Iron deficiency anaemia: Managing symptoms and supporting self-care. 2024 - Part 2

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Summary

Anaemia is a global public health concern, affecting individuals of all ages and demographic groups, with implications for health, morbidity and mortality. It stems from many factors, including diet, chronic illnesses, infections, hereditary blood disorders and other conditions related to blood loss and reduced haemoglobin levels. While anaemia manifests as decreased haemoglobin or haematocrit levels, iron deficiency anaemia is the most prevalent type, and iron is a crucial element for growth and development and a component of haemoglobin.

In 2022, the International Pharmaceutical Federation (FIP) explored the role of pharmacists in anaemia management, emphasising the need for an educational guide to support pharmacists, particularly in addressing iron deficiency anaemia (IDA). IDA, which affects 1.2 billion individuals worldwide, is preventable and treatable, highlighting the importance of early detection. Pharmacists, as accessible healthcare providers, bear a critical responsibility to educate patients, tailored to factors like age, sex, underlying conditions and the causes of IDA, encompassing self-care interventions and various management approaches. Pharmacists can promote a holistic approach to self-care and can support mitigation of the impact of this condition on overall health and well-being.

This handbook aims to provide a comprehensive guide for pharmacists to manage iron deficiency anaemia effectively, including for more vulnerable populations. It equips pharmacists with information on treatment options, managing special populations, screening and preventive measures for IDA. Nutrition, emphasising iron-rich diets and physical activity, is also described.

Addressing other types of anaemia is equally important, necessitating the identification and tailored treatment of their underlying causes. This handbook only covers anaemia treatment and management due to iron deficiency; there remains a need to further develop resources and guidelines for the management of other types of anaemia.

Further professional programmes designed to enhance pharmacists' competence in managing IDA, such as in a format of workshops, self-directed learning opportunities, or continuing professional development courses, are recommended. Collaboration with national professional leadership bodies would facilitate the organisation of workshops, self-directed learning initiatives, and the sharing of best practices.

In conclusion, this handbook serves as an invaluable resource for pharmacists in managing IDA, underpinning the importance of pharmacists' role in screening, managing, treating, patient education and holistic self-care practices. It is recommended to accompany this handbook with further CPD and resources for other types of anaemia.

4. IDA management in special populations

Despite the efforts in diagnosing the condition and the accessibility of therapeutic iron preparations, IDA still affects a significant number of people and special populations.[187] The approach to effective management of IDA requires early identification,[189] accurate diagnoses,[190] individual-based tailored interventions[187] and patient education. Although IDA treatment involves a combination of dietary changes and oral and parental iron therapy, the differences and uniqueness of each population should be considered when addressing this condition.[187] The underlying cause of IDA should be identified for patients who require immediate management to receive optimal care and ultimately experience improved health.[153] This section aims to provide pharmacists with the necessary knowledge on managing IDA in some special populations.

4.1 Paediatrics

Anaemia is defined in the paediatric population as: [191]

- **Infants and toddlers (0.5–5 years old)** — Haemoglobin concentration < 11 g/dl
- **Children (5–12 years old)** — Haemoglobin concentration < 11.5 g/dl
- **Adolescent females (> 12 years old)** — Haemoglobin concentration < 12 g/dl
- A**dolescent males (12 years old)**: Haemoglobin concentration < 13 g/dl

Possible causes of anaemia in paediatrics are as follows:

- **Infants** — Infants with specific risk factors, such as infants of iron-deficient mothers (there is an increased risk of small

Table IV: Available iron formulations for paediatric prescription

Iron formulation*	Recommended dose	Note
Ferrous sulfate/ferrous gluconate	2–6 mg/kg/day	This is a standard treatment with good intestinal absorption and low cost. Side effect happens in 15–32% of cases and include an unpleasant taste. A low dosage, i.e., 2 mg/kg/day, has been proposed as a still efficacious and better- tolerated schedule.
Ferrous fumarate	12.5 mg/day (6–24 months of age); 20–30 mg/day (2–5 years of age); 30–60 mg/day (6–11 years of age)	Drop and syrup formulations are available.
Ferrous glycinate	0.45 mg/kg/day	Good intestinal absorption, limited side effects, and drop formulation available.
Ferric pyrophosphate transported within a phospholipid membrane (liposomal iron)	1.4 mg/kg/day	Excellent palatability, limited side effects, drop formulation available. Possible less prompt response to therapy.
IV iron gluconate	Total dose to be calculated based on initial Hb and weight	Effectiveness is independent of gastro-enteric absorption and very low gastro-enteric side effects. Hospitalisation is required, along with multiple infusions.
IV carboxymaltose iron	The dose to be calculated based on initial Hb and weight	Effectiveness is independent of gastro-enteric absorption, single administration, and indication for adolescents ≥14 years. Hospitalisation is required.

*There can be variation in the licensing of different medicines containing the same drug. Preparations can be in the form of oral suspension, oral solution, drop, drinkable vials, tablets, capsules or spansules.

for gestational age/growth restriction), those with low birth weight or prematurity (as these can limit their iron stores at birth), multiple pregnancies, early introduction of cow milk (as cow milk can hinder iron absorption), exclusive breastfeeding beyond six months of age (as prolonged exclusive breastfeeding without iron fortification can lead to iron deficiency) and lack of infant iron supply.[74,192,193]

- **Children under five years old** — Children aged under five years are vulnerable to IDA due to their rapid growth and development, increased iron requirements, and often limited dietary diversity.[73,192,194]
- **Adolescents** — Both male and female adolescents face a higher risk of IDA. Factors contributing to this risk include inadequate dietary iron intake, susceptibility to parasitic infections like malaria and worms, heavy menstrual bleeding, gastrointestinal disorders, other chronic blood loss, and extreme athletics.[75,193]

Apart from possible signs and symptoms of ID in Section 3.1.1: Signs and symptoms, some other signs and symptoms that can be looked out are developmental delays, frequent tiredness, less activeness as compared with completely healthy children, motor and cognitive retardation, and mood disorders.[192,195] The preventive dose for the paediatric population is set out in Section 5.3.1. Iron supplements. Table IV provides some iron formulations available for paediatric prescription.[193,196,197]

Some key points to consider in managing IDA in this special population include:[195,198,199]

- Inform parents that iron supplements may cause black stool and constipation in children.
- To prevent tooth staining, consider having the child use a straw when taking oral iron supplements and suggest brushing their teeth after consumption.
- Continue iron supplementation for a minimum of three months after anaemia correction to replenish iron stores. Monitor haemoglobin (Hb) and ferritin levels at this point.
- For children with severe anaemia, schedule an early follow-up within a week to ensure treatment compliance and a proper response (e.g., reticulocytosis and Hb increase).
- Evaluate potential issues related to treatment compliance, as non-compliance is the primary reason for treatment failure.
- Encourage parents to increase their child's intake of iron-rich foods and reduce cow milk consumption. Avoid giving cow milk to children under 12 months and limit it to less than 500 ml per day for those older than 12 months.
- If babies are premature, consider delaying the clamping of the cord.
- It is recommended to do exclusive breastfeeding in the first six months, and solid foods that are given after six months should be rich in iron, zinc, phosphorus, magnesium, calcium and vitamin B6.
- Refer patients to a dietitian for dietary guidance.

