

Disorders of blood cells

Blood disorders can affect any of the three main components of blood:

- Red blood cells, which carry oxygen to the body's tissues
- White blood cells, which fight infections
- Platelets, which help blood to clot

**Anemia**

**Anemia** is a condition in which you don't have enough healthy red blood cells to carry adequate oxygen to your tissues. This can happen if:

- Your body doesn't make enough red blood cells
- Bleeding causes you to lose red blood cells more quickly than they can be replaced
- Your body destroys red blood cells

There are many forms of anemia, each with its own cause. Loss of blood is the most common cause of anemia. Anemia can be temporary or long term, and it can range from mild to severe.

**Causes of common types of anemia**

Common types of anemia and their causes include:

- **Iron deficiency anemia.** Iron deficiency anemia is the most common cause of anemia and caused by a shortage of the element iron in your body. Your bone marrow needs iron to make hemoglobin. Without adequate iron, your body can't produce enough hemoglobin for red blood cells.

**This type of anemia** is often caused by blood loss, such as from heavy menstrual bleeding, an ulcer, cancer, a polyp somewhere in your digestive system,

and prolonged use of aspirin or drugs known as nonsteroidal anti-inflammatory drugs (NSAIDs).

- **Vitamin deficiency anemias.** In addition to iron, your body needs folate and vitamin B-12 to produce sufficient numbers of healthy red blood cells. A diet lacking in these and other key nutrients can cause decreased red blood cell production.

Additionally, some people may eat enough B-12, but their bodies aren't able to process the vitamin. This can lead to vitamin deficiency anemia, also known as pernicious anemia.

- **Anemia of chronic disease.** Certain chronic diseases — such as cancer, HIV/AIDS, rheumatoid arthritis, Crohn's disease and other chronic inflammatory diseases — can interfere with the production of red blood cells, resulting in chronic anemia. Kidney failure also can cause anemia.
- **Aplastic anemia.** This very rare life-threatening anemia is caused by a decrease in the bone marrow's ability to produce red blood cells. **Causes of aplastic anemia** include infections, drugs and autoimmune diseases.
- **Anemias associated with bone marrow disease.** A **variety of diseases**, such as leukemia, myelodysplasia or myelofibrosis, can cause anemia by affecting blood production in your bone marrow.

**Other cancers** of the blood or bone marrow — such as multiple myeloma, myeloproliferative disorders and lymphoma — also can cause anemia.

- **Hemolytic anemias.** This group of anemias develops when red blood cells are destroyed faster than bone marrow can replace them.
- **Sickle cell anemia.** This inherited and sometimes serious anemia is caused by a defective form of **hemoglobin(S)** that forces red blood cells to assume an abnormal crescent (sickle) shape. These irregular-shaped red blood cells die prematurely, resulting in a chronic shortage of red blood cells.
- **Other anemias.** There are several other rarer forms of anemia, such as thalassemia and anemias caused by defective hemoglobin

Signs and symptoms of anemia may include:

- Lightheadedness
- Abnormal heart sounds ( heart murmur)
- Extreme fatigue
- Weakness
- Pale skin
- Tachycardia
- irregular heartbeat
- Shortness of breath
- Chest pain
- Dizziness
- Cold hands and feet
- Headache

#### **Tests and diagnosis:**

Diagnose of anemia depends on:

- **Physical exam. .**
- **Complete blood count (CBC). .**
- **Bone marrow biopsy:**

- **Other factors.** A history of certain infections, blood diseases and autoimmune disorders, alcoholism, exposure to toxic chemicals, and the use of some medications can affect red blood cell production and lead to anemia.

### **Complications:**

Left untreated, anemia can cause numerous complications, such as:

- **Severe fatigue.**
- **Heart problems.** Anemia can lead to a **rapid** or **irregular heartbeat** — an **arrhythmia**. Your heart must pump more blood to compensate for the lack of oxygen in the blood when you're anemic. This can even lead to **congestive heart failure**.
- **Death.** severe anemia can be fatal.
- **Heart murmur**

### **Treatment of anemia:**

Anemia treatment depends on the cause.

