

## Awareness people about anemia and the scientific methods used to determine its type and combate it in all society classes

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### ABSTRACT

Anemia is a problem of not having sufficient and healthy red blood cells to carry oxygen from the lungs to all body tissues, or not sufficient hemoglobin concentration inside the red blood cells. anemia is a major public health concern affecting mainly children

### INTRODUCTION

anemia is a problem of not having sufficient and healthy red blood cells to carry oxygen from the lungs to all body tissues, or not sufficient hemoglobin concentration inside the red blood cells. anemia is a major public health concern affecting mainly children, pregnant women, and low income countries. globally there is 40% of children (from 6-59 months), 37% of pregnant women, and 30% of women aged 15 to 49 years are anemic. The common types of anemia are iron deficiency, thalassemia and sickle cell anemia.

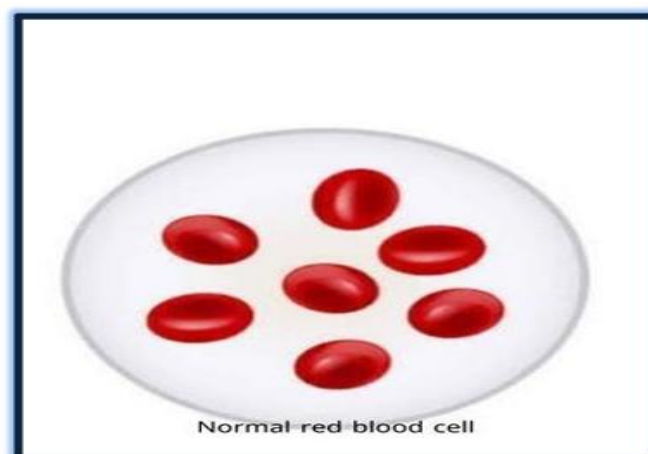
#### blood component:

blood consists of three types of cells:

- 1- the red blood cells (have many functions).
- 2- the white blood cells ( have immunity function).
- 3- the platelets (have coagulation function).

#### classification of anemia:

anemia disease is related mainly with the red blood cells, as the normal RBCs have spherical shape with mean corpuscular volume (MCV) (80-100) fL, and still for 120 days in the bloodstream



anemia classified into 3 major classes according to the the red blood cell size and number:

- 1- macrocytic anemia: when the bone marrow produce large RBCs with high MCHC rate ex; megaloblastic anemia.
- 2- microcytic anemia: when the bone marrow produce small RBCs with low hemoglobin content ( MCHC) such as; thalassemia ,and iron deficiency anemia.
- 3- normocytic anemia: bone marrow produces normal RBCs but low in count such as, iron deficiency anemia

#### what is MCHC?

this is mean corpuscular hemoglobin concentration that represent the amount of hemoglobin per unit volume of fluid inside the cell, It is usually about 320-360g/l.

