

Review on Iron deficiency anaemia

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ABSTRACT:

Iron deficiency anemia (IDA) is one of the most common nutrient deficiencies and accounts for almost half of all cases of anemia. It is common in many developing countries, accounting for 5% (US women) and 2% (US men). In most cases, this deficiency disorder can be diagnosed through a complete blood test (complete blood count) and an elevated serum ferritin level. IDA can occur due to physiological needs in growing children and adolescents, and pregnant women can also lead to IDA. The causes may be due to default of any physiological systems especially poor digestive system. Due to inadequate iron, haemoglobin deficiency occurs in body. Due to these reasons bone marrow is also not able to produce enough haemoglobin. Dietary diversification, supplementation, and fortification of staple foods and nutrition education, are the best. Iron metabolism and homeostasis will be reviewed, followed by a discussion of diagnostic testing and therapeutic recommendations for dogs and cats with iron deficiency anemia

Keywords:Iron deficiency anaemia; Gastrointestinal; Insufficient iron intake; Microcytic

I. INTRODUCTION :

Today, Iron Deficiency Anemia (IDA) is the most common micronutrient deficiency in the world, bringing serious economic consequences and obstacles to national development. Treatment consists of addressing the underlying syndrome causing blood loss and restoring iron stores[1]. Iron deficiency accounts for anemia in 5% of American women and 2% of American men [2]. Iron is essential to virtually all living organisms and is integral to multiple metabolic functions. The most important function is to transport oxygen in haemoglobin [3]. Erythropoietin is a glycoprotein hormone synthesized in the kidneys that regulates red blood cell formation. The term "Anemia" (from the ancient Greek *ἀναμία*, *anaímia*, meaning 'lack of blood') is used for a group of conditions that result from an inability of erythropoietin tissues to maintain a normal hemoglobin concentration on an

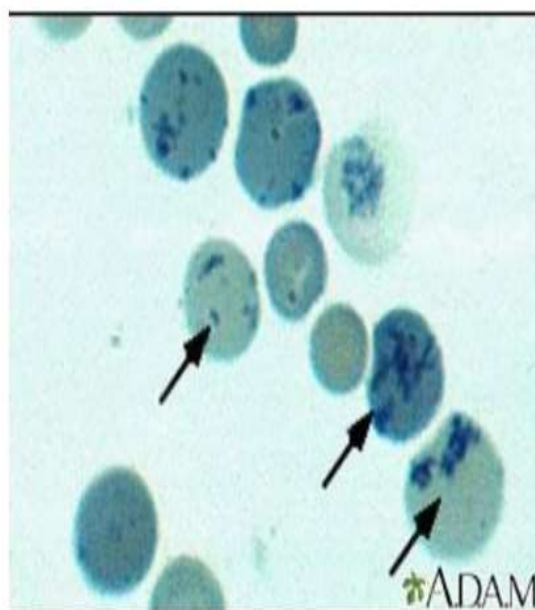
account of inadequate supply of one or more nutrients leading to a reduction in the total circulating haemoglobin.

Methods:

This review includes uncovered data on iron deficiency anemia and updated treatment guidelines. This information was collected through computer search variety of research papers, journal articles, etc. different guidelines for iron deficiency anemia.

Definition:

Anemia is a condition in which our body does not have enough healthy red blood cells (RBCs). The main functions of red blood cells are to supply oxygen to body tissues. Anemia can be divided into different types. Less iron in our body leads to iron deficiency anemia. Iron helps form red blood cells



Iron metabolism and Homeostasis :

Iron in the form of heme is vital to many metabolic functions including oxygen transportation in hemoglobin. Iron is also a

component of multiple enzymes, including cytochromes, necessary for energy generation and drug metabolism (3). Through the donation or acceptance of an electron, iron exists in either a reduced ferrous (Fe^{2+}) or an oxidative ferric (Fe^{3+}) state. The majority of functional iron is contained in hemoglobin, with smaller quantities found in myoglobin and cytochromes (3, 5). The liver, which is the site of production of iron transport proteins, contains the largest non-functional iron stores either as ferritin or hemosiderin (3, 6). Ferritin is both dispersed and soluble and is the major iron storage protein (3, 7). Hemosiderin has a similar structure but contains more iron than proteins and is insoluble (5). Iron is also stored in reticuloendothelial cells of the bone marrow and spleen, but less commonly in the cat bone marrow (1–3). In reticuloendothelial cells of the bone marrow and spleen, but is not commonly stored in the bone marrow of cats (1–3). Dietary iron is absorbed mainly in the duodenum (3,5). Only ferrous iron is absorbed, and it is transported across the apical membrane of the enterocyte by divalent metal transporter 1 (3,5). It is then transferred

across the enterocyte to the basolateral membrane by an unknown mechanism (3,5). Iron is exported across the basolateral membrane of enterocytes by ferroportin, then bound to transferrin in the plasma and transported for use in target organs and/or storage (3,5,7).

