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Iron deficiency anemia- An updated overview

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Abstract
Anemia is defined as the clinical state where the blood lacks healthy red blood cells and this results in decreased oxygen flow to different organs of the body. Iron deficiency anemia is occurred due to insufficient iron. Without adequate iron, the body cannot produce enough of hemoglobin which is a vital part of red blood cells and thus it causes impaired oxygen supply. Iron deficiency anemia is a more severe medical condition in which small levels of iron are linked with anemia and the existence of microcytic hypochromic red cells. Iron Deficiency anaemia is a very common disease in women especially at the time of Menarche & pregnancy including delivery. Due to etiological factors shortage of iron in our body occurs. 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. Most of the cases of iron deficiency anaemia are mild and do not cause complications. The condition can generally be improved easily. Though, if anaemia or iron deficiency is left untreated, it can cause to other health problems. Iron tablets help to restore iron levels in the body. Taking iron tablets in empty stomach helps in absorption of iron faster. If facing any adverse effects, can be taken after meals also. But the supplements should be continued for several months. These Iron supplements may cause constipation or black stools. Drug-induced iron deficiency anaemia is a blood disorder that occurs when a medication triggers the body's immune system to attack its own red blood cells. This causes red blood cells to break down earlier than normal, a process known as haemolysis.

Keywords: iron deficiency anemia, supplements, blood disorder, haemoglobin, pregnency

Introduction
The most common form of anemia in the world is Iron-deficiency anemia. This article intends to review the global nature of the disease, iron homeostasis in normal and iron – deficient states, clinical findings, treatment, and causes of iron-resistant iron deficiency.
One of the most common medical conditions and global health problems seen in everyday clinical practice includes iron deficiency and iron deficiency anemia. Iron deficiency continues to be the high-ranking cause of anemia worldwide, and iron – deficiency anemia has a considerable effect on the lives of young children and premenopausal women in both developed as well as low-income countries. It is crucial to improve the diagnosis and treatment of this condition [1].
Anemia is defined as the clinical state where the blood lacks healthy red blood cells and this results in decreased oxygen flow to different organs of the body. Iron deficiency anemia is occurred due to insufficient iron. Without adequate iron, the body cannot produce enough of hemoglobin which is a vital part of red blood cells and thus it causes impaired oxygen supply. As a result of this, the person feels tired and short of breath.
Iron deficiency may interfere with biological functions like respiration, energy production, DNA synthesis, and cell proliferation [2]. Iron deficiency anemia is a more severe medical condition in which small levels of iron are linked with anemia and the existence of microcytic hypochromic red cells.
The presence of both iron deficiency and anemia of chronic disorders is mutual and may be seen in elderly patients and patients with chronic kidney disease [3]. In adults, iron – deficiency anemia can result an wide-ranging variety of opposing outcomes including reduced work or exercise capacity, impaired thermoregulation, immune dysfunction, GI disturbances and neurocognitive impairment [1].
Around the World, anemia affected people are 1.62 billion (95% CI: 1.50–1.74 billion), which resembles to 24.8% of the population (95% CI: 22.9–26.7%). The highest occurrence (47.4%, 95% CI: 45.7–49.1) is found among preschoolers children, and the lowest occurrence is found in men (12.7%, 95% CI: 8.6–16.9%).Among all over the population group with the highest number of people more affected (468.4 million, 95% CI: 446.2–490.6) are non-pregnant women [1].

Methodology
This review includes discovered data about iron deficiency anemia, updated guidelines with treatment. This information was collected through a computerized search from various research article, review articles & various guidelines related to iron deficiency anemia.

Definition: Anaemia is a disease condition in which our body does not have enough healthy red blood cells (RBC). Main functions of RBC id to provide oxygen to the body tissues. Anaemia can be categorized into many types. Less amount of iron in our body causes Iron deficiency Anaemia. Iron helps to make red blood cells. This is the most common among all the types [5].

