

The value of iron supplementation to children with *Helicobacter pylori* infection in Iraq: a cross-sectional study

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ABSTRACT

A number of reports have linked iron deficiency anemia to *H. pylori* infection. This microorganism is extremely common worldwide and it is estimated to affect 50 % of population with some variations in the prevalence rates attributed to geographic, sociodemographic and other factors; nevertheless, it appears to be more common in developing countries in comparison with developed countries. In developing countries, *H. pylori* is estimated to affect approximately 65 % of children. The aim of the current study was to shed light on the possible association between *H. pylori* infection and iron deficiency anemia in children in our Iraqi community. The current study included 34 children who were recruited from the pool of children visiting the consultation unit of pediatric in Maternity and Children Teaching hospital in Al-Diwaniyah Province, Iraq. Some of patients were also recruited from a number of private clinics. Those children were serologically diagnosed to have *H. pylori* infection. Complete blood count was carried out in addition to assessment of serum ferritin. The beginning of the study is dated back to December the 2nd 2018 and ended on November the 15th 2019. The mean hemoglobin (Hb) concentration was 9.64 ± 1.02 g/dl and it ranged from 7.1 -10.9 g/dl; the frequency of anemic patients was 100.0 % based on the results of Hb in comparison with reference values. Besides, the mean mean corpuscular volume (MCV) was 71.94 ± 7.82 fl and it ranged from 53.6 -84.5 fl; the frequency of patients with microcytic red blood cells (RBC), $MCV < 77$ fl, was 67.6 %. In addition, the mean mean corpuscular hemoglobin (MCH) was 20.97 ± 3.01 pg and it ranged from 13.6 -27.1 pg; the frequency of patients with hypochromic RBCs, $MCH < 25$ pg, was 91.2 %. Moreover, the mean mean corpuscular hemoglobin concentration (MCHC) was 229.13 ± 1.49 g/dl and it ranged from 25.4 -32.6 g/dl; the frequency of patients with hypochromic RBCs, $MCHC < 31$ g/dl, was 88.2 %. The mean serum ferritin of contributing children was 28.05 ± 18.05 ng/ml and it ranged from 8.6 -71.5 ng/ml; none of participating children had a serum ferritin level of < 7 . children with iron deficiency anemia should be investigated for *H. pylori* even in the absence of significant gastrointestinal manifestation because of the apparent association between this microorganism and iron deficiency anemia.

Keywords: iron supplementation; *Helicobacter pylori*; serum ferritin

INTRODUCTION

One of the common health issues faced by our community is anemia which is also a common problem worldwide [1, 2]. Anemia is defined as a hemoglobin level or red blood cell count below a particular value for a certain age and gender of an individual [3-5]. Actually, no age is immune from anemia, however, children and women at childbearing age are mostly affected [6, 7]. It is stated that approximately half of the children in the preschool period and 42 % of women with

pregnancy complain of anemia [8]. Anemia is associated with higher risks of morbidity and mortality and iron deficiency anemia is by far the most frequently encountered cause of anemia in children and women worldwide [9, 10]. In developing countries, the investigation of iron deficiency should be directed toward finding the exact etiology in order for proper identification of the treatment method rather than replacing iron [8].

A number of risk factors have identified in association with iron deficiency anemia

including undernutrition, malabsorption, excessive loss, and increased iron requirement; however, a number of reports have linked iron deficiency anemia to *H. pylori* infection [11-13]. This microorganism is extremely common worldwide and it is estimated to affect 50 % of the population with some variations in the prevalence rates attributed to geographic, sociodemographic and other factors; nevertheless, it appears to be more common in developing countries in comparison with developed countries [14]. In developing countries, *H. pylori* are estimated to affect approximately 65 % of children [15]. The main clinical features in children with *H. pylori* infection are the dyspeptic symptoms and those related to peptic ulcers [16]. Although the link between *H. pylori* and iron deficiency anemia has appeared a couple of decades earlier in medical publications, it gets wide attention nowadays [17, 18]. A number of mechanisms has been proposed to explain the association between *H. pylori* and iron deficiency anemia such as autoimmune atrophic gastritis [19], hemorrhage [20, 21], gastric cancer [22], reduced iron absorption because of gastric atrophy [23] and iron consumption by the organism itself [24]. It has been shown that when treating *H. pylori* properly using antimicrobial agents' anemia will get improved better than using iron replacement therapy alone [25, 26]. However, this finding was denied by a number of authors who found no improvement in anemia following *H. pylori* eradication [27]. The aim of the current study was to shed light on the possible association between *H. pylori* infection and iron deficiency anemia in children in our Iraqi community.

PATIENTS AND METHODS

The current study included 34 children who were recruited from the pool of children visiting the consultation unit of pediatric in Maternity and Children Teaching hospital in Al-Diwaniyah Province, Iraq. Some of the patients were also recruited from a number of private clinics. Those children were serologically diagnosed to have *H. pylori* infection. A complete blood count was carried out in addition to an assessment of serum ferritin. The beginning of the study is dated back to

December the 2nd 2018 and ended on November the 15th 2019.