4.2 Non-pregnant women of reproductive age

Women of reproductive age, especially those with heavy menstrual bleeding, are at increased risk of IDA, and they should be promptly treated for cause.[200] Some may not respond well to oral iron in the short term.[71] In such cases, IV iron therapy is recommended,

especially for women planning pregnancy, as it is more likely to achieve iron sufficiency before conception. [24]

4.2.1 Heavy menstrual bleeding

Heavy menstrual bleeding (HMB) may affect up to 50% of women of reproductive age.[16] Normally, the blood loss during a menstrual cycle is between the range of 25–50 ml; however, patients with HMB experience a blood loss greater than 80 ml per cycle and excessive menstrual blood loss leading to interference with the physical, emotional, social or material well-being.[201-203] Symptoms such as abnormal frequency, regularity and the unpredictable onset of menstruation might be due to abnormal uterine bleeding.[202] Pharmacists can support identifying possible patients with HMB and refer them to a gynaecologist to confirm the diagnosis and treatment.

The goals of HMB management include reducing or stopping blood loss[19] and supplementing for iron loss.[204] The first- line intervention for HMB patients diagnosed with mild to moderate IDA is the use of oral iron therapy.[19,205] Specific instructions should be given regarding dosing intervals and interactions with substances that can hinder absorption.[206] Dietary changes can be advised, but this is insufficient as the only way to replenish iron stores.[71] Pharmacists can provide counselling after the treatment is confirmed (see Section 3.4.1: Patient counselling guide steps).

In cases of intolerance due to frequent administration of oral iron therapy, the drug should be administered on alternate days to optimise treatment outcomes. If there is no improvement in the level of Hb within a month of therapy, the treatment approach should be reassessed.[206] In severe cases of IDA and intolerance to oral therapy or urgency, iron stores can be rapidly restored by administering IV iron therapy.[16]

In addition, hormonal and non-hormonal therapy can be used in treating blood loss in HMB patients.[207] The most preferred hormonal treatment is the use of 52 mg levonorgestrel-releasing intrauterine system, and other treatments include depot medroxyprogesterone acetate, combined oral contraceptive pills, gonadotropin-releasing hormone analogues and selective progesterone receptor modulators.[19] The administration of NSAID and antifibrinolytic agents such as tranexamic acid are non-hormonal treatments used in managing HMB in individuals intending to get pregnant or who cannot use the hormonal treatment.[19] Gonadotropin-releasing hormone agonist can be used as a short-term solution to boost iron stores and is also appropriate for women who undergo surgery.[19,205]

Women with HMB and IDA require a combined approach of medical and surgical measures in cases where medical treatment is not effective alone. Preoperative amenorrhoea is also necessary before carrying out any surgical measures.[205] For women planning

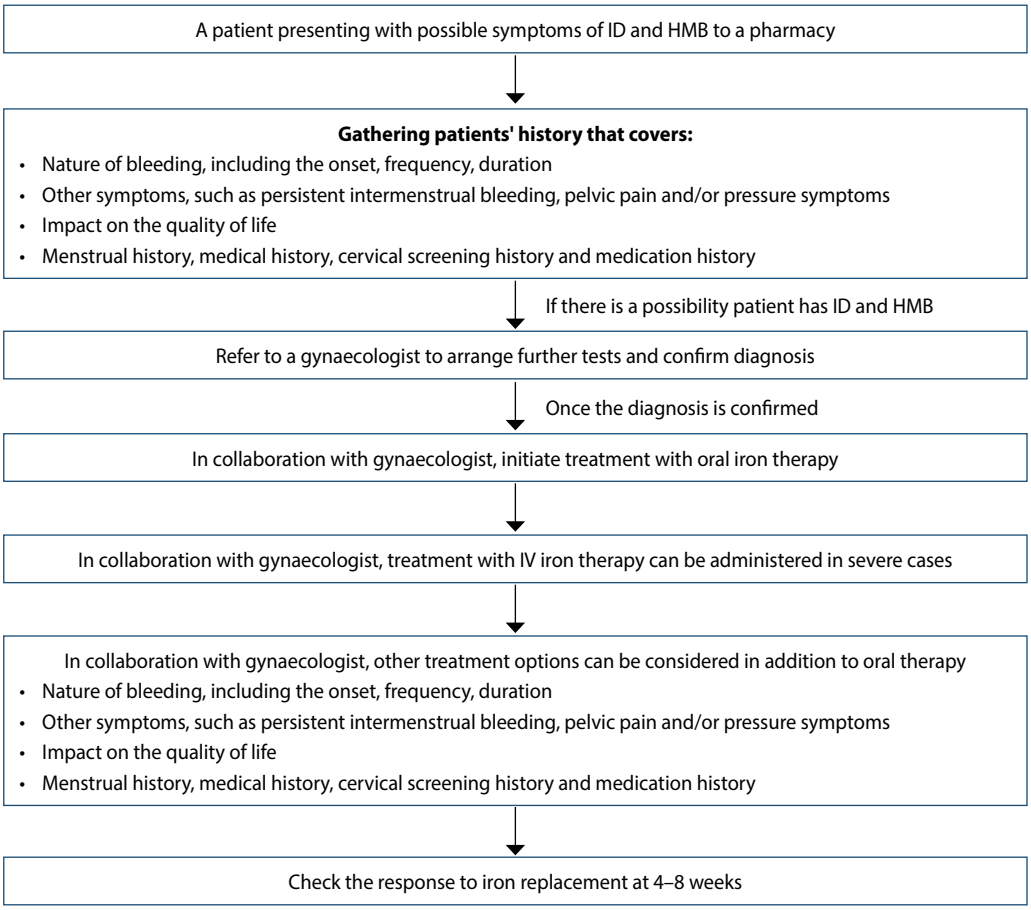

Figure 12: Flowchart for IDA management in HMB[202]

to get pregnant, Hb level and iron status should be assessed, and if deficient, appropriate treatment should be advised before they attempt conception.[206]

Figure 12 describes the flowchart of IDA management for HMB patients.

