Original Article

Effect of Helicobacter Pylori Infection on Iron Profile Among Patients Attending Kosti Teaching Hospital, Sudan

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Abstract

Background: As approved by many studies patients with H. pylori infection; a spiral bacterium that invade different parts of gastrointestinal tract and mainly gastric mucosa causing gastric inflammation and peptic ulceration may linked directly to body iron status.
This study aimed to evaluate the body iron status in H .pylori infected patients
Methods: This study was conducted in Kosti Teaching Hospital, White Nile State (Sudan) Jan 2018 to March 2019. The study groups consisted of 58 patients with H. pylori as cases group and another group were 58 healthy subjects as the control group. The members of both groups were enrolled in the study voluntarily. Study groups demographic and anthropometric data, hemoglobin, serum ferritin and total iron- binding capacity and transferrin were measured.
Results: Hemoglobin, serum ferritin (11.32 vs. 79.15 ng/ml) was significantly lower when compared with the control one. On other hand transferrin and total iron-binding capacity statistically reflected higher figures as (397.05 vs. 265.11 mg/dl) and (543.21 vs.270.42 mcg/dl) respectively when compared case group with control one. Moreover endoscopy screening of patients reflected considerable information regarding esophagitis, gastritis, duodenal ulcer and esophageal cancer.
Conclusion: Although the findings of present study revealed that H. pylori are able to interfere with the distribution of biological iron, reflecting significant alteration on parameters related to iron homeostasis. Since evidence for the association of H. pylori and IDA still not enough and there are contrasting data about such association, future high quality and cohort researches are needed to determine the causal association.

Keywords: H. pylori, Transferrin, Total iron-binding capacity, Ferritin.

Introduction:

The distribution of iron in human body is regulated at different levels including the intestinal absorption, contribution of iron in body activities, hepatic storage and export process. Many proteins play major roles in regulation, homeostasis and maintenance of iron status. The most known proteins are ferritin, transferrin, and total iron binding protein, transferrin receptor, ferroprotein and hepcidin. Transcriptions of all this proteins approved to be regulated at the modification level that involve the post transcribed messenger RNA by stored fraction, and considerable effect on the process of transcription by hormones, inflammatory reaction beside hypoxia.[1] Infection with H. pylori was associated with a reduced level of biological iron pool that seems to be attributed to the cellular response of the infected host to the bacterial components. Clinically reduction in the level of serum iron would be reflected as reduction in hemoglobin and serum ferritin beside increased in the amount of total iron binding capacity (TIBC) and transferrin.[2]

Iron deficiency anemia is the most common cause of anemia in the world. Anemia defined as a reduction in the number of red blood cells (RBCs) or the amount of hemoglobin (Hb) concentration below established standard levels. Based on the World Health Organization reports almost a quarter of the world population is anemic.[3] The main causes in children are the shortage or lack dietary iron while in adult males is almost result from chronic blood loss due to gastrointestinal bleeding and menstrual bleeding in women.[4,5] Most significant laboratory finding including lowering in mean cell volume (MCV), mean cell hemoglobin concentration (MCHC),levels of serum ferritin, increased total iron binding capacity(TIBC).

In peripheral blood of patients the predominant is hypochromic microcytic red blood cell (RBC). [6] Various recent studies that said the underlying causes of anemia are chronic gastritis associated with Helicobacter pylori infection, peptic ulcer and gastric carcinoma. Various studies are suggesting that H. pylori infection as a risk factor for iron deficiency anemia.

Many studies related the mechanisms to reduction in the secretion of Hydrochloric acid (HCL).[7,8] H. Pylori infection is the most common cause of gastritis in Sudan. [9] Another studies suggested an association between H. pylori infection and iron deficiency anemia. [10, 11]

Objectives:

To study the effect of H. pylori infection on iron profile

Materials and Methods:

Approval permission of this study was received from the administration of Kosti Teaching Hospital, White Nile State, Sudan Routine verbal consents for laboratory diagnosis were implemented for all subjects according to hospital regulations and the study protocol conformed to the ethical guidelines of research in the state. The study was conducted in white Nile State, Sudan,enrolled 116 human subjects divided into two groups; H. pylori-positive Case group (n=58) was defined by positive documentation of at least two of the three laboratory test results (H.pylori stool antigen, selective culturing, ICT serological test), and H. pylori-negative (Control) group (n=58) with negative laboratory tests for H. pylori. Clinical histories for all participants for the present of gastro-intestinal symptoms including recurrent Abdominal Pain (RAP), recurrent vomiting and chronic anorexia for three months were taken, beside that weight and height of study groups were measured and recorded in this study.

