OPEN ACCESS

Saudi Journal of Biomedical Research

Abbreviated Key Title: Saudi J Biomed Res
ISSN 2518-3214 (Print) |ISSN 2518-3222 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Clinical and Etiological Profile of Iron-Deficiency Anemia in Adults

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DOI: https://doi.org/10.36348/sjbr.2025.v10i10.003 | **Received:** 04.07.2025 | **Accepted:** 02.09.2025 | **Published:** 14.10.2025

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Abstract

Introduction: Iron deficiency anemia (IDA) is a common condition in adults, particularly affecting women of childbearing age. It is the leading cause of anemia worldwide and represents a major public health concern. ***Purpose of the study:*** analyze the clinical and etiological profile of iron deficiency anemia in an internal medicine department. ***Materials and Methods***. This was a retrospective study conducted over a 4-year period (January 2021 to December 2024) at the OUED-EDDAHAB military hospital in Agadir. ***Results:*** Our study included 151 cases. The mean patient age was 35.2 years, with a male-to-female (M/F) ratio of 0.07. Women of reproductive age (14–50 years) were the most affected group. The mean hemoglobin level was 8.3 g/dL. Gynecological blood loss and malabsorption syndromes were the primary etiological mechanisms. However, digestive disorders were the leading cause of IDA in our series. Among the studied cases, we identified: 51 cases of gynecological bleeding (33.8%), 41 cases of impaired absorption (27.2%), 26 cases of gastrointestinal bleeding (17.2%), 9 cases of dietary deficiency (6%), 5 cases of PICA syndrome (3.3%), and 18 cases of undetermined origin (11.9%). Injectable iron therapy played a significant role in management in our setting, being prescribed in 56.3% of cases. ***Conclusion:*** The causes of IDA in adults are multifactorial, involving several mechanisms. Gastrointestinal disorders were the most frequent in our series, consistent with literature data. For blood loss, gynecological causes predominated. The diagnostic approach to IDA is guided by clinical findings, and treatment relies on iron supplementation alongside etiological management.

Keywords: Iron deficiency anemia, Iron deficiency, Etiology, Treatment.

INTRODUCTION

Iron deficiency anemia (IDA) is a common condition, particularly affecting women of childbearing age. IDA remains the leading cause of anemia. According to the WHO, it affects more than 1.2 billion people worldwide. This study aims to describe the clinical and etiological profile of IDA in an internal medicine department.

METHODS

A retrospective study was conducted over a 4-year period (from January 2021 to December 2024).

Population: 151 patients with iron deficiency anemia (IDA) were included. The inclusion criteria were hypochromic microcytic anemia with abnormal iron studies in adults. The following were excluded:

- Patients who did not meet the biological diagnostic criteria for iron deficiency anemia,
- Patients who did not undergo a minimal etiological workup,
- Patients presenting with a clinical picture suggestive of inflammatory bowel disease (IBD), since these patients are followed by the gastroenterology department.

The collected data included age, sex, clinical signs, laboratory results, and causes of IDA.

Statistical analysis: Data were entered using Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (SPSS).

RESULTS

A total of 151 cases of iron deficiency anemia were recorded. The average age of the patients was 35.2 years [ranging from 14 to 68 years]. The male-to-female sex ratio was 0.07. Women of reproductive age (14–50 years) represented the most affected group (84.7%).

IDA was discovered in 94% of cases during clinical investigations related either to anemia-related symptoms or to the underlying cause of the IDA. In the remaining 6% of cases, the anemia was discovered incidentally through a complete blood count requested for another reason.

The main reason for consultation was physical fatigue (87.4% of cases). Other functional symptoms were mainly neurological and cardiovascular. Clinical examination revealed mucocutaneous pallor in 2/3 of cases. Other symptoms were mostly related to integumentary issues, such as hair loss, brittle nails, koilonychia (spoon-shaped nails), and dry skin (Table 1).

