

Frequency of Iron Deficiency Anemia in Cases With *Helicobacter pylori* Infection: A Cross-Sectional Study

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Abstract: *Helicobacter pylori* infection is a common gastrointestinal disorder and may contribute to impaired iron absorption and iron deficiency anemia. Identifying the burden of iron deficiency anemia in infected patients may help improve timely screening and management. **Objective:** To determine the frequency of iron deficiency anemia in patients with *Helicobacter pylori* infection. **Methodology:** This study included 251 patients aged 18 to 60 years, of either gender, with confirmed *H. pylori* infection, as determined by a stool antigen test. The study was conducted in the Department of Medicine at Lady Reading Hospital, Peshawar, from 26 October 2024 to 26 April 2025. Patients with chronic liver disease, bleeding disorders, thalassemia, vitamin B12 or folate deficiency, and kidney disease were excluded. Iron deficiency anemia was defined as hemoglobin <12 g/dL in males and <11 g/dL in females, ferritin <30 ng/mL, total iron binding capacity >450 µg/dL, and serum iron <50 µg/dL. Data was analyzed using SPSS 25. Post-stratification chi-square test was applied, with $p \leq 0.05$ considered statistically significant. **Results:** The mean age of the patients was 41.37 ± 12.77 years. There were 146 (58.2%) females and 105 (41.8%) males in this study. Iron deficiency anemia was diagnosed in 80 (31.9%) patients. Significant associations were observed between iron deficiency anemia and age >50 years ($p < 0.001$), female gender ($p = 0.04$), body mass index >25 kg/m² ($p = 0.002$), and diabetes mellitus ($p = 0.003$). **Conclusion:** The frequency of iron deficiency anemia in patients with *H. pylori* infection in this study was 31.9%. Older age, female gender, higher body mass index, and diabetes mellitus are significantly associated factors.

Keywords: *Helicobacter pylori*, iron deficiency anemia, prevalence, risk factors

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Introduction

Anaemia disproportionately affects individuals in low-income countries where nutritional deficiencies and chronic infections intersect to compromise haematological health. Iron deficiency anaemia (IDA) is considered the most common type of anaemia, which contributes to a substantial proportion of disease burden globally, and remains the cause of diminished work capacity along with the maternal and child mortality rates (1-4). Dietary insufficiency has been highlighted as a main cause of IDA. Recent evidence implicates chronic infectious agents, such as *Helicobacter pylori* (*H. pylori*), as contributing to the pathogenesis of iron deficiency states. *H. pylori* has a prevalence rate that is evidently higher within the developing regions due to poor sanitation and restricted access to clean water (5,6).

Conventionally identified for its role in gastritis and gastric malignancies, *H. pylori* infection has also been associated with micronutrient deficiencies and haematological abnormalities. Research suggests that *H. pylori* may affect iron homeostasis through multiple mechanisms, thereby exacerbating IDA. Chronic *H. pylori* infection induces gastric mucosal inflammation, which damages the dietary ferric iron, reducing it to a more absorbable ferrous form (7). Such alteration in gastric physiology, in combination with iron bacterial sequestration and the inflammatory modulation of hepcidin expression, can lead to diminished iron absorption, ultimately triggering IDA in susceptible individuals (8,9).

H. pylori infection was found in dyspeptic adults, in which 37.5% of patients demonstrated the iron IDA (10). Another study reported an IDA frequency of 40.95% in *H. pylori*-positive patients upon haematological evaluation, highlighting the significance of this relationship in Pakistani clinical practice (11). Investigations have also reported that microcytic anaemia is more common among *H. pylori* carriers, particularly in the absence of nutritional deficits or chronic blood loss. Such data lend credence to the assumption that *H. pylori* has pathophysiological effects

beyond the gastric mucosa, with systemic concerns for iron metabolism (12).

H. pylori is not generally incorporated into the diagnostic workup of IDA, leading to underdiagnosis and morbidity. The consistency of the association may differ across populations due to nutritional and environmental factors, necessitating context-specific evaluation. Investigating the frequency of IDA among patients with *H. pylori* infection is vital for clarifying the magnitude of this relationship, informing evidence-based screening strategies, and optimizing management protocols to minimize the rate of preventable anaemia and its associated complications. This study aims to determine the frequency of iron deficiency anemia in cases with *Helicobacter pylori* infection.

