RESEARCH PAPER

Association between *Helicobacter pylori* Infection and Iron Deficiency Anemia in School-aged Iranian Children

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Objective: To find the relationship between *Helicobacter pylori* infection and iron deficiency anemia in school-aged children. **Methods:** 71 children with dyspepsia, epigastric and vague abdominal pain attending a tertiary medical center in Iran underwent upper gastrointestinal endoscopy and were investigated for *H. Pylori* infection. Hemoglobin, mean corpuscular volume (MCV), serum ferritin, total iron binding capacity (TIBC) and serum iron levels were compared between children with or without *H. pylori* infection. **Results:** *H. pylori* infection was detected in 42 (59.1%) patients. Proportion of children with iron deficiency anemia was not statistically different between two groups (26.2% *vs*. 14.3%; *P*=0.48). While hemoglobin was significantly lower in children with *H. pylori* infection (*P=0.01*), there were no significant differences in serum level of ferritin, iron, mean corpuscular volume and total iron binding capacity. **Conclusion:** Presence of *H. pylori* does not seem to play an important role in the pathophysiology and development of iron deficiency anemia in school-aged Iranian population.

Keywords: *Complications, Endoscopy*, *School children.*

Iron deficiency anemia is among the most common nutritional deficiencies in the world, with an estimated prevalence of more than 50% in children living in developing countries [1]. Although poor nutritional status, lack of access to iron supplements and parasitic infestations have been proposed as major etiologies of iron deficiency anemia in children [1,2], infections agents have also been reported as contributory factors [3]. Epidemiological studies have demonstrated that the prevalence of *Helicobacter pylori* infection is extremely high in the areas with high prevalence of iron deficiency anemia [4-6]. Patients infected with *H. pylori* are considered at a higher risk of iron deficiency and reduced iron reserves [7,8]. On the other hand, some studies have shown that resolution of *H. pylori* infection would not significantly improve the iron status or reduce the iron deficiency anemia in young children [9,10]. Thus, the exact relationship between *H. pylori* infection and iron deficiency anemia is still a matter of debate. This study aimed to evaluate the association between *H. pylori* infection and iron deficiency anemia in school-aged Iranian children.

METHODS

This cross-sectional study was conducted in the Pediatric Gastroenterology Ward at Namazi Hospital, Shiraz University of Medical Sciences, Iran, between November 2016 and May 2017. All children (age <18 y) who were referred due to dyspepsia, epigastric and vague abdominal pain and had not responded to medical therapy (high dose H_2 blockers or proton pump inhibitors (PPI) were included. Patients having celiac disease, chronic or hemorrhagic diseases, weight loss or inappropriate weight gain, chronic diarrhea, intractable vomiting, recent PPI or acid suppression therapy, and gastrointestinal bleeding were excluded. All experimental procedures were approved by the Ethical Committee of Shiraz University of Medical Sciences. Written informed consent was obtained from the parents or guardians.

Detailed dietary history and history of intake of iron supplements in the first two years of life was recorded. All partcipants underwent an upper gastrointestinal endoscopy, and two biopsy specimens were obtained from the gastric antrum. The diagnosis of *H. pylori* infection was based on presence of *H. pylori* in the histopathological specimen, and concurrent positive rapid urease examination. According to the above mentioned criteria, patients were divided into two study groups: *H. pylori* positive and *H. pylori* negative.

Hematological studies included hemoglobin (Hb),

WHAT THIS STUDY ADDS?

- The presence of *Helicobacter pylori* infection may not play an important role in the pathophysiology and development of iron deficiency anemia in children.

hematocrit, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC) were recorded for all patients. Serum ferritin level was measured using electro chemiluminescence (Elec Sys 2010 analyzer; Roche Diagnostics, Mannheim, Germany), and Serum iron level and total iron binding capacity (TIBC) were determined by CobasIntegra700 analyzer (Roche Diagnostics, Basel, Switzerland). Iron deficiency anemia (IDA) was defined as serum ferritin level of <10 µg/L along with hemoglobin level <-2SD for age [11].