Table 1: Functional and physical signs revealing iron deficiency anemia

	Number of Cases	Percentage
Functional signs		
▪ Fatigue (Asthenia)	132	87,4 %
▪ Cardiovascular signs	38	25,2 %
▪ Neurological signs (dizziness, tinnitus, etc.)	47	31,1 %
Physical signs		
- Mucocutaneous pallor	98	64,9 %
-Integumentary issues	27	17,8 %
-Hair loss	18	11,9 %
-Brittle nails / Koilonychia	9	5,9 %
-Dry skin	11	7,3 %
-Digestive issues	8	5,3 %
▪ Angular cheilitis (Perleche)	6	3,9 %
▪ Glossitis	2	1,3 %

BIOLOGICAL FINDINGS

Iron studies were mandatory. Ferritin levels were measured in all patients and were decreased in every case. Serum iron was measured in 9 patients, and total iron-binding capacity (TIBC) was measured in 4 patients. The average hemoglobin (Hb) level was 8.3 g/dL, with values ranging from 3.7 g/dL to 11.4 g/dL. Anemia was considered severe (Hb < 8 g/dL) in 15.5% of cases. The lowest recorded hemoglobin level in the entire series (Hb = 3.7 g/dL) was found in a patient experiencing episodes of epistaxis due to septal perforation (in the context of granulomatosis with polyangiitis).

All patients underwent at least one additional examination aimed at identifying the cause. These paraclinical tests were guided by a clinical examination and included biological tests, microbiological studies, endoscopic procedures, radiological imaging, and histopathological analysis. These investigations revealed at least one etiology for iron deficiency anemia in 88.1% of cases. In 11.9% of patients, no cause was identified despite comprehensive exploration (including upper GI endoscopy, colonoscopy, gynecological examination, and celiac disease serology).

There are four main groups of etiologies leading to iron deficiency anemia: inadequate iron intake, impaired iron absorption, chronic blood loss, and increased iron requirements. One or more sites of chronic blood loss were found in 78 patients in our series. Table 2 shows the distribution of iron deficiency anemia etiologies by mechanism.

Table 2: Distribution of Iron Deficiency Anemia Etiologies by Mechanism

Mecanisme	Etiologies	Number of Cases	Percentage
Repeated blood loss 78 cases (51,6 %)	Gynecological bleeding	51	33,7 %
	Digestive bleeding	26	17,2 %
	Other bleeding	1	0,66 %
Malabsorption 41 cases (27.1%)	Celiac disease	23	15,2 %
	Helicobacter pylori *infection*	14	9,3 %
	Others (intestinal parasites, gastrectomy)	4	2,6 %
PICA syndrome		5	3,3 %
Iron intake deficiency		9	5,9 %

The etiological investigation of iron deficiency anemia (IDA) identified cancer in 0.66% of cases. The only cancer case involved a 55-year-old man in whom IDA revealed colorectal cancer. Table 3 presents the various causes identified in this study.

Table 3: Detailed Table of the Different Etiologies of Iron Deficiency Anemia

Different Causes	Number of Cases	Percentage
Chronic Gynecological Bleeding	51	33,7 %
Functional menorrhagia	30	19,8 %
Fibroids	12	7,9 %
Others:	9	5,9 %
Intrauterine device (IUD)	2	
Cervicitis	4	
Genital bleeding with endometriosis	2	
Intrauterine polyp	1	
Chronic Digestive Bleeding	26	17,2 %
Gastritis	16	10,6 %
HP (*Helicobacter pylori)* related	9	
None related to HP	7	
Gastric Ulcer	5	3,3 %
Others	5	3,3 %
Duodenitis	1	
Esophagitis	1	
Colorectal cancer	1	
Intestinal angiodysplasia	1	
Hemorrhoids	1	
Other Bleeding Causes		
- Epistaxis due to septal perforation	1	0,66 %
Malabsorption	41	27,1 %
- Celiac Disease	23	15,2 %
- *H. pylori* Infection (without gastritis)	14	9,3 %
- Intestinal parasites	3	1,9 %
- Gastrectomy	1	0,66 %
PICA Syndrome	5	3,3 %
Iron Intake Deficiency	9	5,9 %
Etiologies Not Identified	18	11,9 %

Most of the patients received iron-based treatment either orally or intravenously (88.7% of cases). The table below shows the different types of supplementation treatments and/or dietary interventions.

Table 4: Type of iron supplementation and other treatments

Treatment	Effectives	Percentage
Oral iron	49	32,4 %
Injectable iron	85	56,3 %
Blood transfusion	1	0,66 %
Diet alone	16	11,25 %

Oral iron was one of the main treatment options, used in nearly one-third of cases (32. 4%).In general, the oral iron was based on ferrous salts. The recommended dosage for adults was between 100 and 200 mg/day. The duration of oral treatment ranged from 3 to 4 months. Red blood cell transfusion was performed in only one patient with poorly tolerated anemia (0.66% of cases). Injectable iron treatment represented the cornerstone of therapeutic approaches in our setting (56,3 %).