Body stores of iron are tightly regulated to provide adequate iron for cellular needs without developing toxicity from excess. Because the body lacks a mechanism to excrete excessive iron, homeostasis is tightly controlled by limiting enteric iron uptake through impaired efflux from enterocytes. Iron efflux is regulated by hepcidin, a recently discovered hormone produced by hepatocytes. When iron stores are adequate or high, hepcidin is released and binds to intestinal ferroportin causing internalization and destruction of ferroportin. The reduction in ferroportin causes absorbed dietary iron to remain in the enterocyte, where it is lost by enterocyte shedding. Conversely, when iron stores are low, hepcidin production and secretion are suppressed, increasing iron efflux from enterocytes into the blood (Figure 1) (3,5)

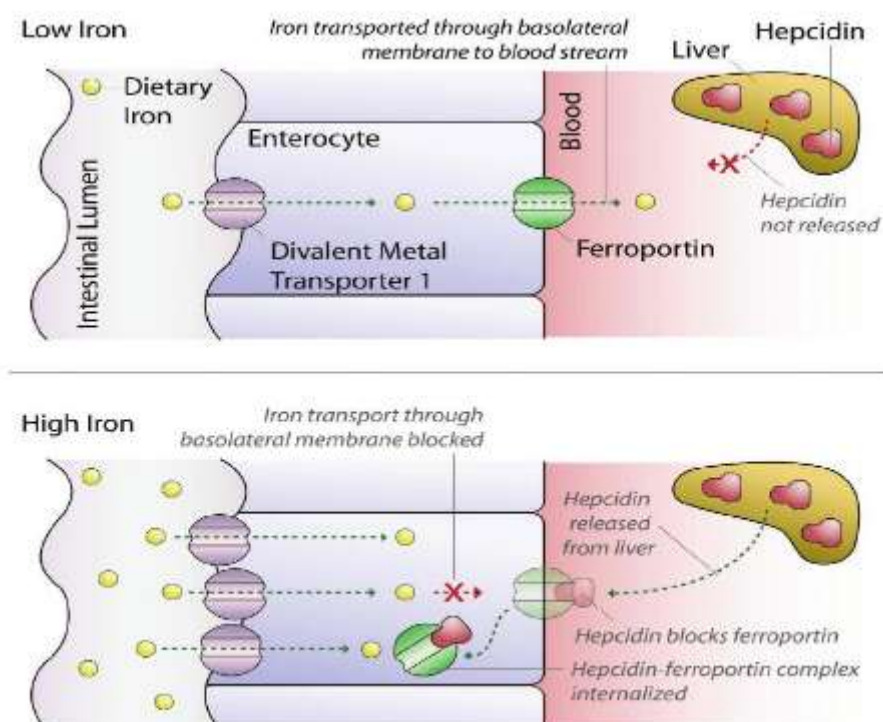


Figure 1. Mechanism of intestinal iron absorption at low and high serum iron levels.

Risk factors:

Iron Deficiency anaemia is a very common disease in women especially at the time of Menarche & pregnancy

including delivery. The following people are in the main risk for Iron deficiency anaemia

- People taking poor diets
- People donating blood frequently,
- Women who are in childbearing age,
- Pregnant women,
- Especially those born prematurely or experiencing a growth spurt
- Infants & children,
- Vegetarians who don't change meat with another iron rich food [8]

Causes:

Regardless of the various aetiologies, most anaemic patients usually have some component of iron deficiency, which responds to iron administration. With the elderly, the aetiology is attributed to iron deficiency in approximately one-third and chronic renal disease or inflammation accounts to another one-third. The aetiology in the remaining group is often unclear [9,10]. Iatrogenic anaemia or drug induced immune hemolytic anaemia (DIIHA) should be underscored

Diagnosis of IDA:



To identify iron deficiency anaemia, doctor may run tests to look for

• **Size and colour of red blood cell:** With iron deficiency anaemia; red blood cells are smaller and paler in colour when comparing with normal.

• **Haematocrit:** It may be defined as percentage of your blood volume made up by red blood cells. Standard levels are generally between 35.5 and 44.9 percent for adult women and 38.3 to 48.6 percent for adult men. These values may differ depending on your age.: Lower than standard

with a growing list of commonly used medications being implicated[10]. Furthermore, data on blood loss due to excessive diagnostic phlebotomy in hospitalized patients have also been a cause of major concern [11].

Clinical manifestation:

- Uncharacteristic paleness or absence of colour of the skin
- Irritability
- Lack of energy or tiring easily (fatigue)
- Increased heart rate (tachycardia)
- Sore or inflamed tongue
- general fatigue
- weakness
- pale skin
- shortness of breath(dyspnoea)
- dizziness
- a tingling or crawling feeling in the legs

haemoglobin levels indicate anaemia. The standard haemoglobin range is generally defined as 13.2 to 16.6 grams (g) of haemoglobin per decilitre (dl) of blood for men and 11.6 to 15.g/dl for women.