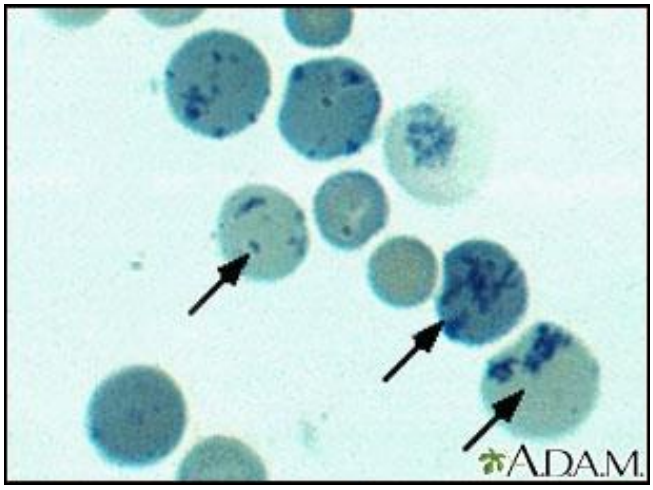

Fig 1

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 [6].

Causes

- Excessive loss of blood- One of the main components of blood is iron, as it is stored in red blood cells. Due to any severe injury when excessive blood loss occurs iron deficiency anaemia may occur.
- Decreased ability to absorb iron
- Poor or inadequate iron reached diet- Foods rich in iron, such as eggs and meat, supply the body with much of the iron it helps to produce haemoglobin. If a person does not eat enough to maintain their iron supply, an iron deficiency can occur.
- During Pregnancy- Low iron levels is very common problem in pregnant women. The growing foetus needs a lot of iron, which can lead to an iron deficiency anaemia. A pregnant woman has an increased amount of blood in her body. This larger volume of blood demands more iron to meet its needs.
- Chronic diseases or Some cancers -In some cases, slow loss of blood from chronic diseases or some cancers can lead to an iron deficiency.
- Decreased ability to absorb iron- Some people are not able to absorb sufficient iron from the food they eat. This may be due to a problem with the small intestine, indicates diseases like celiac disease or Crohn's disease, or if a part of the small intestine has been removed.

Pathophysiology

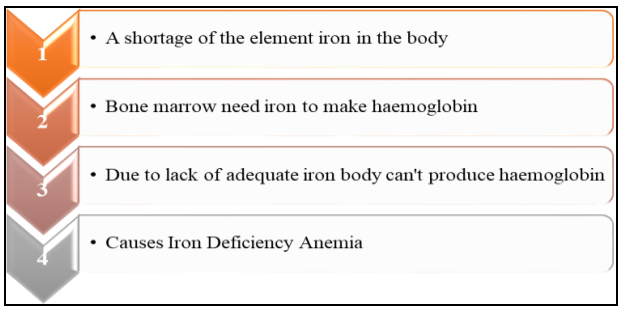

Fig 2

Due to etiological factors shortage of iron in our body occurs. 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. On the other hand, after 120 days RBC will die due to natural destruction phenomenon. Clinical manifestations like weakness, Irritability, lack of energy, sore or swollen tongue, pale skin, shortness of breath etc. of anaemia are become prominent day by day. Iron deficiency anaemia occurs.

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
- cold hands and feet
- fast or irregular heartbeat
- fragile nails
- headaches
- Enlarged spleen(splenomegaly)
- A plea to eat peculiar substances, such as dirt or ice (also called pica) [7].

Diagnosis

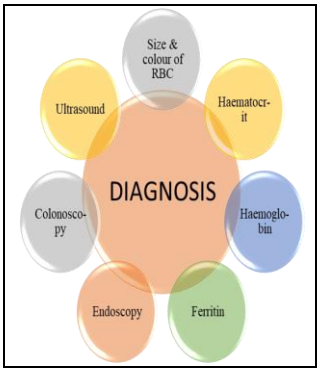

Fig 3

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.
- **Haemoglobin:** Lower than standard 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 supports store iron in your body, and a decreased level of ferritin typically indicates a low level of stored iron.

Additional diagnostic tests

If your blood work point toward iron deficiency anaemia, doctor may recommend for additional tests to recognise an underlying cause, such as:

- **Endoscopy:** Doctors frequently check for bleeding from a hiatal hernia; an ulcer or the stomach with the aid of endoscopy. In this method, a thin, lighted tube fitted out with a video camera is passed down from your throat to your stomach. This permits doctor to view the tube that tracks from your mouth to your stomach (oesophagus) and your stomach to look for sources of haemorrhage.
- **Colonoscopy:** To rule out lower intestinal sources of haemorrhage, doctor may vouch for a procedure called a colonoscopy. A thin, flexible tube fitted out with a video camera is introduced into the rectum and guided to your colon. You are generally sedated during this test. A colonoscopy permits your doctor to view inside some or all of your colon and rectum to look for internal haemorrhage.
- **Ultrasound:** Women may also have a pelvic ultrasound to look for the reason of excess menstrual haemorrhage, such as uterine fibroids [8].