Etiological treatment was prescribed for 126 patients**,** representing a total of 83.4% of those with a well-established etiological diagnosis. Among the 126 cases**,** thirty-seven (37) patients received an adapted diet (in cases of celiac disease or iron-deficient intake) and/or psychotherapeutic support (PICA syndrome). Seven (7) patients did not receive a properly conducted etiological treatment.

The average follow-up duration was 9 months, ranging from 4 to 24 months. The mean follow-up duration was 9 months, ranging from 4 to 24 months. A favorable outcome of IDA (normalization or improvement in hemoglobin levels) was observed in 121 cases (80.1%). An unfavorable outcome (recurrence of IDA, stagnation, or worsening of IDA) was observed in 30 cases, including 29 cases of recurrent iron-deficiency anemia and one case of anemia worsening due to gastrointestinal bleeding related to the use of direct oral anticoagulants. Table 5 compares the outcomes according to several parameters (sex ratio, negative etiological diagnosis, and oral versus injectable iron treatment).

Table 5: Correlation between disease progression and clinical and therapeutic parameters

Parameter	Favorable outcome (n = 121)	Unfavorable outcome (n = 30)	p-value
Sex ratio M/F	8/113	2/28	0.991
Negative etiological diagnosis	9 (7.4%)	9 (30%)	< 0.001
Injectable iron	74 (61.2%)	11 (36.7%)	0.015
Oral iron	37 (30.6%)	12 (40%)	0.324

DISCUSSION

Iron deficiency anemia affects more than 1.2 billion people worldwide, according to the WHO, primarily impacting pregnant women and children under the age of five [1]. A study by Ngeuleu *et al.,* revealed that women of reproductive age represent 57.5% of iron deficiency anemia cases [2]. In our series, this proportion reached 84.7%, confirming a marked female predominance. This high prevalence can be explained by insufficient iron intake, increased needs related to closely spaced pregnancies, menstruation, as well as unfavorable socio-economic factors. The average age of patients in our study was 35.2 years, which is younger than in other published studies, where the average age is around 45 to 48 years [2,3]. This difference could be attributed to easier and faster access to healthcare for beneficiaries, as the hospital mainly serves military families and national security personnel.

The diagnosis of iron deficiency anemia is based on medical history, clinical examination, and laboratory tests. Classic symptoms include pallor, fatigue, dyspnea, atrophic glossitis, angular cheilitis, koilonychia, alopecia, and chlorosis. In our series, fatigue (87.4%) and mucocutaneous pallor (64,9%) were the predominant signs. Symptoms related to iron deficiency included hair loss (11.9%), koilonychia (5.9%), and dry skin (7.3%). These findings are similar to those in the study by Ngeuleu, in which fatigue was observed in 80% of cases and pallor in 76%. However, the study by Ben Salem reported an anemic syndrome in 37% of iron deficiency anemia cases. [2,3].

From a biological perspective, iron deficiency anemia is typically microcytic, hypochromic, and poorly regenerative. Serum ferritin is the most sensitive and specific test used to identify iron deficiency (defined by a level below 30 µg per liter) [1]. In our series, the average hemoglobin level was 8.3 g/dL, which is consistent with the results of the study by Gharbi et al. [4].

The etiology of iron deficiency anemia (IDA) is multifactorial. It also depends on the individual's nutritional status and iron intake. An etiological assessment is essential and should always be carried out. The diagnostic approach depends on several clinical parameters, particularly the patient's sex and age [1,5].

Iron deficiency anemia (IDA) of digestive origin was the most frequent etiology in our study, accounting for 47.7% of cases. This finding is partially consistent with Ruivard's study [7] of 101 IDA patients (excluding women under 50 years old), which reported upper gastrointestinal abnormalities in 36% of cases and lower gastrointestinal lesions in 24%. Digestive involvement is often revealed through gastrointestinal bleeding or symptoms of malabsorption. While existing literature identifies gastritis as the predominant digestive lesion (present in one-third of cases) [4,6], our results revealed a distinct pattern: celiac disease emerged as the leading cause (15.2%), followed by gastritis (10.6%), with gastric ulcer complications occurring in 3.3% of cases. This variation may be explained by two main factors:

- A higher consumption of NSAIDs reported in other studies. For example, in Ruivard's study [7], 20% of patients were taking NSAIDs.
- Following gynecological evaluation, all young women in our study underwent comprehensive celiac disease screening through our specialized gastrointestinal diagnostic unit, which provided complete celiac antibody testing and on-demand endoscopy capabilities.