Patients with hematologic disorders (e.g. sickle cell anemia), immunological or metabolic disorders, food allergy (celiac disease), collagen vascular diseases or children receiving antibiotics for last four weeks or receiving antisecretory therapy for last two weeks, as well as patients with past or family history of psychic element were all excluded from this study. All cases were matched with eligible control group for age, sex, education and other socio-demographic variables to rule out any possible confounders.

Detection of H. pylori Infection.

H.pylori infection was laboratory diagnosed via H. pylori stool antigen test, selective culture for gastric aspirate as well as detection of anti-H. Pylori antibodies (ICT).Then positively tested patients underwent esophagogastroduodenoscopy (OGD)

Estimation of Hemoglobin, Ferritin, transferrin and total iron binding capacity

5ml blood taken from all participates. 2ml was used to determine the level of hemoglobin while the reminder processed to obtain the needed serum for estimation of ferritin, transferrin and total iron binding capacity using commercial diagnostic kits and carefully following the enclosed instructions.

Statistical Analysis:

Data collected, organized, and processed tabulated and analyzed. A confidence interval with 95% was calculated. Data analyses in the

current study were performed through SPSS, version 18.0 (SPSS Inc., Armonk, NY, USA).

Results:

General characteristics Of 116 subjects that referred to laboratory of Kosti Teaching Hospital, 67% of them were females and 33% were males. The mean age of cases was 26.21 ± 7.9 while that of control group was 29.15±6.5.

Endoscopy screening of patients

Esophagogastroduodenoscopy (OGD) findings in case group reflected the presence of esophagitis, gastritis, duodenal ulcer and cancer of esophagus among this group while no evident of gastric tumor, **Table** (**1**).

Table 1: Esophagogastroduodenoscopy(OGD) Findings in Case Group

OGD Finding	No of Patients	Percent (%)No = 58
Esophagitis,	4	6.89%
Gasteritis	20	34.48%
Duodenal Ulcer	9	15.52%
Cancer of Esophagus	2	3.45%

Hemoglobin, Ferritin, transferrin and TIBC Levels.

Among the cases group the mean level of hemoglobin was 7.94 ±0.6 mg/dl while that of control group was14.34±0.9 mg/dl. Serum ferritin levels is 11.32 ±4.5 (ng/ml) in case group while that of control group was 79 ±6.8 (ng/ml). TIBC and transferrin showed an increased levels in case group 543 vs. 270 mcg/dl and 397 vs. 265 mg/dl respectively, **Table** (**2**).

Table 2: The distribution of Hb ,Ferritin,Transferrin & TIBC levels among study groups

Group	Hb (mg/dl)	Ferritin(ng/ml)	TIBC (mcg/dl)	Transferrin(mg/dl)
Patients	7.94 ±0.6	11.32±4.5	543.21 ±34.12	397.05± 43.35
Controls	14.34±0.9	79.15±6.8	270.42±28.32	265.11±45.27

Discussion:

The current topic revealed strong association between reductions in the level of hemoglobin among H. pylori infected subjects when compared with H. pylori free group. These findings were supported with the study published regarding the association between H. pylori infection and anemia due to iron deficiency in 1991.[12] later on much research conducted and approved this association. For example a case report study concerning 14 cases revealed clear association between H. Pylori infection and ID or IDA among children.[13,14] Iron deficiency anemia (IDA) patients with H. pylori infection who received H.pylori treatment had a significantly greater increases hemoglobin level one month following H. pylori treatment compared to IDA patients with H. pylori infection who did not receive H. pylori treatment.[14] Multiples studies focusing on the epidemiology of the H. pylori infection reported findings of association between the bacteria and occurrence of iron deficiency and iron deficiency anemia (ID/IDA) in both developed and developing countries.[14,15] Eradication of H. pylori for refractory IDA is supported by most of the current evidences. However, larger sample and well-constructed study design are necessary to clarify the association between H. pylori infection, iron deficiency and iron deficiency anemia.[16,17] Low ferritin level observed in our study (Table 2) is matching that shown by epidemiological studies involved persons seropositive for H. pylori

