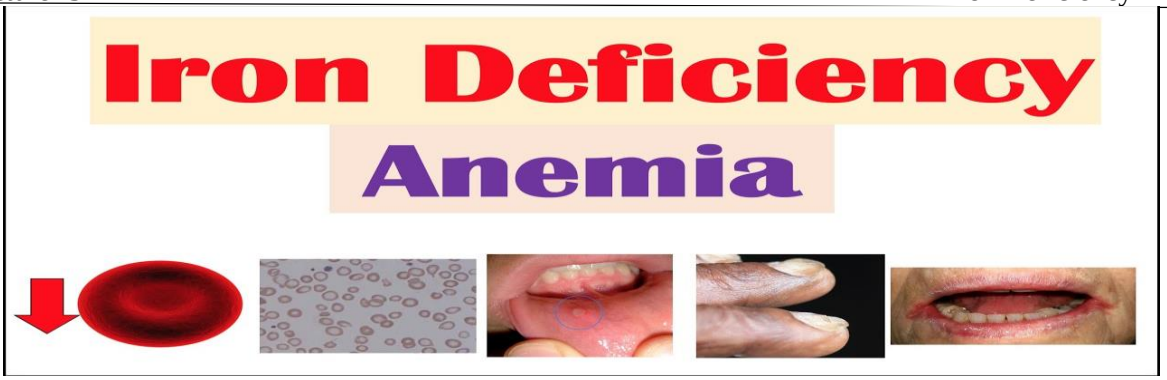


It is **Microcytic** type of anemia, most common throughout the world, affecting 25% of the world population. It was occurring when the imbalance of iron intake, iron stores, and the body's loss of iron are insufficient to fully support production of erythrocytes. Iron deficiency anemia rarely causes death, but the impact on human health is significant.

Iron forms in human body:

The two most common iron states are the divalent **ferrous (Fe2+)** and the **trivalent ferric (Fe3+)**. Within the human body, iron is required as a cofactor for many **hemoproteins** and **non-hemoproteins**.

Hemoproteins include **hemoglobin** and **myoglobin** that are responsible for oxygen binding and transport, **catalase** and **peroxidase enzymes**, which take part in oxygen metabolism, and cytochromes, that important in electron transport and mitochondrial respiration.

Non-hemoproteins also have crucial functions, as these are used in DNA synthesis, cell proliferation, gene regulation, drug metabolism, and steroid synthesis

The normal total amount of iron in human has **70 kg**, about **3500–4000 mg**, corresponding to an average concentration of **50–60 mg** of iron per kg of body weight.

1-The vast majority **(2300 mg, 65%)** of iron in the body is found in the **hemoglobin of erythrocytes.**

2-About a tenth of total iron **(350 mg)** is present in the **myoglobin** of muscle and enzymes and cytochromes of other tissues.

3-Also approximately 500 mg is found in macrophages of the reticuloendothelial system (RES),

4-About 200–1000 mg is stored in hepatocytes in the form of **ferritin**

5-while 150 mg of iron is found in the bone marrow

Iron Hemostasis and Metabolism:

Two main sources of iron Fe^{++} in the body, 1-dietry 2-recycled iron from RBC degradation.

Iron metabolism steps:

1-Small intestine duodenum cells (**enterocytes)** absorbed iron Fe^{++} from food digestion.

2-Upon absorption, iron circulates around the body bound to the protein **transferrin** (A plasma protein that transports iron through the blood to the **liver, spleen and bone marrow**) and is taken up by tissues for utilization such as **erythropoiesis** in bone marrow, **myoglobin synthesis** in muscle, and **oxidative metabolism** in all respiring cells.

3-The **reticuloendothelial system (RES),** which includes macrophages, recycles iron from senescent erythrocytes.

4-The liver produces the hormone **Hepcidin** that controls the release of iron from enterocytes and macrophages into the circulation and is regarded as the master regulator of systemic iron metabolism.