Complications

Most of the cases of iron deficiency anaemia are mild and do not cause complications. The condition can generally be improved easily. Though, if anaemia or iron deficiency is left untreated, it can cause to other health problems. These include

Rapid or irregular heartbeat

When you are anaemic, heart has to pump supplementary blood to make up for the low volume of oxygen. This can cause irregular heartbeat. In major cases, it can cause heart failure or an enlarged heart.

Pregnancy complications

In major cases of iron deficiency anemia, a child may be born in advance or with a low birth weight. Furthermost pregnant women take iron supplements as part of their prenatal care to prevent complication.

Delayed growth in infants and children

Infants and children who are ruthlessly deficient in iron may cause delayed growth and development. They may also be more susceptible to infections.

Treatment

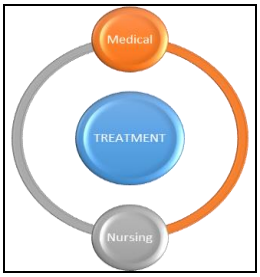

Fig 4

Medical

- **Iron supplements-** Iron tablets help to restore iron levels in the body. Taking iron tablets in empty stomach helps in absorption of iron faster. If facing any adverse effects, can be taken after meals also. But the supplements should be continued for several months. These Iron supplements may cause constipation or black stools.
- **Diet:** Diets which include the following foods can help treat or prevent iron deficiency:
- red meat
- dark green leafy vegetables
- dried fruits
- nuts
- iron-fortified cereals

Furthermore, vitamin C helps the body to absorb iron. A doctor might advise taking the tablets along with vitamin C sourced foods, such as a glass of orange juice or citrus fruit.

- **Treating the underlying cause of bleeding:** Iron Deficiency can't be treated with supplements if the cause is excessive blood loss. In case of excessive periods birth control pills can be used. This can decrease the quantity of menstrual bleeding each month. For most severe cases, a blood transfusion can replace iron and blood loss quickly [9].

Nursing

The nursing interventions for a child with iron deficiency anaemia are:

Administer prescribed medications, as ordered

- If oral iron is poorly absorbed then IM or IV iron should be administered.
- To check anaphylaxis reaction sensitivity test should be done
- Guide the patient to take iron supplements an hour before meals for maximum absorption; in case of gastric distress occurs, supplements can be taken with meals.
- Notify the patient that iron salts change stool to dark green or black to avoid fear & tension.
- Counsel patient to take liquid forms of iron through straw and wash mouth with water.

Reduce fatigue

- Should make a schedule of daily activity & rest for the patient
- Stress the importance about rest periods at regular

interval.
- Monitor haemoglobin, RBC count, Haematocrit & reticulocyte counts.
- Educate energy-conservation techniques to the patient.
- Inspire patient to continue iron therapy for a total therapy time (6 months - One year), even when fatigue is no lengthier present.

Educate the patient and family members about iron deficiency anaemia
- Should explain the importance of the diagnostic procedures like complete blood count (CBC), bone marrow aspiration & possible referral to a haematologist.
- Should explain the importance of iron replacement or supplementation.
- Should educate the client and the family concerning foods rich in iron (organ and other meats, leafy green vegetables, molasses, beans).

Prevent infection
- Should evaluate the local or systemic signs of infection like fever, chills, swelling, pain, and body malaise.
- Should monitor WBC count; anticipate the need for antibiotic, antiviral, and antifungal therapy.
- Should instruct the client to avoid contact with people with prevailing infections.
- Should stress about the importance of daily hygiene, mouth care & perineal care.

Prevent bleeding
- Should monitor platelet count & bleeding protections.
- Should anticipate the need for a platelet transfusion once the platelet count drops to a very low value.
- Should assess the skin for bruises and petechiae.

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 [9]

Drug Causes Iron Deficiency Anaemia

Drug-induced iron deficiency anaemia is a blood disorder that occurs when a medication triggers the body's immune system to attack its own red blood cells. This causes red blood cells to break down earlier than normal, a process known as haemolysis.