Statistical analyses were performed using SPSS software, version 19 (SPSS Inc., Chicago, IL, USA). Independent student t test was used for comparison of quantitative variables between groups. Chi-square or Fisher's exact test was used to compare the proportions. $P<0.05$ was considered statistically significant.

RESULTS

Seventy-one children (27 boys) with a mean (SD) age of 8 (4.2) years were evaluated. Demographic characteristics of all patients are presented in ***Table* I**. *H. pylori* infection was detected in 42 (59.1%) participants. Proportion of children with IDA was comparable between *H. pylori* positive and negative patients (26.2% *vs.* 14.3%; *P=0.48*). Serum level of hemoglobin was significantly different between two study groups (*P=0.01*). No significant differences were observed regarding MCV, TIBC, serum ferritin and serum iron levels between *H. pylori* positive and negative patients (***Table* II**).

DISCUSSION

In the present study, no significant association was found between *H. pylori* infection and iron deficiency anemia in a group of Iranian school-aged children. Though the mean hemoglobin was lower in H.pylori positive cases, the difference was not significant for other hematological parameters, including serum ferritin, MCV and TIBC.

These results should be interpreted with caution in view of small sample size and observational data. Larger studies and interventional trials may further clarify association between iron deficiency and *H. pylori* infection in children. These results are in contrast with some recent studies indicating some associations between *H. pylori* infection and iron deficiency anemia [7,8]. However, in agreement with our findings, *H. pylori* seropositivity was not associated with iron deficiency in Estonian children aged 7–18 years [9]. *H. pylori* infection was neither a cause of iron deficiency anemia nor a reason for treatment failure of iron supplementation in Bangladeshi children [10]. Zamani, *et al*. [12] also reported no significant association between serum ferritin level and antibody titer against *H. pylori* bacteria in school-aged children in Tehran province, Iran. Variations among different studies might be as a result of confounding variables such as different species of *H. pylori* bacteria. Cag-PAL positive isolates are mostly associated with peptic ulcer and gastrointestinal symptoms, while some *H. pylori* species are related to the gastric ulcer and iron deficiency anemia [13]. Furthermore, serum ferritin which is used for identifying the iron deficiency anemia is an acute phase protein and its level is influenced by other factors besides iron deficiency.

In conclusion, presence of *Helicobacter pylori* may not play an important role in the pathophysiology and

TABLE I DEMOGRAPHIC CHARACTERISTIC OF *H. PYLORI* POSITIVE AND NEGATIVE IRANIAN SCHOOL CHILDREN

	H. pylori positive (n=42)	*H. pylori negative (n=29)*	*P value*
Age (y)*	8.5 (4.2)	8.9 (4.3)	0.88
Male sex*	16 (38.1)	11 (37.9)	0.33
Weight	26.6 (12.9)	31.2 (14.1)	0.40
Body mass index	16.7 (3.2)	17.1 (3.2)	0.62

*Data in mean (SD) or *n (%).*

TABLE II HEMATOLOGICAL INDICES IN *H. PYLORI* POSITIVE AND NEGATIVE IRANIAN SCHOOL CHILDREN

	H. pylori positive (n=42)	*H. pylori negative (n=29)*	*P value*
Low (<10 µg/L) ferritin*	0	5 (14.3)	0.06
Low serum iron*	14 (34.1)	9 (31.1)	1.00
MCV	87.9 (5.99)	77.9 (6.71)	0.85
Hemoglobin (g/dL)	12.1 (1.3)	12.9 (1.2)	0.01
Low TIBC*	1 (2.4)	0	1.00

*Data presented as mean (SD) on *n (%); MCV: mean corpuscular volume; TIBC: total iron binding capacity.*

development of iron deficiency anemia in school-aged Iranian population. At present, severity for *H. pylori* infection in children with iron deficiency anemia is not justified.

Contributors: MZ and BC: conception and design of study, interpretation of data; MK: acquisition, analysis, and interpretation of data; BG: design of study, interpretation of data; SE: acquisition of data, drafting the manuscript; AE: experimental procedures, statistical analysis of the manuscript; ARS: conception and design of study, critical revision of the manuscript for important intellectual content. He could also be approached for access to the raw data. All authors contributed to, and approved the final version of the manuscript.

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