5-Iron enter to the cells by special receptors for transferrin (**TFR1, TFR2**), in the cytoplasm, ferrous iron is found in a soluble, it can be stored in **Ferritin** (protein storage **4500** iron molecule as ferric iron **Fe^{+++}**) in **liver and bone marrow,** due to the **ferroxidase** (which converted Fe^{++} to Fe^{+++}). If the capacity for storage of iron in ferritin is exceeded, a complex of iron with phosphate and hydroxide forms **dysfunctional ferritin** as **Hemosiderin** (which form after bleeding, when macrophage engulfed hemoglobin of destroyed RBC).

Common signs and symptoms of IDA are:

1-Difficulties with memory and concentration 2-Fatigue 3- Dizziness 4-Feeling unusually cold 5-Pale skin 6-Chest pain 7-fast heartbeat or shortness of breath 8-Headache 9-Poor appetite, especially in infants and children 10- Brittle nails.

Causes of iron deficiency:

1-Blood loss. Women because they lose blood during **menstruation. Gastrointestinal bleeding** can result from regular use of some over-the-counter pain relievers, especially aspirin.

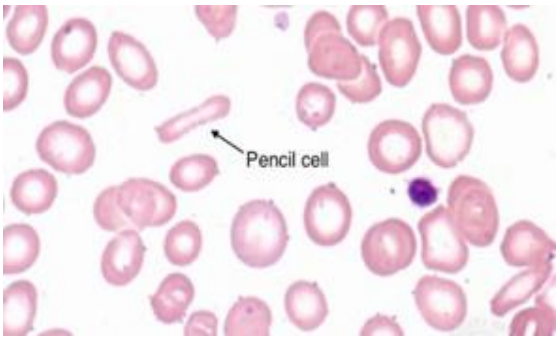
2-A lack of iron in your diet. Body regularly gets iron from the foods you eat. Examples of iron-rich foods include meat, eggs, leafy green vegetables and iron-fortified foods. The normal requirements of iron **8 mg per day for men, 18 mg per day for premenopausal women. 8 mg a day for postmenopausal women.**

3-An inability to absorb iron. An intestinal disorder, such as celiac disease, which affects your intestine's ability to absorb nutrients from digested food, can lead to iron deficiency anemia. If part of small intestine has been bypassed or removed surgically, that may affect your ability to absorb iron and other nutrients.

4-Pregnancy. Without iron supplementation, iron deficiency anemia occurs in many pregnant women because their iron stores need to serve their own increased blood volume as well as be a source of hemoglobin for the growing fetus.

Diagnosis of IDA:

1-CBC: it will revealed **low** in all of these test: hemoglobin (Hb), hematocrit (Hct), mean cellular volume (MCV), packed cell volume (PCV), ferritin, serum iron, iron saturation and **High** transferrin or total iron-binding capacity (**TIBC**)



2-The peripheral blood smear: or blood slide may show small RBC, has oval-shaped with pale centers (**pencil** shape).

3-Bone marrow: study in iron deficiency anemia using biopsy and **Prussian blue** stain to indicate poor iron storage.

4-Serum ferritin: test for iron stores

5-Serum iron is a medical laboratory test that measures the amount of circulating iron that is bound to transferrin, normally,1/3 of transferrin is saturated with iron, and this is the iron measuring in the plasma

6-Transferrin saturation: It is the value of serum iron divided by the total iron-binding capacity (**TIBC**) of the available transferrin bound.

Note: a total iron-binding capacity (**TIBC**) test measures the blood ability to attach itself to iron and transport it around the body. A transferrin test is similar. In iron deficiency anemia, iron level will be low but your TIBC will be high.

Test	Normal value
Serum iron	80 – 180 mcg/dl
TIBC (transferrin)	240 – 400 mcg/dl
Transferrin Saturation	30%
Serum ferritin	18 – 22 ng/dl

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