4.2.2 Women with birth control

Another population that is part of women of reproductive age that will be discussed is those who are with birth control. There are two types of contraceptives — hormonal and non-hormonal. Hormonal contraceptives include hormonal intrauterine devices (IUDs), oral contraceptives and vaginal rings, while non-hormonal contraceptives include barrier methods such as condoms, copper IUDs, the withdrawal method, and the fertility awareness method used to monitor a woman's fertility cycle.[208] The use of oral contraceptives is beneficial for those with haematological disorders and diagnosed with IDA because it alters the hormones, reduces blood loss and is beneficial for family planning.[208,209] Other types of contraceptives, including hormonal IUDs, patches, rings and injections, can be used for similar purposes and benefits. In contrast, copper IUDs are not advised for use because they increase the loss of blood in haemorrhagic patients. [210,211]

The combination of contraceptives and iron supplements has been found to be beneficial in the prevention of IDA.[212] Nevertheless, iron-containing oral contraceptives can be used instead of non-iron oral contraceptives, although the benefits and differences have not yet been identified from the study done so far.[208]

4.3 Pregnant women and breastfeeding mothers

In pregnancy, the demand for iron by the fetus becomes critical after 28–32 weeks for fetal brain development.[71] The period from conception to the infant's second year is crucial because of brain development.[213] Without effective management of anaemia in pregnancy, some adverse fetal outcomes could occur, including preterm birth, low birth weight, impaired neurodevelopmental outcome and perinatal death.[214] Breastfeeding mothers need to provide iron through breast milk for their infants. If their iron stores are depleted or their dietary intake is inadequate, they can become vulnerable to IDA.[67,215]

Anaemia is defined in pregnant women and breastfeeding mothers as:

- **First and third trimester of pregnancy** —Haemoglobin concentration of less than 11 g/dl (Hct 33%).[216]
- **Second trimester of pregnancy** — Haemoglobin concentration of less than 10.5 g/dl (Hct 32%).[216]
- **Breastfeeding mothers** — Haemoglobin concentration of less than 10 g/dl.[217]

Clinical symptoms cannot be relied on alone to diagnose IDA in pregnancy; however, all signs and symptoms should be watched for (see signs and symptoms section). Low haemoglobin, mean cell volume, mean cell haemoglobin, mean cell haemoglobin concentration and serum ferritin (30 microgram/l) are indicative of ID in pregnancy. The values obtained must be interpreted cautiously because of the physiological changes in pregnancy.[218]

The management of IDA in this special population includes preventive oral iron and folic acid supplements[199] (see 5.3.1: Iron supplements for the preventive dose), accompanied by diet, oral or parenteral iron therapy and blood transfusions, if necessary.

4.3.1 Oral iron supplements

Table V outlines different criteria for administering oral iron therapy and conducting serum ferritin tests in both anaemic and non-anaemic pregnant women.[218]

Initially, the recommended daily dose of elemental iron for treating IDA was 100–200 mg.[218] However, recent studies indicate that lower doses or intermittent supplementation may be beneficial to minimise side effects (such as gastric irritation, nausea, constipation, disturbed bowel function).[218,219] Collective evidence and recommendations from guideline and expert consensus suggest as low as 30-60 mg elemental iron to be effective while minimising side effects.[7,220] Hb should be monitored at two to three weeks to ensure an adequate response to oral iron treatment. Daily folic acid (400 microgram) is also necessary before the 12 weeks of gestation to reduce the risk of neural tube defects.[218] The use of enteric-coated or timed-release formulations could be avoided as it demonstrated low levels of bioavailability.[216]

Table V: Criteria for conducting serum ferritin tests and administering oral iron therapy

Conditions	Criteria
Anaemic women with known haemoglobinopathy or who require parenteral iron repletion therapy.	A serum ferritin test should be conducted prior to administering oral iron therapy.
Non-anaemic women at high risk of low iron, including • Previous anaemia • Women who have had many pregnancies • Twin or higher-order multiple pregnancy • Interpregnancy interval < 1 year • Women who have poor dietary habits • Those following a vegetarian/vegan diet • Pregnant teenagers • Recent history of clinically significant bleeding	Empirical iron treatment should be administered with or without serum ferritin testing
Non-anaemic women with: • High risk of bleeding during pregnancy or at birth • Women declining blood products, such as Jehovah's Witnesses • Women for whom providing compatible blood is challenging	Serum ferritin may be necessary

Women of reproductive age often experience multiple-micronutrient deficiencies, increasing their risk of ID and IDA. Iron with multivitamins and multimineral supplementation proves

Table VI: Indications and contraindications in the choice of IV iron in pregnant women and breastfeeding mothers [216]

Indications	Contraindications
Failure to respond to oral iron therapy	Lack of facilities for resuscitation
Non-compliance or intolerance to oral iron	Known history of anaphylaxis or reactions to IV iron therapy
Late second or third trimester with moderate to severe IDA	Gestation period less than 12 weeks
Malabsorption (e.g., bowel resection/coeliac disease)	Known state of iron overload
Bleeding diathesis when haemorrhage is likely to continue	First trimester of pregnancy*
In combination with recombinant erythropoietin patients with pregnancy and chronic disease	Active or chronic bacteraemia
Moderate to severe post-partum anaemia when compliance with oral iron therapy and follow-up in the health care facility is doubtful	Decompensated liver disease

*Although IV iron is not recommended in the first trimester, it can be administered when the benefits outweigh the risk, especially in cases where the potential risk will affect the neurodevelopment of the fetus. This should be done with proper counselling and monitoring.