The investigation of the digestive tract includes an upper gastrointestinal endoscopy (esophagogastroduodenoscopy or EGD) with biopsies to detect underlying pathologies (such as celiac disease, Helicobacter pylori infection, or others). A colonoscopy may be indicated if the upper endoscopy reveals no abnormalities. In cases of unexplained iron deficiency, more advanced examinations such as CT enterography, MR enterography, or capsule endoscopy are recommended [1,5].

Gynecological causes rank second among the etiologies of iron deficiency anemia. A gynecological abnormality was found in one-third of the cases (33.7%) in our series. This result is close to that of the study by Ngeuleu *et al.,* which reported a frequency of 31.5% [2]. In women of childbearing age, the increased iron requirement is generally due to physiological menstruation and closely spaced pregnancies. When the patient history reveals abnormal menstrual bleeding, gynecological evaluation should be prioritized. Our series highlighted several conditions causing genital blood loss, mainly related to hormonal disorders and functional menorrhagia, observed particularly in young women.

Malignant conditions are particularly concerning in the context of iron deficiency anemia. In some studies, cancers account for 6% of cases [6], which is not insignificant. In our series, only one case (0.66%) of colorectal cancer was recorded. Iron deficiency due to

inadequate intake also plays a role among the causes of iron deficiency anemia. In our series, it accounted for 5.9% of cases, which is similar to findings in the literature [6, 8]. Reduced intake is often linked to economic, social, and cultural factors [5].

Treatment is tailored according to the cause of anemia and the profile of each patient. It involves both pharmacological and non-pharmacological measures. An appropriate diet is often necessary, with a dietary approach aimed at consuming 10 to 20 mg of iron per day, depending on the individual's profile [9, 10]. Patients with celiac disease must pay special attention to maintaining a gluten-free diet while ensuring sufficient iron intake [10].

Pharmacological treatment aims to correct anemia and increase iron stores. The most common replacement option is the administration of exogenous iron, either orally (iron salts or liposomal iron) or via parenteral routes. Oral administration is convenient, cost-effective, and efficient. The recommended daily dose for adults is between 100 and 250 mg of elemental iron [5]. Common side effects of oral iron therapy include heartburn, constipation, nausea, vomiting, and black stools.

Intravenous treatment has specific indications. These include intolerance to oral iron, gastrointestinal conditions leading to malabsorption, and the need for rapid iron replenishment [5]. Other indications described in the literature include the use of erythropoiesis-stimulating agents in chronic kidney disease or cancer patients, as well as anemia associated with chronic disease that does not respond to erythropoiesis-stimulating agents alone [5]. The most commonly used compounds are iron sucrose and ferric carboxymaltose. In our study, more than half of the patients received injectable iron, primarily due to contraindications to oral iron (such as malabsorption) and professional considerations. Iron absorption is influenced by several clinical conditions. In addition to celiac disease and parasitic infections, *Helicobacter pylori* infection and obesity also reduce iron absorption [5,11].

CONCLUSION

The causes of IDA in adults are multiple and involve several mechanisms. Gastrointestinal disorders are the most common in our study, consistent with data from the literature. For blood loss, gynecological localization predominates. The exploration of IDA is guided by clinical factors, and treatment is based on iron supplementation as well as etiological management.

Conflict of Interests: We declare no conflicts of interest related to this work.

Authors' Contributions:

All authors have contributed to the preparation and writing of this manuscript. The article is submitted exclusively to your journal and has not been published or submitted elsewhere.

Acknowledgments:

- Iron deficiency anemia remains a public health issue.
- Digestive causes are the leading etiology of iron deficiency anemia.
- *Celiac disease is one of the main digestive causes of iron deficiency anemia.*
- *Helicobacter pylori* infection can lead to iron deficiency and, consequently, iron deficiency anemia.
- Treatment is based on iron supplementation and addressing the underlying cause.

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