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Impact of Helicobacter pylori infection on iron Deficiency Anemia Among Adult Women Aged 18-41 Years

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Abstract

Iron deficiency anemia (IDA) is a common nutritional disorder affecting adult women, particularly those aged 18–41 years. Helicobacter pylori infection has been suggested as a potential contributor to IDA due to its effects on gastric mucosa, iron absorption, and chronic blood loss. This study aimed to investigate the impact of H. pylori infection on iron deficiency anemia among 34 adult women in this age group. Findings revealed that women infected with H. pylori had a higher prevalence of IDA, lower hemoglobin and ferritin levels, and more severe anemia compared to non-infected women. The results highlight the importance of screening for H. pylori infection in women with unexplained anemia and suggest that combined management, including eradication therapy and iron supplementation, may improve outcomes.

Keywords: Iron deficiency, Helicobacter pylori, women, infection

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تأثير الإصابة ببكتيريا المعدة على مرضى فقر الدم بنقص الحديد للسيدات من عمر 18 – 41 سنة

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المستخلص:

فقر الدم بسبب نقص الحديد وهو اضطراب غذائي شائع يؤثر على النساء البالغات، وخاصة أولئك اللائي تتراوح أعمارهم بين 18–41 سنة. تم اقتراح عدوى هيليكوباكتر بيلوري كمساهم محتمل في نقص الحديد بسبب تأثيرها على الغشاء المخاطي في المعدة، وامتصاص الحديد، وفقدان الدم المزمن. هدفت هذه الدراسة إلى دراسة تأثير عدوى الملوية البوابية على فقر الدم الناجم عن نقص الحديد لدى 34 امرأة بالغة في هذه الفئة العمرية. كشفت النتائج أن النساء المصابات بالبكتيريا الحلزونية كان لديهن معدل انتشار أعلى فى نقص الحديد، وانخفاض مستويات الهيموجلوبين والفيريتين، وفقر الدم الأكثر شدة مقارنة بالنساء غير المصابات. تسلط النتائج الضوء على أهمية فحص عدوى الملوية البوابية لدى النساء المصابات بفقر الدم غير المبرر وتشير إلى أن الجهود المشتركة، بما في ذلك علاج الاستئصال ومكملات الحديد، قد تحسن النتائج.

الكلمات المفتاحية: نقص الحديد، فقر الدم، النساء، الملوية البوابية.

1.Introduction

Helicobacter pylori is a well-known pathogenic bacterium that colonizes the gastric mucosa and is associated with several gastrointestinal disorders, including chronic gastritis, peptic ulcer disease, and an increased risk of gastric cancer. In addition to these conditions, growing evidence suggests a significant association between H. pylori infection and iron deficiency anemia (IDA), one of the most common nutritional deficiencies worldwide, particularly

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in developing countries. Several studies indicate that H.
Either pylori may impair iron absorption directly or indirectly through gastric mucosal inflammation, damage to the epithelial lining, and alterations in gastric acid secretion, all of which reduce the bioavailability of dietary iron. Moreover, chronic gastrointestinal blood loss related to persistent infection may further contribute to iron depletion. In light of these findings, the present study investigates the potential relationship between H. pylori infection and iron deficiency anemia by examining a cohort of 34 patients, with the aim of providing deeper insight into the associated risk factors and underlying pathophysiological mechanisms.

Material and Methods: 2.

2.1 Sample Collection and Processing

Venous blood samples were collected from all participants under sterile conditions. Blood samples were drawn into tubes containing a coagulation activator, allowed to coagulate, and then centrifuged to obtain serum.

The separated serum was used for biochemical and serological analyses, including ferritin measurement and Helicobacter pylori (H. pylori) testing.

2.2 Study Design and Setting

This study was designed as a cross-sectional observational study to evaluate the effect of Helicobacter pylori infection on iron deficiency anemia in adult women aged 18–41 years.

2.3 Study Population and Sample Size

The study included 34 adult women aged 18–41 years, divided equally into two groups:

Iron Deficiency Group: 17 women diagnosed with an iron deficiency disorder, indicating iron deficiency anemia.

Non-Iron Deficiency Group: 17 women with normal iron levels.

Participants were also categorized by age group (18–23, 24–29, 30–35, and 36–41 years) to reflect the age distribution of the study sample.

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2.4 Inclusion and Exclusion Criteria

- **Inclusion Criteria:**

- Adult women aged 18–41 years.
- Willingness to participate in the study and providing informed consent.