effective in preventing and treating mild to moderate IDA.[221] A study demonstrates that a 90-day regimen of this supplementation significantly improves haemoglobin levels, ferritin, quality of life and IDA symptoms, with early Hb level increase observed by day 14 for moderate IDA subjects. The treatment is well-tolerated, with minimal adverse events. These findings support the use of iron with multivitamin and multimineral supplementation for treating IDA across different patient populations, contributing to the reduction of the global health burden associated with IDA.[181]

Apart from the counselling points for the general population (see Section 3.4.1: Patient counselling guide steps), information that pharmacists should give pregnant women and breastfeeding mothers includes:[218]

- It is advised to take the supplement on an empty stomach first thing in the morning due to the low levels of hepcidin in the morning.
- If point-of-care testing is available, it is advised to check for haemoglobin levels biweekly to ensure adequate response to the medication.
- Other medicines, such as antacids and vitamins, should not be taken with iron supplements (usually, it is recommended to take two hours apart from milk and calcium supplements).
- It is important to discuss common adverse effects such as constipation, metallic taste, enlarged uterus, and nausea, and recommend non-pharmacological treatment and laxatives, such as sorbitol, that are safe in pregnancy if necessary.

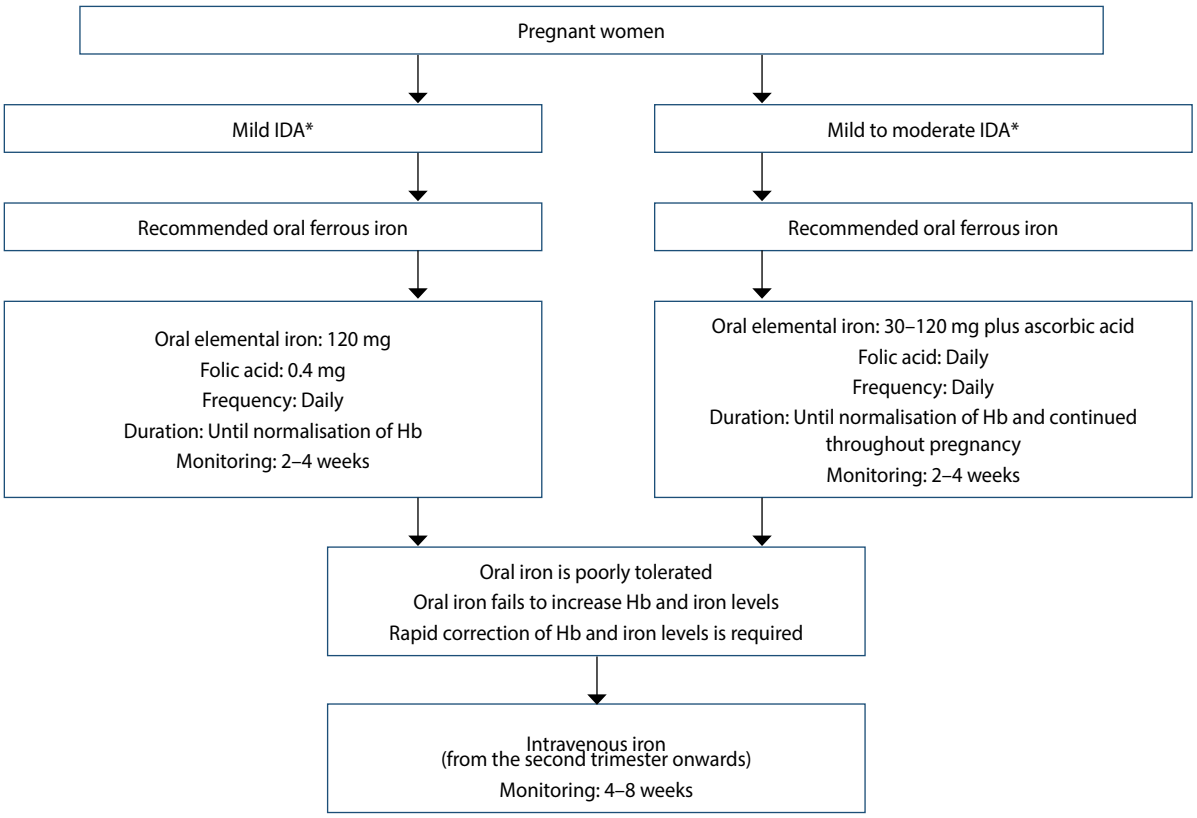

Figure 13: Flowchart for the ID/IDA treatment in pregnant women

*First trimester: mild IDA (10.0–10.9 g/dl), moderate IDA (7–9.9 g/dl).

Second and third trimester: mild IDA (9.5–10.4 g/dl), moderate IDA (6.5–9.4 g/dl)

4.3.2 Parenteral iron therapy

The decision to use parenteral iron therapy instead of oral iron should be based on the patient's needs, and the goal of the therapy should be to increase the haemoglobin level to at least 11 g/dl.[217] Table VI shows indications and contraindications in the choice of IV iron for managing IDA in pregnant women and breastfeeding mothers.[216]

Figure 13 illustrates the treatment of ID/IDA in pregnant women.[220]

4.4 The elderly and patients with chronic diseases

4.4.1 Elderly patients

IDA is the second most common cause of anaemia in elderly patients, accounting for 15–30% of anaemic cases in those over 85 years of age.[222] The causes of anaemia in this population are multiple and complex, including poor diet, reduced iron absorption, occult blood loss, medication (e.g., aspirin) and chronic disease (e.g., chronic kidney disease, chronic heart failure). In addition to the other symptoms of IDA from Section 3.1.1: Signs and symptoms, patients could present with weakness of the body and derailed cognitive function.[60]

The goal of IDA management in this population is to alleviate IDA, replenish iron stores, and treat any underlying disease. As in other special groups, the first-line treatment for IDA in this population is the administration of oral iron therapy, dietary changes and parenteral iron therapy, which can also be administered in cases of intolerance to oral therapy.[223,224] The recommended daily dose of elemental iron is in the range of 60–200 mg, and intravenous iron has also shown high efficacy in patients who cannot tolerate oral therapy, but it has been reported to have side effects such as anaphylaxis in 0.5–1% of treated patients.[223]

It is important to note that a personalised approach that considers comorbidities, drugs and the potential effects of ageing should be considered when managing elderly patients. Pharmacists should be able to provide information in easy-to-understand terms and assist elderly patients to improve their iron status and general health outcomes.[224]

A wide range of co-morbidities in elderly patients could contribute to developing IDA; hence, early and proper diagnosis is beneficial for optimum care.[225]

4.4.2 Patients with chronic diseases

Patients with IDA could present with chronic diseases which are associated with systemic inflammation, such as chronic kidney disease, cirrhosis, heart failure, inflammatory bowel syndrome and cancer. This section will describe brief management of patients with chronic heart failure, chronic kidney disease and inflammatory bowel syndrome.