- **Iron deficiency anemia.** This form of anemia is treated with changes in your diet and iron supplements.

If the underlying cause of iron deficiency is loss of blood — other than from menstruation — the source of the bleeding must be located and stopped.

- **Vitamin deficiency anemias.** Folic acid and vitamin C deficiency anemias are treated with dietary supplements and increasing these nutrients in your diet. If your digestive system has trouble absorbing vitamin B-12 from the food you eat, you may receive vitamin B-12 injections.

- **Anemia of chronic disease.** There's no specific treatment for this type of anemia. Doctors focus on treating the underlying disease. If symptoms become severe, a blood transfusion or injections of synthetic erythropoietin.
- **Aplastic anemia.** Treatment for this anemia may include blood transfusions to boost levels of red blood cells. You may need a bone marrow transplant if your bone marrow is diseased and can't make healthy blood cells.
- **Anemias associated with bone marrow disease.** Treatment of these various diseases can include simple medication, chemotherapy or bone marrow transplantation.
- **Hemolytic anemias.** Managing hemolytic anemias includes avoiding suspect medications, treating related infections and taking drugs that suppress your immune system, which may be attacking your red blood cells.
- **Sickle cell anemia.** Treatment for this anemia may include the administration of oxygen, pain-relieving drugs, and intravenous fluids to reduce pain and prevent complications.
- **Thalassemia.** This anemia may be treated with blood transfusions, folic acid supplements, removal of the spleen (splenectomy).

## Polycythemia

### What is polycythemia?

Polycythemia is a condition that results in an increased level of circulating red blood cells in the bloodstream. People with polycythemia have an increase in

hematocrit, hemoglobin, or red blood cell count above the normal limits.

- **Hematocrit (HCT):** Polycythemia is considered when the hematocrit is greater than 48% in women and 52% in men.
- **Hemoglobin (HGB):** Polycythemia is considered when a hemoglobin level of greater than 16g/dL in women or hemoglobin level greater than 18 g/dL in men.

Polycythemia can be divided into two categories; primary and secondary.

- **Primary polycythemia:** In primary polycythemia the increase in red blood cells is due to inherent problems in the process of red blood cell production.
- **Secondary polycythemia:** Secondary polycythemia generally occurs as a response to other factors or underlying conditions that promote red blood cell production.
- **relative polycythemia:** This type can be happened as a result of plasma volume loss from **dehydration, severe vomiting or diarrhea, or excessive sweating.**

#### **Signs and symptoms:**

- easy bruising;
- tingling in the hands and feet
- deep vein thrombosis (DVT)
- easy bleeding;
- blood clot formation (potentially leading to heart attacks, strokes, blood clots in the lungs [pulmonary embolism]);
- bone and joint pain (hip pain or rib pain);

- headache;
- itching;
- itching after taking a shower or bath (post-bath pruritus);
- fatigue;
- difficulty breathing
- ischemic stroke—a stroke caused by loss of blood supply to the brain

### **diagnosis of polycythemia:**

- 1- blood test: complete blood count (CBC)
- 2- medical history and physical examination.
- 3- chest X-ray, electrocardiogram (EKG), and echocardiogram
- 4- erythropoietin (EPO) blood levels

### **What are the complications of polycythemia?**

- 1- increased viscosity of the blood. This can be associated with higher risk of thrombus or clot formation leading to strokes, heart attacks, pulmonary embolism, and possibly death.
- 2- transformation into a blood cancer (leukemia), excessive bleeding (hemorrhage), or clotting problems.
- 3- kidney stones

4- right sided heart failure and pulmonary hypertension. Chronic heart failure can lead to generalized swelling oredema, low blood pressure, kidney dysfunction.

### **Treatment of polycythemia**

The treatment for polycythemia is generally dependent on the cause.

- 1- Phlebotomy (drawing blood ) is the most essential part of the treatment. The recommended hematocrit of less than 45 in men and less than 42 in women is the goal of phlebotomy.
- 2- chemotherapeutic drugs (hydroxyurea)
- 3- Aspirin to reduce clotting complications.
- 4- In secondary polycythemia, the goal is to treat the underlying cause.