#### What is the hemoglobin compound?

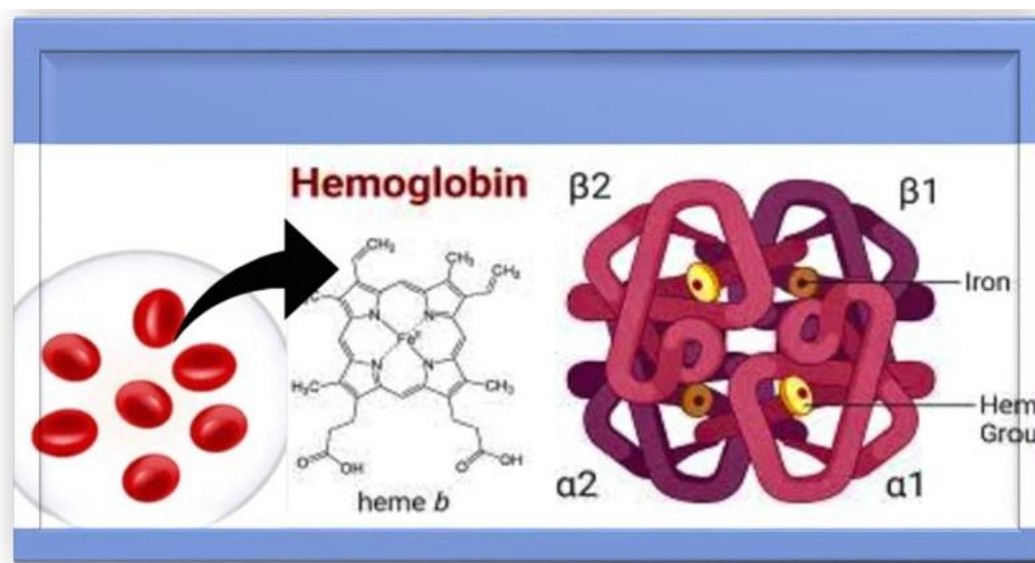
hemoglobine is a type of protein present inside the red blood cells that give the the blood its distinctive color it carry ferritin molecules that enable blood carrying oxygen from lungs to all body organs.

hemoglobin represents 94% of dried red blood cells volume. the normal amount of hemoglobin inside the red blood cells give it its round shape, but any change in hemoglobin percentage will lead to change in the red cell morphology and its efficiency.

#### The chemical structure of hemoglobin:

hemoglobin molecule consist of;

- 1- 4 of a multiptptide protein series called Globulin.
- 2- each series of Globulin related to a compound called porphyrin.
- 3- (this porphyrin contain the Heme molecule)
- 4- the Heme reacts with one oxygen molecule, this results in the hemoglobin which has and gives the red color to the blood.



#### Etiology

Basically, only three causes of anemia exist: blood loss, increased destruction of RBCs (hemolysis), and decreased production of RBCs. Each of these causes includes a number of disorders that require specific and appropriate therapy. Genetic etiologies include the following:

- Hemoglobinopathies
- Thalassemias
- Enzyme abnormalities of the glycolytic pathways
- Defects of the RBC cytoskeleton Congenital dyserythropoietic anemia
- Rh null disease
- Hereditary xerocytosis
- Abetalipoproteinemia
- Fanconi anemia

Nutritional etiologies include the following:

- Iron deficiency

- Vitamin B12 deficiency
- Folate deficiency
- Starvation and generalized malnutrition

Physical etiologies include the following:

- Trauma
- Burns
- Frostbite
- Prosthetic valves and surfaces

Chronic disease and malignant etiologies include the following:

- Kidney disease
- Liver disease
- Chronic infections
- Neoplasia
- Collagen vascular diseases

Infectious etiologies include the following:

- Viral - Hepatitis, infectious mononucleosis, cytomegalovirus
- Bacterial - Clostridia, gram-negative sepsis
- Protozoal - Malaria, leishmaniasis, toxoplasmosis

Drugs or chemicals commonly cause the aplastic and hypoplastic group of disorders.

Idiosyncratic reactions involve certain genetic polymorphisms involving cellular detoxifying enzymes. As a result, exogenous toxins that would normally be converted to nontoxic compounds are instead metabolized into reactive compounds that modify cellular proteins, which can be recognized by the immune system and trigger autoimmunity.

### 1- Hemolytic anemia:

In this type of anemia, the red blood cells are destroyed before they complete their normal age (120 days), this destruction is called hemolysis.

As we explain, the function of the red blood cells is to carry the oxygen from the lungs to all body organs and at the same time carry CO<sub>2</sub> from the cells inversely to the lungs to go out with exhalation (as an output process).

In hemolytic people, they have a lower number of RBCs than normal people; then the blood cannot carry a sufficient amount of O<sub>2</sub> to the body organs that affect body activities and may affect the myocardium.