4.4.2.1 Chronic Heart failure

Patients with chronic heart failure (CHF) have preserved ejection fraction or reduced ejection fraction.[226] The cause of IDA is multifactorial, including malabsorption, malnutrition, gastrointestinal blood loss and chronic inflammation, which could increase the level of hepcidin, thereby decreasing the uptake and absorption of iron.[60]

IDA is defined in CHF patients as serum ferritin < 100 microgram/l and/or a TSAT of < 20%.[60] In cases where IDA is due to CHF, it is recommended to check causes from the gastrointestinal tract through an endoscopic evaluation. A collaborative approach with a cardiologist is crucial for diagnosis confirmation and treatment.[60]

Randomised studies to assess the effectiveness of oral or IV iron therapy in CHF patients are limited; however, studies have been carried out in patients with reduced ejection fraction, and oral iron therapy has demonstrated no prognostic benefit due to low absorption and side effects such as oedema.[224] IV iron is recommended to improve the patient's quality of life and prognosis.[224]

4.4.2.2 Chronic kidney disease

Anaemia in patients with chronic kidney disease (CKD) is common and associated with poor quality of life and increased mortality.[227] Factors contributing to iron deficiency are chronic inflammation and poor hepcidin clearance seen in CKD.[227-229]

Table VII: Iron therapy management in patients with chronic kidney disease (CKD)[232]

Patient treatment	Population	Threshold for iron therapy*	Recommended therapy
Patient is not currently on Erythropoiesis-Stimulating Agents (ESA) or iron therapy	Paediatric CKD patients	TSAT ≤ 20% and ferritin < 100 microgram/l	Trial of oral iron (or trial of IV iron in CKD-Haemodyalisis (CKD HD))
	Adult CKD patients	Increase in Hb concentration without ESA initiation is desired AND TSAT ≤ 30% and ferritin ≤ 500 microgram/l	Trial of IV iron (or trial of oral iron for 1 to 3 months in CKD-Non- haemodyalisis (CKD ND))
Patient is taking ESA therapy and not on iron therapy	Paediatric CKD patients	TSAT ≤ 20% and ferritin < 100 microgram/l	Trial of oral iron (or trial of IV iron in CKD HD)
	Adult CKD patients	Increase in Hb concentration, or decrease in ESA dose is desired, and TSAT ≤ 30% and ferritin ≤ 500 microgram/l	Trial of IV iron (or trial of oral iron for 1 to 3 months in CKD ND)

*Evaluate iron status (TSAT and ferritin) at least every three months during ESA therapy, including the decision to start or continue iron therapy. Test iron status (TSAT and ferritin) more frequently when initiating or increasing ESA dose, when there is blood loss, when monitoring response after a course of IV iron, and in other circumstances where iron stores may be depleted.

Iron supplements with erythropoiesis-stimulating agents are the management choices in this population.[230] Iron supplementation can be administered orally, intravenously or intradyalitically (during haemodialysis sessions).[228] Iron therapy should be chosen based on the severity of iron deficiency, availability of venous access, response and side effects from prior iron therapy, patient compliance and cost.[231]

Table VII shows recommendations from the Kidney Disease Improving Global Outcomes guidelines on appropriate treatment regimens for patients with CKD. A multidisciplinary approach is crucial in CKD patient management.[227,231]

4.4.2.3 Inflammatory bowel disease

Inflammatory bowel disease (IBD) is another chronic disease of inflammation in the gastrointestinal tract. While oral iron therapy is indicated for mild anaemia and inactive disease, it is recommended that it should be less than 100 mg of elemental iron.[60] Oral iron in IBD patients can worsen symptoms and disrupt the intestinal microbiome if it is not tolerated.[233,234] The absorption of oral iron may be impaired by the systemic inflammatory process, as well as by small bowel involvement and/or previous surgery, which favours IV iron as the first-line therapy.[235]

Figure 14 illustrates a summary of IDA management and treatment in chronic disease patients.

4.5 Patients with chronic blood loss

4.5.1 Gastrointestinal bleeding

Gastrointestinal bleeding is the second most common cause of blood loss in men and postmenopausal women.[236] IDA is estimated to be present in 61% of those with gastrointestinal bleeding, and studies have shown that it is underdiagnosed, under-recognised and undertreated, especially in hospitalised patients.[236] The blood loss could go unnoticed because it occurs in small amounts with bowel movement.[237] However, blood in the stool can be detected through a haemoccult slide test (a test of faecal occult blood) during further investigation.[238] Other investigation includes upper GI endoscopy and colonoscopy.[239]

IDA treatment for this population aims to restore the haemoglobin level, serum ferritin levels and transferrin saturation to normal.[236] Patients are first started on oral therapy; in other cases, parenteral iron can be administered. The indications for parenteral iron therapy are patients who are intolerant to oral therapy or who have possible intestinal malabsorption, and suspected non-adherence to oral therapy is observed.[237] Blood transfusion should be considered to improve treatment outcomes in patients with persistent bleeding, heart disease, haemoglobin level less than 7 g/dL, comorbidities or postoperative care and symptomatic anaemia.[236] If the cause of gastrointestinal bleeding is ulceration, the use of anti-inflammatory medicines such as NSAIDs and blood-thinners should be avoided.[240]

For individuals who have had bariatric surgery or other procedures that affect the duodenum, taking oral iron therapy may not be effective. Similarly, where there are problems with blood vessels in the digestive tract (gastrointestinal tract angiodysplasia), oral iron therapy may not be able to replace the blood loss quickly. In these conditions, it is advised to use IV iron rather than oral iron.[241]

4.5.2 Bleeding disorders

Bleeding disorders occur due to the absence or deficiency of some clotting proteins. The most common types of bleeding disorders are haemophilia A, haemophilia B and von Willebrand disease.[242]

Pharmacists need to encourage patients with bleeding disorders to optimise iron intake and absorption since they are at a higher risk of IDA. This can be done by recommending patients take 100–200 mg of elemental iron daily to increase gut absorption to at least 5 mg per day. Food rich in iron should be consumed regularly. In addition, medicines that interfere with iron absorption, such as proton pump inhibitors, should be avoided. The underlying bleeding disorder should be managed to prevent further blood loss.[243]

Figure 15 illustrates a summary of IDA management and treatment in patients with chronic blood loss.