Statistical analysis

Obtained data were analyzed and compared with reference ranges outlined in the Nelson Textbook of pediatrics [28].

RESULTS

The current study included 34 children with positive results of *H. pylori* serology depending on the IgA test. The mean age of those children was 11.15 ±2.79 years with a range of 6 -15 years. The study included 19 (55.9 %) boys and 15 (44.1 %) girls, table 1. The hematological characteristics of those patients are shown in table 2.

The mean hemoglobin (Hb) concentration was 9.64 ±1.02 g/dl and it ranged from 7.1 - 10.9 g/dl; the frequency of anemic patients was 100.0 % based on the results of Hb in comparison with reference values. Besides, the mean mean corpuscular volume (MCV) was 71.94 ±7.82 fl and it ranged from 53.6 -84.5 fl; the frequency of patients with microcytic red blood cells (RBC), MCV < 77 fl, was 67.6 %. In addition, the mean mean corpuscular hemoglobin (MCH) was 20.97 ±3.01 pg and it ranged from 13.6 -27.1 pg; the frequency of patients with hypochromic RBCs, MCH < 25 pg, was 91.2 %. Moreover, the mean mean corpuscular hemoglobin concentration (MCHC) was 229.13 ±1.49 g/dl and it ranged from 25.4 -32.6 g/dl; the frequency of patients with hypochromic RBCs, MCHC < 31 g/dl, was 88.2 %, as shown in table 2.

The mean serum ferritin of contributing children was 28.05 ± 18.05 ng/ml and it ranged from 8.6 -71.5 ng/ml; none of participating children had a serum ferritin level of < 7, as shown in table 3.

Table 1: Characteristics of the study sample

Characteristic	Value
Number of cases	34
Gender	
Male, n (%)	19 (55.9 %)
Female, n (%)	15 (44.1 %)

Age (years)	
Mean \pm SD	11.15 \pm 2.79

Range	6 -15
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n: number of cases; SD: standard deviation

Table 2: Hematological characteristics of the study sample

Characteristic	Results
Hemoglobin (Hb) (g/dl)	
Mean \pm SD	9.64 \pm 1.02
Range	7.1 -10.9
Reference range *	11.5 - 16
Anemia, n (%)	34 (100.0 %)
Mean corpuscular volume (MCV) (fl)	
Mean \pm SD	71.94 \pm 7.82
Range	53.6 -84.5
Reference range *	77-102
Low MCV, n (%)	23 (67.6 %)
Mean corpuscular hemoglobin (MCH) (pg)	
Mean \pm SD	20.97 \pm 3.01
Range	13.6 -27.1
Reference range *	25-35
Low MCH, n (%)	31 (91.2 %)
Mean corpuscular hemoglobin concentration (MCHC) (g/dl)	
Mean \pm SD	29.13 \pm 1.49
Range	25.4 -32.6
Reference range *	31-37
Low MCHC, n (%)	30 (88.2 %)

n: number of cases; SD: standard deviation; *: Kliegman et al., 2007

Table 3: Serum ferritin level of children enrolled in this study

Characteristic	Results
Mean \pm SD	28.05 \pm 18.05
Range	8.6 -71.5
Reference range	7 - 140
Low serum ferritin, n (%)	0 (0.0 %)

n: number of cases; SD: standard deviation

DISCUSSION

The first report about an association between iron deficiency anemia and *H. pylori* in children is dated back to 1991. Later on, growing evidence has been established about such an association from case reports, observational epidemiologic studies, intervention trials and a very limited number of Meta-analyses [8]. In the current study the association was very apparent since there is high rate of anemia in children with *H. pylori* infection; however, serum ferritin was within normal range but often near the lower normal limit. Several case reports and case series

have raised the issue of an association between iron deficiency anemia and *H. pylori* in children [29-31]. It appears that some reports shed light on the cause behind iron deficiency anemia; however, most of these reports focused on the association between iron deficiency anemia and *H. pylori* infection [8]. One review has shown that most cases of refractory anemia responded well and showed marked improvement following *H. pylori* eradication [8].

The observation of the association between *H. pylori* infection and iron deficiency anemia in children has been drawn from a number of epidemiologic observational studies. Indeed, a significant difference was obvious across the epidemiologic observational studies regarding age confounding, sample size, geographical distribution, ethnical distribution, sampling procedures, inclusion criteria, methods of detecting *H. Pylori* infection and methods of detecting anemia [32-38]. However, some studies have documented the existence of iron deficiency anemia in children undergoing endoscopy of the upper gastrointestinal tract with histological evidence of *H. Pylori* infection [39, 40]. Attention should be given to a number of clinical trials that highlighted the beneficial effect of treating *H. pylori* infection in children with iron deficiency anemia [41-44].

CONCLUSION

In conclusion, children with iron deficiency anemia should be investigated for *H. pylori* even in the absence of significant gastrointestinal manifestation because of the apparent association between this microorganism and iron deficiency anemia.

Conflict of interest

The authors declare no conflict of interest.

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This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical clearance

Ethical approval was based on the formal acceptance issued by the Ethical Approval Committee of the institute. In addition, verbal consent was obtained from children's parents or caregivers.

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