- **Exclusion criteria:**

- Presence of chronic diseases.
- History of recent blood transfusion.
- Pregnancy.
- Current use of iron supplements or medications that affect iron metabolism.

2.5 Assessment of Helicobacter pylori Infection

H. pylori infection was detected using a rapid immunochromatographic assay (Right Sign®/MAY® H. pylori test).

2.6 Procedure:

- A blood sample was collected in a tube containing a coagulation activator and then centrifuged to extract the serum.
- Using a micropipe, 20 µL of serum was added to the test card.
- Three drops of the provided solution were added to the designated well.
- The test result was read according to the manufacturer's instructions within the specified time.
- Participants were classified as either positive or negative for Helicobacter pylori based on the appearance of the test lines.
- This method was chosen for its simplicity, speed, and suitability for clinical examination.
- Measurement of Serum Ferritin Levels: Serum ferritin levels were measured using quantitative immunoassay on a dedicated ferritin analyzer.

2.7 Reagent Preparation:

150 µL of reagent diluent was added to the reagent tube containing the precipitate.

The tube was gently stirred until the precipitate was completely dissolved to form the reagent solution.

The reagent solution was used immediately, within 30 seconds of

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preparation.

2.8 Sample Analysis:

- 30 µL of serum or plasma sample was added to the reagent tube using a micropipe. The reagent tube was closed and gently stirred by inverting it approximately 10 times.
- 75 µL of the mixed sample was transferred to the test cartridge.
- The loaded cartridge was placed in the test chamber or incubator at 25°C.
- The cartridge was incubated for 10 minutes, after which the ferritin concentration was determined according to the instrument protocol.

2.8.1 Complete Blood Count (CBC)

- A complete blood count was performed on all participants to assess hematological parameters related to anemia, including hemoglobin concentration.
- Blood samples were collected in suitable tubes containing anticoagulants.
- The CBC was analyzed using an automated hematology analyzer according to standard laboratory procedures.

Hemoglobin values were used as the primary indicator in classifying iron deficiency anemia.

2.9 . Data Analysis

Data were analyzed using descriptive statistical methods. Continuous variables were expressed as means and standard deviations, while categorical variables were presented as frequencies and percentages. Comparisons were made between two groups, one with iron deficiency and the other without, to describe the prevalence of H. pylori infection and iron status indicators.

2.10. Ethical Considerations

Ethical approval was obtained from [private laborites, and written informed consent was obtained from all participants prior to sample collection. Participants' identities were fully protected and not disclosed throughout the study.

3. Results

A total of 34 blood samples collected from adult women aged 18–41 years were successfully analyzed. Laboratory investigations

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included Complete Blood Count (CBC), serum ferritin measurement, and Helicobacter pylori testing. All parameters were recorded directly from the laboratory analyzers. (table .1 & Figure.1)

Table 1. Age Distribution of the Study Sample Age Groups in Patients and Control.

Age group	Women with iron deficiency	Non-iron-deficient women	Total
18 – 23	5	6	11
24 – 29	5	4	9
30 – 35	3	3	6
36 – 41	4	4	8
Total	17	17	34

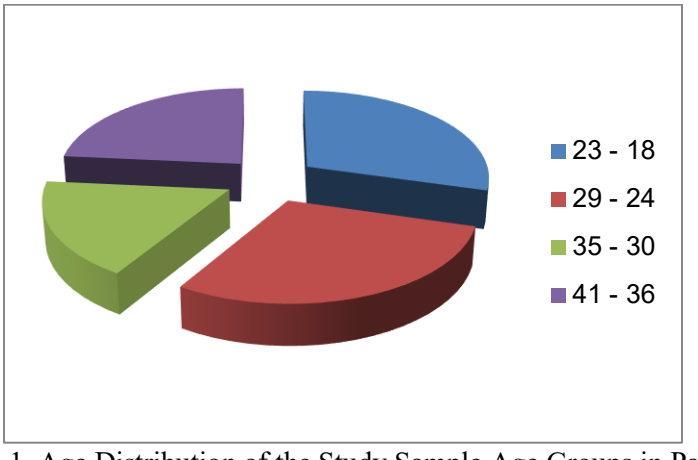

Figure 1. Age Distribution of the Study Sample Age Groups in Patients and Control.

3.1 Hematological Parameters (HB, HCT, RBC)

- The recorded hemoglobin (HB) values among the tested samples ranged within measured laboratory limits, with a mean value of 10.39 g/dL in samples positive for H. pylori and 13.06 g/dL in samples negative for H. pylori.
- Hematocrit (HCT) values showed mean levels of 35.01% in H. pylori positive samples and 42.45% in negative samples.