4.6 Individuals on strict diets

Patients on strict diets are commonly vegetarians who do not take protein from animals but consume dairy foods and eggs from

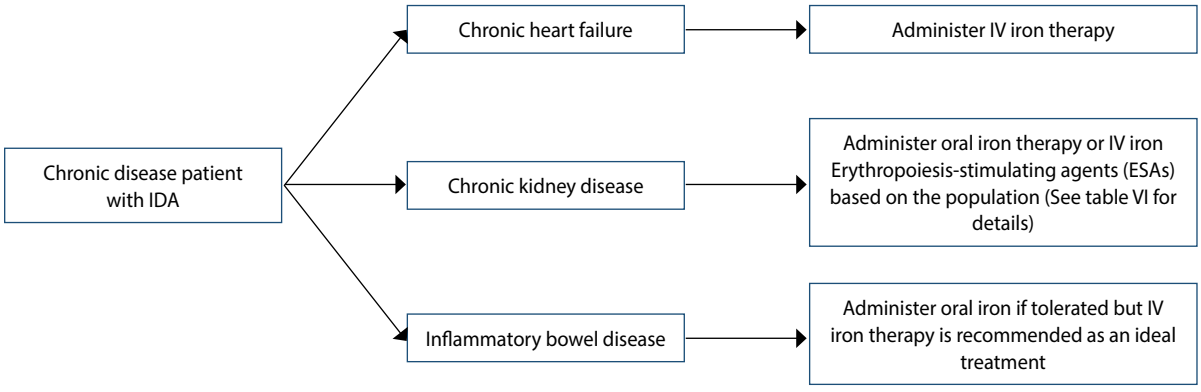

Figure 14: Summary of IDA management and treatment in chronic disease patients

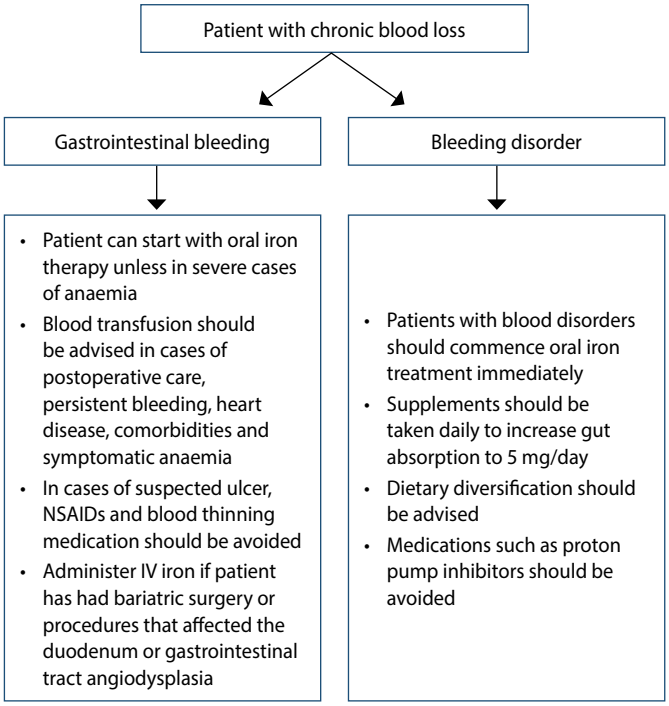

Figure 15: Summary of IDA management and treatment in patients with chronic blood loss

animals and vegans who do not consume any animal protein-based products.[244] Foods from plant sources only contain non-haem iron, obtained from sources such as legumes, peas, nuts and seeds, and wholegrain cereals (see Figure 9: Food containing non-haem iron in Section 3.3.1.1: Iron-rich foods). However, studies have shown that there might be no difference in the iron level between these populations and others; it is advised that in addition to iron supplementation, biofortified food can be consumed to manage IDA.[245] Food sources such as spinach, broccoli, peas etc, which are accommodated in their diet plan and rich in iron, can be consumed.[246]

Patients should be advised to:

- Take oral iron supplements
- Consume non-haem foods that are rich in iron, such as legumes, peas, nuts, etc (see Figure 12)
- Consume biofortified foods

5. IDA prevention

IDA prevention requires a holistic, multi-faceted approach encompassing community consciousness, early detection of high-risk individuals, increasing iron intakes, monitoring and evaluation and proactive engagement of healthcare professionals. Public health initiatives and nutritional education are essential to reduce the prevalence of IDA in communities. This section aims to provide pharmacists with the necessary knowledge and tools to support their roles in preventing IDA in communities.

5.1 Increasing awareness and public education

The initial step in preventing IDA involves enhancing awareness about the condition and its origins. This can be achieved through public health campaigns, educational programmes, and community outreach initiatives.

Public health campaigns can inform people about the importance of iron for health, the signs and symptoms of IDA, and the ways to prevent and treat it. Pharmacists are instrumental in these initiatives, providing accurate information about IDA, its symptoms, causes and prevention strategies. However, it is important to consider the skills and knowledge required for pharmacists to contribute to these measures effectively. Pharmacists need a comprehensive understanding of IDA, including its causes, symptoms, and prevention strategies (see Section 3.1: Identification and investigation of IDA). They should be capable of identifying high-risk individuals (see Section 4: IDA management in special populations) and have knowledge about the various forms of iron supplements available (see Section 3.2.1: Iron repletion therapy).

Effective communication skills are also crucial for pharmacists to educate the community about IDA. They should be adept at explaining complex medical information in a manner that is easily understandable to the public. This includes information on dietary habits that can prevent IDA, such as iron-rich foods (see Section 3.3.1.1: Iron-rich foods).

The WHO published a comprehensive framework for action to accelerate anaemia reduction in May 2023. This framework is based on the core principles of primary health care: meeting people's health needs through comprehensive promotive, protective, curative and rehabilitative care along the life course, systematically addressing the broader determinants of health, and empowering individuals, families and communities to optimise their health.[247] Pharmacists can contribute to the comprehensive approach needed to address anaemia effectively and improve the overall health of individuals and communities.

