific antigen (HpSAg) determination. Blood containing ethylenediaminetetraacetic acid (EDTA) was analyzed using the Sysmex hematology machine. The serum ferritin level was 30-400 ng/ml. 22 Total iron binding capacity-255-450 µg/dL.23, Serum iron level 40–165 µg/L 24 were considered normal. The inclusion and exclusion criteria were strictly followed to control for confounding variables.

Data were noted in a predesigned, prestructured proforma, and confidentiality was maintained. All data variables were analyzed using SPSS 22.0 (USA). The continuous variables e.g. age, iron profile was calculated as mean and standard deviation by using descriptive statistics. The categorical variables like gender were calculated as percentages and frequencies. An independent t-test was used to compare age, sex, Hb, Hct, serum iron, serum ferritin, and TIBC between the two groups. A *p*-value of < 0.05 was used as significant difference between the two groups, that mean as that the null hypothesis was false.

RESULTS

Total of 256 subjects were enrolled for this study, 128 were in case group and 128 in control group. The mean age of case group was 37.8906 ± 11.69510 years and for control it was $37.5000 + 11.56018$. Forty-eight (37.5%) subjects were belonging to between 41-50 age, that was higher than other age groups. (Table 1). Regarding the gender the 60 (46.9%) were male and 56 (43.8%) were female in case group. Table-I showed the descriptive statistics in relation to age.

Table 1 Demographics of the participants (256)

Demographics	Case group (128)	Control Group (128)	p-value
Gender			
Male	60 (46.9%)	56 (43.8%)	0.769
Female	68 (53.1%)	72 (56.3%)	
Age Scale (years)			
< 20	13 (10.2%)	11 (8.6%)	0.454
20-30	22(17.2%)	25(19.5%)	
31-40	29(22.7%)	33 (25.8%)	
41-50	48(37.5%)	44(34.4%)	
51-60	16 (12.5%)	15 (11.7%)	

In our study the mean iron level was $58.9530 + 24.77736$ in H. pylori participants as and those who were negative H. pylori their mean serum iron was 68.1180 ± 18.06080 ; p-value: <0.001 . Serum ferritin level was 112.7328 ± 105.16863 in H. pylori positive group as compared to control group that was 208.5980 ± 114.04281 ng/dL; p-value: <0.001 . The mean total iron-binding capacity was 331.7559 ± 67.79927 ug/dl. The mean hemoglobin level was $12.3688 + 2.30147$ g/dl. (See Table 2).

Table 2: Comparison of the Hemoglobin and Serum, iron, serum ferritin and TIBC(total iron-binding capacity) between two groups (256)

	Case group	Control group	p-value
Hemoglobin	$12.3688 + 2.30147$	$13.9905 + 1.43013$	<0.001
Serum iron ($\mu\text{g/dL}$)*	$58.9530 + 24.77736$	68.1180 ± 18.06080	<0.001
Serum ferritin (ng/dL)!	112.7328 ± 105.16863	208.5980 ± 114.04281	<0.001
Serum TIBC ($\mu\text{g/dL}$)	$331.9844 + 105.16863$	$385.9766 + 68.51398$	<0.001

* $\mu\text{g/dL}$: micrograms per decilitre,! ng/dL: nanograms per decilitre,

DISCUSSION

In our study, the mean age of patients infected with H. pylori was 37.8906 ± 11.69510 years and that of the control group was $37.5000 + 11.56018$ years, with almost the same observations made in other studies.21,25-26 and slightly higher (40,44) by Nohario et al,19 who performed a cross-sectional study. We found that 41-50 years was the most common age group, which was also observed by Kishore G et al.16 in their study. In our study, female subjects (53.1%) dominated over male subjects (46.9%), as also noted by Rahat et al,26 who reported 52.7% female and 47.3% female subjects. A preponderance of males was noted in some studies, but in these studies serum ferritin levels were observed only in H. pylori positive subjects 27-28

We performed this case-control study of serum iron profile in both sexes and almost all age groups, and the results showed an inverse relationship between serum iron levels and H. pylori-infected individuals. The H. pylori infected subjects had lower serum iron, serum ferritin and TIBC levels compared to H. pylori negative subjects, which was statistically significant. (p.value < 0.001), the same results were observed by Kishore et al16, Nohario et al19.

Low iron levels ultimately lead to ID and eradication therapy of H. pylori infection can reverse ID and increase iron stores and improve quality of life. 29

Serum ferritin levels were lower in H. pylori-infected subjects than in the control group, which is not consistent with the study by Kishore G et al,16 who found higher serum ferritin levels in H. pylori-positive subjects, which they believed was due to persistent inflammation. Our findings are consistent with other studies conducted nationally and internationally. 8,21

Low serum ferritin levels were found in patients infected with H. pylori in Bangladesh30, Australia31, China32, and Korea33. No significant differences in serum ferritin levels according to H. pylori status were observed in Iran34, Korea35, and Egypt36. These different observations could be due to different geographic areas, lifestyle, dietary habits, sample size or sampling error, laboratory error, statistical error, etc. 17.

Iron is stored in the form of serum ferritin and is therefore a reliable biological marker of iron stores in humans.37 However, because serum ferritin is also an acute-phase protein, it is elevated during infections and inflammatory processes, so its levels may be unreliable in H. pylori or concurrent infections.38

Many studies, including meta-analyses, have found an association between *H. pylori* infection and iron deficiency anemia (IDA), and all of these studies have also found lower serum iron levels. 16,19,39-43 Many mechanisms have been described for iron deficiency induced by *H. pylori* 44-45; it induces chronic gastritis, which leads to a depletion of "gastric acid secretion and ascorbic acid levels in the stomach, which are necessary for iron absorption". 46-47 In addition, these patients have high gastric pH, which leads to decreased iron absorption. 48 In addition, the body loses iron due to iron binding by *H. pylori* and the inflammatory mucosa of the gastrointestinal tract. 46 Eventually, these patients will develop iron deficiency and eventually iron deficiency anemia if not corrected.

CONCLUSIONS

In our case-control study, we found lower serum iron, serum ferritin, and TIBC levels compared with the control group, and the results of our study support a positive association between *H. pylori* and a low serum iron profile. Therefore, in all patients with positive *H. pylori* findings, the iron profile must be investigated immediately. Proper eradication of *H. pylori* along with iron supplements can improve the quality of life.

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