Methodology

This cross-sectional study was conducted in the department of medicine at Lady Reading Hospital, Peshawar, from 26 October 2024 to 26 April 2025, after obtaining ethical approval from the hospital's ethical review board. A total of 251 patients were enrolled in this study. The sample size was estimated using the WHO sample size calculator, using the previous frequency of iron deficiency anemia in *H. pylori* patients, 37.5% (10), a margin of error of 6%, and a confidence interval of 95%. Non-probability consecutive sampling was used.

Patients aged 18 to 60 years, of either gender, presenting with *H. pylori* infection were enrolled in this study. *H. pylori* infection was labelled positive if *H. pylori* antigens were detected in the stool sample in patients with all of the following complaints: abdominal pain (VAS > 3), bloating, and nausea. Patients with chronic liver disease, bleeding disorder, thalassemia, vitamin B 12 or folate deficiency, and kidney disease were excluded.

After obtaining written consent from the patients, their demographic data were recorded (age, BMI, gender, educational status, profession, place of



residence, and socioeconomic background). Comorbid conditions like hypertension and diabetes mellitus were documented as well. Confirmed patients of H-pylori infection were assessed for the iron deficiency anemia as defined as Hemoglobin < 12 g/dL in men and < 11 g/dL in women, ferritin level < 30 ng/ml with a raised total iron binding > 450 µg/dL, and serum iron level < 50 µg/dL in patients with all of the following complaints such as fatigue, weakness, and pale skin. To confirm the iron deficiency anemia, a blood sample of 5-10 mL was taken using a syringe/needle from the vein of the arm and collected in a sterile tube for laboratory assessment. Assessment of this process was conducted under the supervision of a consultant with at least 5 years of post-fellowship experience.

IBM SPSS 25 software was used for the data analysis. Mean + SD were calculated for numerical data such as age, BMI, serum hemoglobin level, serum ferritin level, serum iron binding capacity, and serum iron level. Frequencies and percentages were presented for categorical data, including iron deficiency anemia, diabetes, hypertension, education status, profession, place of residence, and socioeconomic background. Effect modifiers such as age, gender, BMI, diabetes, hypertension,

education status, profession, place of residence, and socioeconomic status were controlled for through stratification. A post-stratification Chi-square test was used at the 5% significance level.

Results

A total of 251 patients presenting with Helicobacter pylori infection were enrolled. Their mean age was 41.37±12.77 years. Their mean body mass index was 23.88 ± 1.97 kg/m². In the present study, there were 105 (41.8%) male and 146 (58.2%) female patients (Table 1).

Table 2 presents the hematological parameters of the patients. Table 3 presents the comorbidity profile of the patients; there were 56 (22.3%) diabetic patients, while 73 (29.1%) were hypertensive patients. Iron deficiency anemia was diagnosed in 80 patients (31.9%), while 171 (68.1%) did not have iron deficiency anemia (Table 4).

It was observed that IDA was associated with female gender (p = 0.04), higher BMI (> 25 kg/m²; p = 0.002), and diabetes (p = 0.003) (Table 5).

Table 1: Demographics

		n	%
Gender	Male	105	41.8%
	Female	146	58.2%
Education status	Educated	119	47.4%
	Uneducated	132	52.6%
Place of living	Rural	138	55.0%
	Urban	113	45.0%
Socioeconomic status	Lower class	110	43.8%
	Middle class	88	35.1%
	Upper class	53	21.1%
Professional status	Employed	128	51.0%
	Unemployed	123	49.0%

Table 2: Hematological parameters

	N	Minimum	Maximum	Mean	Std. Deviation
BMI (Kg/m2)	251	20.33	27.25	23.8780	1.97485
Hemoglobin (g/dl)	251	7.00	15.00	12.3108	2.74209
Ferritin (ng/dl)	251	22.00	37.00	31.9243	4.79064
Raise iron binding (ug/dL)	251	210.00	460.00	324.8127	95.22668
Serum iron level (ug/dL)	251	35.00	68.00	55.1076	12.44445

Table 3: Comorbidities

Comorbidities		n	%
Diabetes	Yes	56	22.3%
	No	195	77.7%
Hypertension	Yes	73	29.1%
	No	178	70.9%

Table 4: Frequency of iron deficiency anemia

		n	%
Iron deficiency anemia	Yes	80	31.9%
	No	171	68.1%

Table 5: Association of iron deficiency anemia with demographics and comorbidities