5.2 Identification and screening of high-risk individuals in the population

Certain groups are more likely to develop IDA due to increased iron needs or losses, and screening can identify iron deficiency at an early stage and improve outcomes.[3,248] Some examples of high-risk individuals are:

- Infants and toddlers under two years of age, due to the high iron requirements needed for their rapid growth and development.
- Children under five years of age.
- Adolescents and women of reproductive age (non-pregnant and pregnant).
- Elderly people.
- People with low dietary iron intake and micronutrient deficiencies, such as in vegetarians and vegans.[67]
- Endurance athletes due to chronic inflammation and increased

iron losses through urine and sweat.[59,67]

- Individuals with chronic diseases or infections, such as malaria and worm infestation (as these infections can lead to chronic blood loss and impaired iron absorption),[249] HIV (as patients may have compromised iron status due to various factors, including infection-related inflammation)[250] and inherited disorders.[75]
- Individuals with chronic blood loss, such as heavy menstrual bleeding, chronic gastrointestinal diseases, and regular blood donation and those with gastrointestinal conditions, e.g., peptic ulcer disease.[67]
- Individuals who have undergone major surgery or physical trauma.

Pharmacists can contribute to the prevention, early detection and management of IDA through the identification of signs and symptoms, point-of-care testing and referrals. They can identify these high-risk individuals by asking about their medical history, dietary habits, menstrual cycle and other risk factors (see Figure in Section 3.1: Identification and investigation of IDA.

It is reasonable to perform annual screening with complete blood count and iron studies in high-risk populations, e.g., women with heavy menstrual bleeding or a history of iron deficiency. Women in the reproductive age group can be screened every five years for haemoglobin or haematocrit. It may be reasonable to screen men and postmenopausal women once or more frequently if any risk factors are present.[21]

5.3 Increasing iron intakes

A range of interventions are available for correcting IDA at the population level. These interventions, which focus on improving iron intake and bioavailability, can be implemented alone or in combination. They primarily revolve around iron supplements, nutrition education coupled with dietary modification or diversification, as well as iron fortification of foods and biofortification.[14] These strategies aim to correct iron deficiency anaemia by increasing iron intake and diversifying nutrient sources, thereby empowering individuals with informed choices for improved well-being.

5.3.1 Iron supplements

Preventive iron supplements are particularly important for paediatric populations, non-pregnant women of reproductive age, pregnant women and breastfeeding mothers. Pharmacists can advise on the appropriate type and dosage of supplements.

Generally, 1–2 mg/kg/day is the preventive dose for iron deficiency.[193] As a preventive measure against IDA, the WHO suggests daily doses of elemental iron for three consecutive months each year.[251]

- **For infants and young children aged six to 23 months** — 10–12.5 mg of elemental iron (equivalent to 50–62.5 mg of ferrous sulfate heptahydrate, 30–37.5 mg of ferrous fumarate or 83.3–104.2 mg of ferrous gluconate) in the forms of drops, syrups or drinkable vials.
- **For preschool-aged children aged 24 to 59 months** — 30 mg of elemental iron (equivalent to 150 mg of ferrous sulfate heptahydrate, 90 mg of ferrous fumarate or 250 mg of ferrous gluconate) in the forms of drops, syrups, tablets or drinkable vials.
- **For school-aged children aged 60 months and older** — 30–60 mg (equivalent to 150–300 mg of ferrous sulfate heptahydrate, 90–180 mg of ferrous fumarate or 250–500 mg of ferrous gluconate) in the forms of tablets, capsules, syrups or drinkable vials.

For infants and toddlers, measures to prevent iron deficiency include completely avoiding cow milk and starting iron supplementation at four to six months of age in breastfed infants (this is because breast milk contains highly bioavailable iron but in amounts that are not sufficient to meet the needs of infants older than four to six months), and using iron- fortified formula when not breastfeeding. When infants are 12 months old, they should be screened for IDA.

The WHO suggests daily doses of elemental iron for non-pregnant women of reproductive age according to the prevalence as a preventive measure against IDA.[251] In areas where the prevalence of anaemia is 40% or higher, the WHO suggests non-pregnant women and adolescents of reproductive age take daily tablets of 30–60 mg elemental iron (equivalent to 150–300 mg of ferrous sulfate heptahydrate, 90 180 mg of ferrous fumarate, or 250–500 mg of ferrous gluconate) for three consecutive months each year.[7] In areas where the prevalence of anaemia is 20–40%, the WHO recommends an intermittent regimen. This involves taking one supplement weekly, containing 60 mg of elemental iron and 2,800 microgram (2.8 mg) folic acid, for three consecutive months, followed by three months without supplementation, and then resuming another three months of supplementation.[163]

Similarly, the WHO suggests daily doses of elemental iron for pregnant women and breastfeeding mothers. In populations where the prevalence of anaemia in pregnant women is 40% or higher, along with blood haemoglobin concentration below 11 g/dl, it is recommended to take a daily supplement containing 60 mg of elemental iron and 400 microgram (0.4 mg) folic acid throughout pregnancy. The supplementation with iron and folic acid should begin as early as possible.[163] In populations with a 20–40% prevalence of anaemia, intermittent oral iron can be provided once a week for pregnant women.[163] The regimen includes 120 mg of elemental iron (equivalent to 360 mg of ferrous fumarate, 600 mg of ferrous sulfate heptahydrate, or 1,000 mg of ferrous gluconate) and 2,800 microgram (2.8 mg) of folic acid throughout pregnancy. This dosing regimen is recommended as an alternative in settings where non- compliance is observed or there are concerns with women who have adequate iron intake.[163] This dosing regimen for pregnant women aims to improve maternal and neonatal outcomes if daily iron intake is not tolerable due to side effects.[163] The amount of elemental iron varies with different types of oral iron salts, and this is important in the choice of the preparation to dispense to a patient.[178]

5.3.2 Dietary modification

Strategies aimed at dietary improvement have been directly applied to vulnerable groups, such as infants, children and pregnant women.[124] Recognising and acting upon the critical role of correcting anaemia is essential to achieving the overarching global nutrition targets identified by the WHO, namely, stunting, low birth weight, childhood overweight, exclusive breastfeeding and wasting.[3]

Dietary diversity refers to consuming various foods or food groups within a specific timeframe,[252] and is viewed as the most long-lasting and desirable intervention. Increasing dietary diversity implies increasing the amount of food consumed and expanding the variety of micronutrient-rich foods incorporated into the diet.[164] Diet quality is characterised by having an adequate intake of essential macro- and micronutrients and incorporating a diverse selection of foods at the household or individual level.[252]

Pharmacists play a crucial role in promoting these dietary changes. They can educate individuals about the importance of a balanced diet for maintaining healthy iron levels. They can advise which foods are high in iron and how to incorporate them into daily meals. They can also inform individuals about the benefits of combining iron-rich foods with foods high in vitamin C (see Section 3.3.1.1: Iron-rich foods).