#### causes of hemolytic anemia:

-inherited hemolytic anemia:

Occurs when the genetic parents are abnormal, having sickle cell anemia or thalassemia, and pass the genes to their children.

Sickle cell anemia: In this case, the stem cells producing abnormal hemoglobin have a sickle shape. These RBCs cannot stay alive more than 20 days, and the bone marrow cannot sickle reproduce new RBCs in this time, so patients often need blood transfusion.

Patients who are homozygous (Hgb SS) have the worst prognosis, because they tend to have more frequent crises. Patients who are heterozygous (Hgb AS) have sickle cell traits, and they have crises only under extreme conditions.

sickle cell red blood cells:



-acquired hemolytic anemia

This may occur by viral, bacterial infection.

- autoimmune disorder
- hypersplenism (spleen over activity)
- blood cancers

## **2- aplastic anemia:**

stem cells in the bone marrow produce all blood cells ( red white and platelets) , in aplastic anemia stem cells are damaged and not able to produce the blood cells normally ,as a result the bone marrow become empty (aplastic).

causes of a plastic anemia:

the common reason is the immune system attacking of the stem cells inside the bone marrow.

radiation and chemical treatments may result in aplastic anemia.

exposure to toxic chemicals have been linked to aplastic anemia.

## **3- thalassemia**

thalassemia is inherited blood disorder that make your body producing lower RBCs than normal.

symptoms of thalassemia:

low blood count results(anemia).

continuous fatigue

treatment:

the mild cases may not have to treat, but the sever cases may need to regular blood transfusion.

## **4- folate- deficiency anemia**

folate is a type of vitamin B necessary to building the healthy red blood cells when folate decrease folate anemia appear in folate -deficiency anemia the red blood cells are abnormally large , called macrocytic or megaloblastic anemia

### **causes of folate anemia**

- hemolytic anemia
- poor folate diet
- pregnancy

treatment

by eating liver, fresh fruits and vegetables.

taking folic acid tablets

## **5- the iron deficiency anemia:**

This is the most common type of anemia resulting from the lack of iron in the body.

when the iron is not enough, your body cannot produce enough hemoglobin and as a result the amounts of oxygen carried to the body tissues are not sufficient.

iron important

iron present in the body in ferrous ions  $Fe^{+2}$  and ferric  $Fe^{+3}$  . intracellular homeostasis shows by the balance between iron absorption, export utilization and storage.

iron has vital cell functions such as, hemoglobine synthesis, oxygen transport, ATP production and enzymatic reactions.

symptoms of iron deficiency anemia:

- weakness and fatigue
- chest pain
- shortness of breath
- poor appetite
- brittle nails

### **causes of iron deficiency anemia blood loss**

blood loss mean lost of red blood cells with their hemoglobin which lead to anemia such as women with heavy period persons who suffer from slow chronic blood loss as a peptic ulcer, and colorectal cancer. gastrointestinal bleeding may result from using more pain relives

### **lack of iron**

when the person consumes little iron in his food, his body cannot produce enough hemoglobin.

#### **inability to absorb iron**

there are some bodies cannot absorb the iron completely due to some diseases such as celiac diseases that reduce the intestines ability to absorb nutrients from the digested food.

#### **pregnancy:**

the pregnant woman need more iron supplements as her blood volume become more and her fetus need iron to get normal growth.

#### **the most categories susceptible to iron deficiency anemia**

1-infants and children: some newborns which have low weight or were born prematurely, or they can't have enough iron from breast milk may face iron deficiency anemia.

2-women: women are at great risk of anemia due to menstruation, where they lose a lot of blood monthly .

3-vegetarians: people who don't eat animal proteins, or iron rich food are at risk of anemia.

4-frequent blood donors: people who regularly donate blood may have anemia as the blood donating deplete the iron stores and decrease the hemoglobin levels in blood.