infection seem to have a significantly lower serum ferritin level.[18]In a population- based study(n=2794) from Denmark, H. pylori - seropositive persons were at 40% increased risk of having reduced serum ferritin level (<30μg/L) compared to seronegative individuals(after adjustment of age, gender, menopausal status, socioeconomic status, blood donation, and alcohol consumption) .[19] The effect of the bacteria on the metabolism of iron approved in studies conducted by Milman et al.[19] and Seo et al. their studies showed reduction in serum ferritin levels in children with H. pylori infection. Other studies searched more deep in this direction linking H. pylori infection with iron deficiency. In study regarding iron profile the output showed an increased in the level of transferrin and total iron binding capacity in patients than in healthy group. The effect of H. pylori on iron level can be reflected on proteins that involve in iron metabolism. A study of Alaskan natives (n=2080) found increased risk of low serum ferritin in persons seropositive for H. pylori infection. Berg et al[18] in their study have shown that H. pylori infection cause decrease in serum ferritin level that consistent with our results.

The report by Epidemiologic studies also support an association between H. pylori infection and low iron stores, and several reports have shown resolution of refractory cases of anemia after H. pylori treatment.[20] Also Choe et al. have shown that H. pylori result in IDA with decreased level of hemoglobin and ferritin and increased level of transferring and TIBC.[21] The mechanism by which H. pylori gastritis could cause iron deficiency anemia still need advanced researches. Although several mechanisms have been taken as hypothetical explanation regarding the possible effect of H. pylori infection on iron stores many of them approved that blood lost during the gastrointestinal bleeding accompanied with H. pylori infection is not the likely the main causes. Since most published studies found no bleeding lesions in those cases diagnosed as iron deficiency anemic patients and investigation of the subjects showed negative fecal occult blood testing.[21-23]

The most accepted mechanism is the effect of the bacteria on the absorption of iron due to hypo-or achlorhydria result from gastritis that associated with the infection. Gastric hydrochloric acid facilitates iron absorption by reducing non-heme iron from the ferric to ferrous form.[19] Persons with H. pylori infection and IDA appear more likely to have corpus gastritis as compared to H. pylori-infected patients without anemia.[24,20] Corpus gastritis results in decreased gastric acid secretion and increase in intragastric pH that may impair iron absorption.[19] Acid secretion returns to the normal range after eradication of H. pylori.[21] Another possible mechanism by which H. pylori could result in decreased availability of iron is sequestration of iron in lactoferrin in the gastric mucosa. H. pylori takes up iron from human lactoferrin through a receptor-mediated method,[25,26] and lactoferrin secretion in the gastric mucosa appears to be influenced by the H. pylori organism. [21] Since gastric mucosa lactoferrin levels have been shown to be significantly higher in H. pylori-positive IDA persons compared to persons who are non-anemic H. pylori-negative, nonanemic H. pylori-positive and H. pylori-negative with IDA.[21]

The other effect of H. pylori gastritis that may cause reduced iron absorption is a decrease in the concentration of ascorbic acid in gastric secretion. The vitamin; ascorbic enhance iron absorption by reducing iron to the ferrous form.[27]

Ascorbic acid is secreted into gastric juice, and it has been shown that gastric juice ascorbic acid levels are significantly lower in H.pylori-infected vs. uninfected persons, [24] and those ascorbic acid level increases after cure of H. pylori infection. [25]

Conclusion:

The current study reflected significant association between H. pylori infection and iron status in the body that reflected as reduction in hemoglobin and ferritin while TIBC and transferring were elevated.

Recommendation:
Patients with iron deficiency anemia (IDA) should be screened for H. pylori infection and much effort need to be done for to clarify the association between iron deficiency anemia and H. pylori infection.

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