5.3.3 Iron fortification

The WHO has recommended four types of food fortification: universal or mass fortification, open market (commercial) fortification, targeted (high-risk groups) fortification, and household and community fortification methods.[164] Mass fortification involves adding nutrients, such as iron, folic acid, vitamin B12 or vitamin A, to commonly consumed foods, reaching a wide population. Targeted fortification focuses on specific groups with higher nutritional needs, like infants and pregnant women. Market-driven fortification refers to manufacturers adding micronutrients to processed foods to improve public health. Household and community fortification combines supplementation and fortification, particularly in enhancing foods for young children.[164] Food fortification with suitable iron compounds is considered the best long- term method to prevent iron deficiency.[253] Fortification with micronutrients, such as iron, aims to improve the nutritional status of populations vulnerable to micronutrient deficiencies.[124,164]

Iron fortification, in contrast to supplementation, allows the delivery of lower micronutrient doses in a food vehicle, providing the option of multiple servings throughout the day. Although it takes a longer time to increase body iron levels compared with iron supplementation or iron therapy, iron fortification proves to be practical, more sustainable, and cost-effective and may be the safer intervention over the extended period for addressing iron deficiency at the national level.[164, 172]

5.3.4 Biofortification

Biofortification refers to a range of methods to counter micronutrient deficiencies by enriching the nutritional value of crops using plant breeding techniques, genetic modifications or agronomic practices.[254] It combines conventional crop varieties with modern techniques, merging the favourable characteristics of high-iron and high-yield crop varieties,[255] for instance, rice and legumes with higher iron content, carrots and sweet potatoes rich in beta-carotene varieties, and maize with lower phytate content (which enhances iron absorption and zinc absorption).[256-258]

Biofortification aims to augment the nutritional value of staple foods, including cereals, legumes and tubers, by increasing their nutrient content, such as iron, zinc, provitamin A, amino acids and protein, during the cultivation of these plants. It plays a crucial role in supporting the health of vulnerable populations who lack access to commercially fortified foods.[164,254] Additionally, if biofortified crops possess favourable agronomic characteristics, it could result in an autonomous approach to public health, as farmers would be inclined to choose these crops.[172]

Several research findings suggest that consuming iron-biofortified staple crops, e.g., biofortified millet, can effectively manage iron deficiency.[259,260] A randomised trial was carried out among adolescent boys and girls in India to investigate the effects of supplementation of iron-biofortified pearl-millet-based flatbread on iron status. The supplementation was conducted twice daily for four months. The findings suggested that supplementation of biofortified pearl millet led to a 64% reduction in the prevalence of anaemia among these schoolchildren.[259]

5.4 Monitoring and evaluation

Pharmacists play a crucial role in preventing IDA by monitoring iron stores and ensuring adherence to iron supplementation.

- **Monitoring iron stores** — Pharmacists can monitor patients' iron stores through point-of-care testing for haemoglobin and other relevant tests. Regular monitoring allows for early detection of iron deficiency, enabling timely intervention and preventing the development of IDA.
- **Ensuring medication adherence** — Pharmacists can ensure patients take their iron supplements as directed. This involves educating patients about the importance of regular supplementation, potential side effects, and strategies to manage them. Pharmacists can also provide reminders for refill prescriptions to ensure uninterrupted supplementation.

6. Summary and conclusions

IDA is a significant global public health concern with far-reaching implications for maternal, infant and child well-being. International targets and sustainable development goals reinforce efforts to combat this condition. Health literacy is fundamental in managing IDA, ensuring patients can make informed decisions and engage in meaningful dialogues with healthcare providers. Pharmacological treatment options, including oral

iron supplements and intravenous therapy, are commonly used, along with non-pharmacological approaches that involve dietary diversification. Early identification and accurate diagnosis are pivotal in managing IDA effectively.

Despite ongoing efforts and the accessibility of treatment options, IDA affects many individuals, including special populations. The approach to effective management of IDA requires early identification, accurate diagnoses, individual- based tailored interventions and patient education. Additionally, the prevention of IDA calls for a holistic, multi-faceted approach. This encompasses enhancing community consciousness, early detection of high-risk individuals, proactive engagement of healthcare professionals and dietary enhancements.

Pharmacists play a pivotal role in raising awareness about IDA by offering accurate information regarding its symptoms, causes and preventive strategies. In a community seting, pharmacists can provide health services and information on preventing and managing iron deficiency anaemia. In a hospital setting, pharmacists can optimise patient outcomes by monitoring and adjusting treatment plans. They also actively develop evidence-based practice guidelines in collaboration with fellow healthcare professionals. Their active engagement in providing health advice has yielded significant therapeutic impact and garnered approval from fellow healthcare professionals.

To effectively contribute to these efforts, pharmacists must comprehensively understand IDA, encompassing its symptoms and preventive measures. Furthermore, they should be adept at identifying high-risk individuals and be well- versed in the various forms of iron supplements available. Collaborating with other healthcare professionals, including doctors, nurses and dietitians, is integral to providing comprehensive care for anaemic patients. This involves sharing relevant patient information and actively participating in developing and assessing patient care plans. This handbook is expected to serve as an invaluable resource, providing pharmacists, specifically in patient-facing roles, with the essential knowledge needed to address the identified gaps above in their understanding of IDA.

Further support for research and innovation in anaemia management, including diagnostic tools and treatment modalities, is necessary. Promoting continuous education through workshops, webinars and certification programmes is vital to ensure that pharmacists remain updated with the latest advancements in anaemia care. Organising workshops and group discussions based on handbook guidelines can empower pharmacists, enhancing their understanding and practical application of knowledge in the context of IDA and supporting their roles in promoting self-care to patients and communities.

References available on request.

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