• **Ferritin:** This protein helps store iron in the body, and reduced ferritin levels generally indicate low iron storage levels.

• **Endoscopy:** Doctors often examine whether there is bleeding from a hiatal hernia; Ulcer or stomach through endoscopy. This method involves inserting a thin, lighted tube equipped with a video

camera from the throat to the stomach. This allows your doctor to examine the tube that runs from your mouth to your stomach (esophagus) and back into your stomach to look for sources of bleeding.

- **Colonoscopy:** To rule out sources of bleeding from the lower intestine, your doctor may order a procedure called a colonoscopy. A thin, flexible tube equipped with a video camera is inserted into the rectum and guided into the large intestine. You will usually be sedated during this test. During a colonoscopy, your doctor may examine part or all of your colon and rectum to check for internal bleeding.

- **Ultrasound:** Women may also undergo a pelvic ultrasound to determine the cause of excessive menstrual bleeding, such as uterine fibroids [12].

Symptoms of IDA:

The two main types of iron deficiency are 1) absolute iron deficiency arising due to the lowered or exhausted level of total body iron stores are low or exhausted and, 2) functional iron deficiency wherein the total body iron stores are normal or increased, with the insufficient iron supply to the bone marrow. Absolute iron deficiency and functional iron deficiency can coexist. Functional iron deficiency is present in many acute and chronic inflammatory states [17]. The clinical features of iron deficiency anaemia depends on the following factors:

- Level of severity of the anaemia
- Age group
- Multiple disorders
- Illness consistency
- Speed of onset

Patients with iron deficiency anaemia present with symptoms that are associated with all anaemias such as pallor of the skin, conjunctivae, nail beds, fatigue, vertigo, syncope, exertional dyspnoea progressing to breathlessness at rest, tachycardia headache, and a cardiac systolic flow murmur [13-14]. Patients may also show dyspnoea at rest, angina pectoris and haemodynamic instability in severe cases [15].

Iron deficiency rapidly affects the epithelial cells thereby leading to dryness and roughness of the skin, dry and damaged hair, koilonychia and alopecia. In mild-to-moderate iron deficiency loss of tongue papillae is reported. Atrophic glossitis is also noted in severe cases. Iron deficiency may be associated with restless legs syndrome [16].

Anaemic condition tends to have negative impact on physical performance, mostly work

productivity due to reduced oxygen transport the reduced cellular oxidative capacity [17]. Perinatal iron deficiency is associated with tardy neurocognitive development and psychiatric illness [18, 19, 20, 21, 22].

Prevention:

When affected by inadequate iron intake; iron deficiency anemia can be prevented by eating a diet which is high in iron-rich foods and vitamin C. Mothers should make sure to feed their childrens breast milk or iron-fortified infant formula.

Foods high in iron include-

- pork, chicken, and beef
- beans
- pumpkin and squash seeds
- leafy greens, such as spinach
- raisins and other dried fruit
- eggs
- seafood, such as clams, sardines, and oysters
- iron-fortified dry cereals

Foods high in vitamin C include-

- fruits such as oranges, grapefruits, strawberries, kiwis, papayas, pineapples, melons, and mangoes
- broccoli
- red and green bell peppers
- Brussels sprouts
- cauliflower
- tomatoes
- green leafy vegetables [23]

Treatment: To treat iron deficiency anemia, your doctor may recommend that you take iron supplements. Your doctor will also treat the underlying cause of your iron deficiency, if necessary.

Iron supplements:

Your doctor may recommend over-the-counter iron tablets to replenish the iron stores in your body. Your doctor will let you know the correct dose for you. Iron is also available in liquid form for infants and children. To improve the chances that your body will absorb the iron in the tablets, you may be instructed to:

- **Take iron tablets on an empty stomach:**

If possible, take your iron tablets when your stomach is empty.

- **Don't take iron with antacids:**

Medications that immediately relieve heartburn symptoms can interfere with the absorption of iron.

- **Take iron tablets with vitamin C** : Vitamin C improves the absorption of iron.

Treating underlying causes of iron deficiency: If iron supplements don't increase your blood-iron levels, it's likely the anemia is due to a source of bleeding or an iron-absorption problem that your doctor will need to investigate and treat. Depending on the cause, iron deficiency anemia treatment may involve:

- Medications, such as oral contraceptives to lighten heavy menstrual flow.
- Antibiotics and other medications to treat peptic ulcers.
- Surgery to remove a bleeding polyp, a tumour or a fibroid.

II. CONCLUSION

The most severe significance of iron reduction is iron Deficiency anemia, and it is still well thought-out the most Communal nutrition deficiency worldwide. In addition, IDA Related with CKD or CHF can deteriorate the outcome of Both conditions. Comparing IDA from anemia of chronic Disease using hematologic measures is studied as well.

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