#### **symptoms of anemia**

- in mild cases of anemia symptoms not appear, but it will appear by increasing anemia severity to include
- feeling weak and tired
- loss of appetite
- pale or yellow skin
- headache
- brittle nails
- sore tongue and mouth ulcers
- tingling of hands or feets
- diagnosis of anemia:
- when your doctor notice some of the above symptoms with you, he must examine you to make an accurate diagnosis in many steps

#### **blood tests:**

1-complete blood count test CBC

2-peripheral blood smear

- the blood tests are the most important tests in anemia diagnosis that show:
- RBCs color and size in case of anemia RBCs have pale color and small size.
- hematocrit :the percentage of your blood volume made by red blood cells.
- hemoglobin : the low level of hemoglobin indicate anemia.
- The normal range in men is from 13.2 to 16.6 gm\dl
- The normal range in women is 11.6 to 15 gm\dl.
- ferritin: the low level of ferritin indicate low stored iron and low hemoglobin

3-colonoscopy This procedure is to examine the colon and rectum to make sure there is no internal bleeding that may be a cause of anemia, doctor insert a thin flexible tube with a camera through the patient rectum passing to the colon for accurate examination.

4- upper endoscopy this procedure to check for bleeding from the stomach or the ulcer, doctor insert a thin tube down your throat to the esophagus and stomach looking for a bleeding source to treat it.

5- genetic tests The doctor describes some specific genetic tests to diagnose some inherited types of anemia.

#### **treatment of the iron deficiency anemia**

if the cause of anemia is lack of iron only, the doctor will prescribe iron supplements in appropriate dose for each patient according to the age, and the health condition.

take iron supplements with vitamin c to improve its absorption.

- don't take iron with antacids, as it may interfere with the iron absorption, and may relieve heartburn symptoms

if the anemia is due to blood loss it will not improve by iron supplements doctor may give

- medication as contraceptive to treat the heavy menstrual flow

- antibiotics to treat the peptic ulcer

- others: vitamins , electrolyte , glucocorticoids , vasopressors

- surgery to remove the bleeding polyp, tumor if detected.

**treatment in general**

anemia treatment begins with the proper diagnosis of the type of anemia, its origin and clarification of causes, each type has a different therapeutic plan to get the best result

name of anemia	sickle cell anemia	aplastic anemia	thalassemia	folate anemia	iron deficiency anemia
Origin	Inherited	inherited	inherited	inherited/acquired	acquired
Treatment	1-blood transfusion 2-folic acid 3-hydroxyurea	1-blood transfusion 2-bone marrow transplants 3-strengths of immune system medically	blood transfusion	folic acid tablets 2-vitamin B12 supplements 3- well balanced diet	1-iron tablets 2-intravenously iron in severe cases 3-well balanced diet

**society awareness against anemia**

governments and health institutions must educate individuals about anemia and how serious it is , and what are the symptoms that require medical intervention and examination for the person whether a child or an adult.

Poverty and conditions that lead to anemia must also be combated.

The initiative includes measuring the weight, height, and hemoglobin level of students and then providing the necessary free treatment to those affected to maintain the health of young people.

**CONCLUSION**

anemia defined as presence of insufficient hemoglobin in the red blood cells or presence of subnormal count of RBCs where body cannot have the enough oxygen to do its biological functions. anemia classified according to the red blood cells size into 3 major categories:

1- normocytic anemia

2-macrocytic anemia.

3- microcytic anemia

anemia classified according to its origin into 2 types

1-inherited anemia ( when you born with it)

2- acquired anemia (when you affected due to some disease, some medication, and no balanced diet). all types of anemia have similar symptoms such as, short breath,weak appetite,headache,pale skin, and low hemoglobin level.

To diagnose anemia accurately patient must subject to blood tests to determine the hematocrit level, hemoglobin level, and to examine the RBCs morphology . also physical examination to exclude the bleeding reasons. the

treatment of anemia including the iron supplements or blood transfusion in case of the severe inherited anemia or in case of bone marrow failing to produce the blood component.

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