		Iron deficiency anemia				P value
		Yes		No		
		n	%	n	%	
Age (years)	18 to 40	22	27.5%	101	59.1%	< 0.001
	41 to 50	7	8.8%	32	18.7%	
	> 50	51	63.8%	38	22.2%	
BMI (Kg/m2)	18 to 25	43	53.8%	126	73.7%	0.002
	> 25	37	46.2%	45	26.3%	
Gender	Male	26	32.5%	79	46.2%	0.04

	Female	54	67.5%	92	53.8%	
Education status	Educated	31	38.8%	88	51.5%	0.06
	Uneducated	49	61.2%	83	48.5%	
Place of living	Rural	44	55.0%	94	55.0%	0.99
	Urban	36	45.0%	77	45.0%	
Socioeconomic status	Lower class	43	53.8%	67	39.2%	0.09
	Middle class	24	30.0%	64	37.4%	
	Upper class	13	16.2%	40	23.4%	
Professional status	Employed	41	51.2%	87	50.9%	0.95
	Unemployed	39	48.8%	84	49.1%	
Diabetes	Yes	27	33.8%	29	17.0%	0.003
	No	53	66.2%	142	83.0%	
Hypertension	Yes	28	35.0%	45	26.3%	0.15
	No	52	65.0%	126	73.7%	

Discussion

The association between *Helicobacter pylori* infection and iron deficiency anemia (IDA) has been discussed widely in the literature. Several pathophysiological mechanisms have been proposed to explain the relationship between *H. pylori* and IDA. Chronic infection with *H. pylori* can lead to hypochlorhydria or achlorhydria, which impairs the reduction of dietary ferric iron to its absorbable ferrous form. (13,14)

Various studies have documented the prevalence of this comorbidity. Mubarak et al. found that 35% of *H. pylori*-positive patients had low serum iron levels, representing a significantly higher risk compared to controls. (14) Rahat and associates reported that 37.5% of patients with *H. pylori* infection had iron deficiency anemia. In comparison, Nohario et al. reported anemia prevalence of 50%, with confirmed iron-deficiency anemia in 27.1% of their cohort. (10,15) These findings align well with the present study, which found iron deficiency anemia in 31.9% of patients.

Younus et al., in their study, reported significantly lower hemoglobin, hematocrit, and mean corpuscular volume in anemic patients compared to non-anemic patients, along with elevated red cell distribution width. (13) Kishore et al. also reported significantly lower serum iron and higher total iron binding capacity in *H. pylori*-infected patients compared to controls. (16)

The subgroup analysis in this study revealed some interesting patterns. Female gender was a significant risk factor, with 67.5% of anemic patients being female. This finding is consistent with Younus et al., who reported anemia in 56.3% of infected women versus only 34.6% of infected men (13). Nohario et al. similarly found that anemia and IDA were significantly more common in women than in men. (15)

Age also demonstrated a significant association in the present study. Patients older than 50 years had a higher frequency of IDA. This finding contrasts with some previous studies. (13) However, the study by Aliu et al. found that older patients with *H. pylori* infection had significantly lower iron levels, especially in the age groups of 41 to 60 years and greater than 60 years. (17)

BMI > 25 kg/m² was another significant factor associated with IDA in this study. Nohario et al. reported that obesity was a significant risk factor for iron deficiency anemia. (15) The underlying mechanism involves chronic low-grade inflammation, which raises hepcidin and restricts iron absorption. The presence of diabetes was also significantly associated with iron deficiency anemia in the study.

The present study adds to the existing evidence by confirming the high prevalence of iron deficiency anemia in patients from a local setting with *H. pylori* infection and by identifying age over 50 years, female gender, elevated BMI, and diabetes as significant associated factors. These findings have practical implications for clinical practice, suggesting that screening for anemia should be prioritized in *H. pylori*-infected patients who possess such a risk profile.

Conclusion

In conclusion, this study demonstrated that iron deficiency anemia is a frequent condition in patients with *Helicobacter pylori* infection, affecting 31.9% patients. The study found that older age, female gender, elevated body mass index, and the presence of diabetes mellitus were significantly associated with iron deficiency anemia in patients with *H. pylori* infection.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRB-403/LRH/MTI)

Consent for publication

Approved

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Conflict of interest

The authors declared no conflict of interest.

Author Contribution

MMA (Postgraduate Resident)

Data Collection, Data entry, Data analysis and Manuscript drafting

H (Assistant professor)

Study Design, Conception and Critical guidance

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the study's integrity.

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