

Anaemias

In anaemia there is not enough haemoglobin available to carry sufficient oxygen from the lungs to supply the needs of the tissues. It occurs when the rate of production of mature cells entering the blood from the red bone marrow does not keep pace with the rate of haemolysis. The classification of anaemia is based on the cause:

impaired erythrocyte production

- iron deficiency
 - megaloblastic anaemias
 - hypoplastic anaemia
- increased erythrocyte loss
- haemolytic anaemias
 - normocytic anaemia.

Anaemia can cause abnormal changes in red cell size or colour, detectable microscopically.

Signs and symptoms of anaemia relate to the inability of the blood to supply body cells with enough oxygen, tachycardia; the heart rate increases to improve blood supply and speed up circulation palpitations (an awareness of the heartbeat), or angina pectoris.

These are caused by the increased effort of the overworked heart muscle breathlessness on exertion; when oxygen requirements increase, respiratory rate and effort rise in an effort to meet the greater demand.

Types of Anaemia

Iron deficiency anaemia

This is the most common form of anaemia in many parts of the world. The normal daily requirement of iron intake in men is about 1 to 2 mg, mainly from eating meat and highly coloured vegetables. The normal daily requirement in women is 3 mg because of blood loss during menstruation and to meet the needs of the growing fetus during pregnancy. Children, during their period of rapid growth, require more than adults.

Deficient intake

Because of the relative inefficiency of iron absorption, deficiency occurs frequently, even in individuals whose requirements are normal. The risk of deficiency increases if the daily diet is restricted in some way, as in poorly planned vegetarian diets, or in weight-reducing diets where the range of foods eaten is small. Babies dependent on milk may also suffer mild iron deficiency anaemia if weaning on to a mixed diet is delayed much past the first year, since the liver carries only a few months' store and milk is a poor source of iron.

High requirements

In pregnancy iron requirements are increased both for fetal growth and to support the additional load on the mother's cardiovascular system. Iron requirements also rise when there is chronic blood loss, the causes of which include peptic ulcers heavy menstrual bleeding (menorrhagia), haemorrhoids or carcinoma of the GI tract.

Malabsorption

Iron absorption is usually increased following haemorrhage, but may be reduced in abnormalities of the stomach, duodenum or jejunum.

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Megaloblastic anaemias

Deficiency of vitamin B12 and/or folic acid impairs erythrocyte maturation

and abnormally large erythrocytes (*megaloblasts*) are found in the blood. During normal erythropoiesis several cell divisions occur and the daughter cells at each stage are smaller than the parent cell because there is not much time for cell enlargement between divisions. When deficiency of vitamin B12 and/or folic acid occurs, the rate of DNA and RNA synthesis is reduced, delaying cell division. The cells can therefore grow larger than normal between divisions. Circulating cells are immature, larger. The cells are fragile and their life span is reduced to between 40 and 50 days. Depressed production and early lysis cause anaemia.

Vitamin B12 deficiency anaemia

Pernicious anaemia

This is the most common form of vitamin B12 deficiency anaemia. It is commonest in females usually between 45 and 65 years of age. It is an autoimmune disease in which autoantibodies destroy intrinsic factor (IF) and parietal cells in the stomach

Dietary deficiency of vitamin B12

This is rare, except in true vegans, i.e. when no animal products are included in the diet. The store of vitamin B12 is such that deficiency takes several years to appear.

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Folic acid deficiency anaemia

Deficiency of folic acid causes a form of megaloblastic anaemia identical to that seen in vitamin B12 deficiency, but not associated with neurological damage. It may be due to:

dietary deficiency, e.g. in infants if there is delay in establishing a mixed diet, in alcoholism, in anorexia and in pregnancy, malabsorption from the jejunum caused by, e.g., coeliac disease, or anticonvulsant drugs interference with folate metabolism by, e.g., cytotoxic and anticonvulsant drugs.

Aplastic anaemia

by Aplastic (hypoplastic) anaemia results from bone marrow failure. Erythrocyte numbers are reduced. Since the bone marrow also produces leukocytes and platelets, *leukopenia* (low white cell count) and *thrombocytopenia* (low platelet count) are likely to accompany diminished red cell numbers. When all three cell types are low, the condition is called *pancytopenia*.

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Haemolytic anaemias

These occur when circulating red cells are destroyed or are removed prematurely from the blood because the cells are abnormal or the spleen is overactive.

Congenital haemolytic anaemias

In these diseases, genetic abnormality leads to the synthesis of abnormal haemoglobin and increased red cell membrane fragility, reducing their oxygen-carrying capacity and life span. The most common forms are sickle cell anaemia and thalassaemia.

Sickle cell anaemia

The abnormal haemoglobin molecules become misshapen when deoxygenated, making the erythrocytes sickle shaped. If the cells contain a high proportion of abnormal Hb, sickling is permanent. The life span of cells is reduced by early haemolysis, which causes anaemia. Sickle cells do not move smoothly through the small blood vessels. This tends to increase the viscosity of the blood, reducing the rate of blood flow and leading to intravascular clotting, ischaemia and infarction.