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- Red blood cell (RBC) counts demonstrated mean values of 4.53 $\times 10^6/\mu L$ in H. pylori positive samples and 5.76 $\times 10^6/\mu L$ in negative samples. (See Table. 2 & Figure. 2)

Table 2 The Hematologicl Parameters (hemoglobin, red blood cells, and hematocrit) In Patients and Control Groups.

	Pylori	N	Mean	Std. Deviation	Std. Error Mean	T	df	Sig. (2-tailed)
HB	1.00	17	10.3941	1.55823	.37793	-5.843-	32	.000
	2.00	17	13.0647	1.06004	.25710			
RBCS	1.00	17	4.5318	.48596	.11786	-1.680-	32	.103
	2.00	17	5.7594	2.97306	.72107			
HCT	1.00	17	35.0094	4.84250	1.17448	-4.790-	32	.000
	2.00	17	42.4506	4.19150	1.01659			

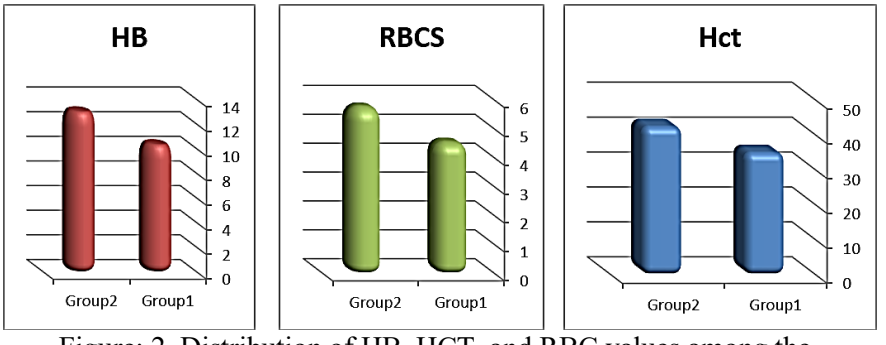

Figure: 2. Distribution of HB, HCT, and RBC values among the analyzed samples

Red Cell Indices (MCV, MCH, MCHC)

Mean corpuscular volume (MCV) values recorded a mean of 77.06 FL in H. pylori positive samples and 96.35 FL in negative samples Mean corpuscular hemoglobin (MCH) showed mean values of 23.61 pg. and 29.58 pg. in positive and negative samples, respectively Mean corpuscular hemoglobin concentration (MCHC) values were 29.60 g/dL in H. pylori positive samples and 30.66 g/dL in negative samples. (See Table. 3 & Figure. 3)

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Table 3 Comparison of Means of The Red Blood Cells Indices in Patients and Controls Groups.

	Pylori	N	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
MCV	1.00	17	77.0588	7.24112	1.75623	-7.003-	32	.000
	2.00	17	96.3529	8.75315	2.12295			
MCH	1.00	17	23.6118	3.73595	.90610	-5.621-	32	.000
	2.00	17	29.5824	2.28507	.55421			
MCHC	1.00	17	29.6000	1.39687	.33879	-2.701-	32	.011
	2.00	17	30.6647	.83137	.20164			

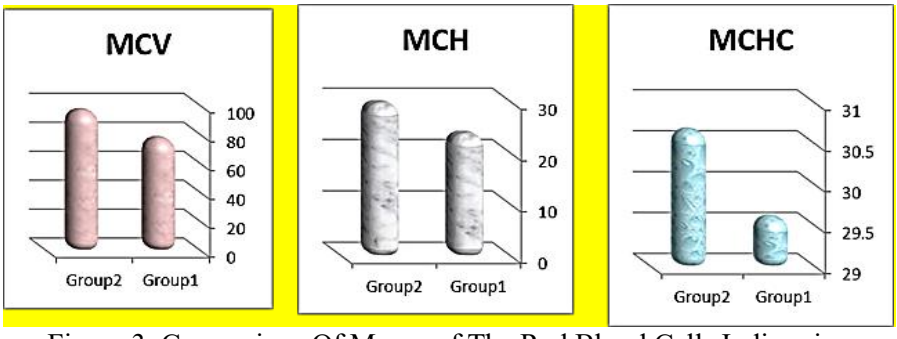

Figure 3. Comparison Of Means of The Red Blood Cells Indices in Patients and Controls Groups.