Drugs that can cause this type of iron deficiency anaemia include-
- Antibiotic such as Cephalosporin
- Dapsone
- Levodopa
- Levofloxacin
- Methyldopa
- Nitrofurantoin
- Nonsteroidal anti-inflammatory drugs (NSAIDs)
- Penicillin and its derivatives
- Phenazopyridine (Pyridium)
- Quinidine
- Drug-induced iron deficiency anaemia is rare in children [10, 11].

Updated Overviews

Iron deficiency anemia & gestational oncology

Iron deficiency anemia in cancer patients is a main source of cancer morbidity. Nonetheless, it still remains an underrated problem and sensitization of medical doctor caring for cancer patients is compulsory. It is essential to differentiate between AID and FID as it indicates the potential response on erythropoiesis stimulating agents and the probable prerequisite for iron supplements in patients receiving ESA. There are no precise studies or guidelines accessible for gastrointestinal cancer patients. But in general, based on the studies in general oncology patients, we advise to be attentive about ID in cancer patients in order to stop anemia, anemia-related symptoms, and treatment with luxurious ESA and transfusion. IV iron should be started when ferritin levels are <100 ng/mL and/or transferrin capacity is below 20%, unconventionally from Hb level [12].

Iron deficiency anemia & cancer patients

Iron deficiency anemia is among the most common sources of anemia in this situation and can mature in nearly half of patients with hard tumors and hematologic malignancies. Astonishingly, this fact is typically ignored by the attending medical doctor in a way that proper and rapid investigation of the iron status is either not implemented or postponed. In cancer patients, functional iron deficiency is the principal mechanism, in which iron availability is decreased due to disease or the therapy-related inflammatory procedure. Besides, deficiency of bioavailable iron can be further degenerated by the use of erythropoiesis stimulating mediators that surge iron utilization in the bone marrow. Iron deficiency can grounds anemia or worsen pre-existing anemia; leading to a deterioration in performance position and adherence to treatment, with possible implications in clinical conclusion among iv iron formulations, slow release preparations present more favorable pharmacological characteristics and efficiency in cancer patients [3].

Anemia correction with field crops

Iron deficiency anemia brings about in severe Fe chlorosis of field harvests in Texas generally happens on calcareous, alkaline soils. The harshness of Fe chlorosis in these field harvests ranges from insignificant deficiencies which can be modified by a one-time foliar spray application to extreme circumstances which involve several successive foliar

applications at 10 days intermissions. Several Fe sources were investigated as soil applications. Most foundations were somewhat effective in improving Fe chlorosis when soil applied at adequately high charges [14].

Iron deficiency in chronic heart failure

Patients having chronic heart failure, iron deficiency, even in the nonappearance of anemia, can aggravate the underlying disease and have a adverse impact on clinical outcomes and quality of life. As per 2016 European Society of Cardiology guidelines for the diagnosis and treatment of acute and chronic heart failure recognize iron deficiency as a co-morbidity in chronic heart failure and recommend iron status screening in all newly diagnosed patients with chronic heart failure. Iron deficiency alone or even in the absence of anemia, is a common co-morbidity in patients with CHF. As per 2016 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure recommend evaluating the iron status [15].

Iron deficiency anemia & chronic kidney disease

Iron deficiency anemia (IDA) is a frequent complication of CKD associated with opposing outcomes in these patients. Conventional oral iron agents are insufficiently effective as of the poor absorption with gastrointestinal side effects. Ferric citrate, an innovative oral iron-repletion agent approved for patients with non-dialysis-dependent CKD and IDA. It's having good power of improvements in hemoglobin levels and iron parameters, with good permissibility in patients with non-dialysis-dependent CKD. When used as a phosphate ring binder, ferric citrate also improves hemoglobin and iron parameters in dialysis-dependent CKD. Other novel oral iron preparations in case of development for IDA in patients with CKD include FERRIC MALTOL- approved in Europe and the United States for IDA in adult patients, and sucrosomial iron has been evaluated in IDA associated with CKD and numerous other clinical settings [16].

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.

List of abbreviation

AID-Absolute Iron Deficiency
FID- Functional Iron Deficiency
ESA-Erythropoiesis Stimulating Agents
CKD-Chronic Kidney Disease
IDA-Iron Deficiency Anemia
CHF-Congestive Heart Failure

Conflict of interest

No

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