3.2 Serum RDW and Ferritin Levels

The mean RDW value was 16.09% in H. pylori-positive samples and 13.48% in H. pylori-negative samples. Serum ferritin levels showed a mean value of 10.73 ng/mL in H. pylori-positive samples and 71.67 ng/mL in H. pylori-negative samples. (See Table. 4 & Figure. 4)

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Table 4: The Mean of Red Blood Cells Distribution Width and Serum ferritin Values Among Patients and Control Group.

Group Statistics						T	df	Sig. (2-tailed)
	Pylori	N	Mean	Std. Deviation	Std. Error Mean			
RDW	1.00	17	16.0882	2.22960	.54076	4.477	32	.000
	2.00	17	13.4824	.88758	.21527			
Ferritn	1.00	17	10.7347	5.34578	1.29654	-6.446	32	.000
	2.00	17	71.6653	38.60819	9.36386			

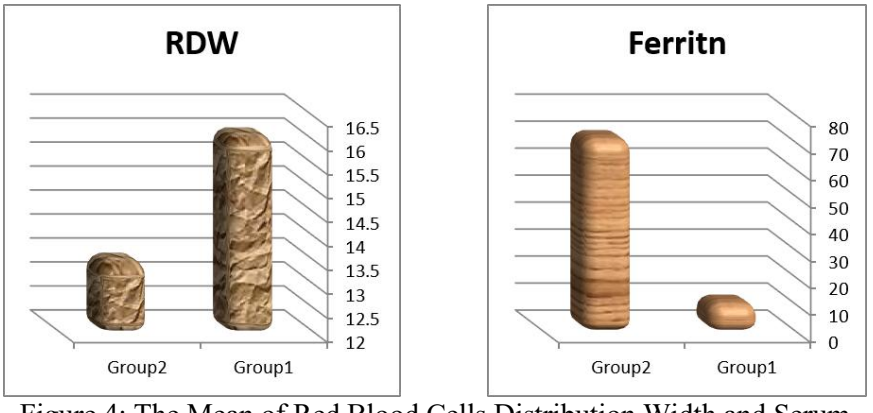

Figure 4: The Mean of Red Blood Cells Distribution Width and Serum ferritin Values Among Patients and Control Group.

4. Discussion

The findings of the present study are largely consistent with previous research that has demonstrated a significant association between Helicobacter pylori infection and disturbances in iron status and hematological parameters, particularly among women. The current analysis revealed reductions in hemoglobin (Hb),

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hematocrit (HCT), red blood cell (RBC) count, and related erythrocyte indices (MCV, MCH, and MCHC), along with increased red blood cell distribution width (RDW) and variability in serum ferritin levels. These laboratory patterns are characteristic of iron deficiency and impaired iron metabolism.

These results are in agreement with the study by Wang (2024), which reported a significantly higher prevalence of iron deficiency and iron deficiency anemia among H. pylori–infected women compared to non-infected individuals, even after adjusting for metabolic and organ-related confounders. Similarly, the findings support those of Man et al. (2024), who observed significantly lower hemoglobin levels, red blood cell indices, serum iron, and transferrin saturation in H. pylori–positive adults, with a markedly higher prevalence of iron deficiency anemia.

Moreover, the observed decrease in hematological parameters and the variability in ferritin levels in the present study are consistent with the findings of Al Mutawa (2023) and Eyoum Bille and Kouitcheu Mabeku (2022), both of which demonstrated significantly reduced hemoglobin and ferritin concentrations among individuals infected with H. pylori, along with an increased risk of anemia and iron deficiency. The elevated RDW values identified in the current study further support these observations, as RDW is recognized as a sensitive indicator of iron deficiency and altered erythropoiesis.

In addition, the results of this study align with evidence from systematic reviews and meta-analyses, including those conducted by Wang et al. (2025) and Walle et al. (2025), which confirmed that H. pylori infection is associated with lower hemoglobin and serum ferritin levels and a higher risk of iron deficiency anemia, particularly in children and women. These reviews also highlighted that eradication of H. pylori, especially when combined with iron supplementation, leads to significant improvements in iron stores and hematological parameters, reinforcing the clinical relevance of the current findings.

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5.Conclusion

Addressing *Helicobacter pylori* infection as a contributing factor to iron deficiency anemia represents an important step toward improving women's health outcomes. A combined approach involving clinical management, nutritional support, public health initiatives, and policy development is essential for effective prevention and control.

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