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E-BOOK

Everyday Life

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Summary

Iron deficiency anaemia: symptoms. How do you recognise them?

Sideropenic anaemia or **iron deficiency anaemia** is a disease characterised by a reduced amount of iron in the body. In this article, we will explore the **symptoms of iron deficiency anaemia** and learn how to recognise them.

Iron deficiency anaemia: what is it?

Iron is an essential mineral for our body because it plays a role in numerous physiological processes. One of the fundamental roles of iron is related to the production of haemoglobin. Haemoglobin is a protein present in red blood cells that contains an iron ion (Fe^{2+}). **Haemoglobin enables red blood cells to transport oxygen** (O_2) from the lungs to the tissues **and carbon dioxide** (CO_2) from the body's tissues to the lungs.

According to the World Health Organization (WHO), anaemia is considered diagnosed when **haemoglobin** values in **the blood** are less than 12 g/dL (grams per decilitre) in **women** and 13.4 g/dL in **men**.

Low haemoglobin values may be related to an **iron deficiency**. In these cases, the doctor will also check the values of the iron circulating in the blood (**serum iron**), **transferrin** and **ferritin levels** in order to have a complete picture of the blood iron levels, i.e., the balance and metabolism of iron in the body.

When there is an **iron deficiency**, there may be **sideropenic anaemia**. There are some typical symptoms that may vary in intensity depending on the severity of the iron deficiency.

What are the symptoms of iron deficiency anaemia?

The **causes of iron deficiency anaemia** may differ and the doctor will investigate each case with diagnostic tests and an in-depth medical history. As regards the **symptoms, sideropenic anaemia** is usually characterised by:

- Feeling of fatigue and general tiredness (asthenia);
- Pale skin and mucous membranes;
- Headaches and migraine;
- Shortness of breath and difficulty breathing, even at rest;
- Irritability;
- Increased fragility of skin, nails and hair;
- Difficulty resting;
- Tachycardia;
- Difficulty concentrating;
- Dizziness and vertigo.

Many of the **symptoms of iron deficiency anaemia** listed above are related to a **general reduction in energy metabolism**. This is because iron is an essential component, not only of **haemoglobin** and **myoglobin**, but also of **cytochromes**: enzymes that are involved in numerous metabolic processes. In cases of anaemia, the doctor will make the diagnosis by taking an accurate history of the patient.

On what does the severity of the symptoms of iron deficiency anaemia depend?

The severity of **symptoms related to iron deficiency anaemia** depends on many factors. The most important are the following:

- Levels of iron circulating in the blood (serum iron);
- Amount of iron present in the body's deposits (part of the iron

consumed through diet is stored in the liver, spleen and bone marrow);
- The age of the person (in general, **children and adolescents** require more iron than adults);
- Presence of other diseases that can aggravate the symptoms of iron deficiency anaemia.
- How quickly anaemia develops or whether it is a chronic condition.

On this last point, it should be pointed out that an **iron deficiency anaemia** that develops slowly over time can be difficult to diagnose because our body puts in place some compensation mechanisms, delaying the onset of symptoms. For this reason, it is not uncommon to discover **sideropenic anaemia (of a moderate extent) that does not show symptoms**. **Asymptomatic iron deficiency anaemia** is usually diagnosed during blood tests that have not necessarily been performed to detect anaemia.

How do you overcome the symptoms of iron deficiency anaemia?

A varied and balanced **diet** is usually sufficient to maintain normal iron values in the body. However, certain physiological conditions (menstrual cycle, pregnancy, breastfeeding) or pathological conditions (diseases affecting **iron absorption** in the intestine) may lead to **iron deficiency** or **an increased body requirement for this nutrient**.

If you have any doubts and wish to obtain a targeted diagnosis to assess a possible **iron deficiency anaemia**, you should seek your our doctor's advice, who may request some blood test. Based on the outcome, the doctor will assess the most suitable approach to bring the iron values in the body back to normal.

What are the symptoms of iron deficiency? What happens when iron level is very low?

According to the World Health Organization (WHO), approximately 600-700 million people worldwide are subject to **iron deficiency**. In Italy, approximately 7.1% of women and 2.8% of men suffer from iron deficiency for diet-related reasons. Given the importance of iron for the proper activity of many physiological functions, it is important to keep the values of this nutrient under control. When the values are lower than physiological ones, typical symptoms of **iron deficiency** may occur.

Iron deficiency symptoms: let's learn how to recognise them

Iron is an essential nutrient for the normal course of many metabolic processes. For example, it plays a role **in the formation of haemoglobin, myoglobin and certain enzymes (cytochromes)**, contributes to **normal cognitive functions** and to **normal function of the immune system**.

The amount of iron in the body is measured through specific diagnostic tests such as **serum iron**, **transferrin** and **ferritin level**. These values contribute, together with other tests that investigate the **total iron binding capacity (TIBC)** and **transferrin saturation**, to define the **blood iron levels,** i.e. to have a picture of the metabolism and balance of iron in the body. Diagnostic tests to assess the **amount of haemoglobin** **in the blood** and **haematocrit** values (test indicating the percentage of blood volume occupied by red blood cells) may also be useful to investigate the severity of a possible **iron deficiency**.

When we are faced with an iron deficiency, some typical symptoms or disorders may occur. **Symptoms of iron deficiency** mayinclude:

- General physical and mental fatigue (asthenia);
- Pale skin and mucous membranes;
- Headaches and migraine;
- Difficulty breathing and shortness of breath, even at rest;
- Irritability;
- Insomnia and difficulty in resting normally;
- Tachycardia;
- Difficulty concentrating;
- Dizziness;
- Greater fragility of skin, nails and hair.

The more significant the deficiency, the more the **symptoms of iron deficiency** intensify. In the extreme case in which **iron** values **are very low**, extreme thirst, a state of confusion and fainting can also occur.

In general, the **severity of symptoms** depends on the rate at which **iron deficiency** sets in. An **iron deficiency** caused by an insufficient intake of this nutrient through **food** related to **absorption** disorders or related to **physiological factors** (pregnancy, breastfeeding, menstrual cycle, growth during childhood and adolescence) sets in over a long time and therefore the symptoms are less evident than an iron deficiency caused by a significant loss of blood resulting from trauma, surgery or intestinal bleeding.

Iron deficiency without symptoms

Iron deficiency that sets in slowly over time is sometimes difficult to identify. Especially **when it is moderate**, the symptoms of iron deficiency can be very mild and not lead to obvious disorders. It is therefore not uncommon to discover an **iron deficiency in asymptomatic people**. In these cases, the deficiency is identified by routine blood tests or performed to investigate

problems that have nothing to do with **sideropenic anaemia**.

What you should do when iron deficiency symptoms occur

If you are subject to iron deficiency, or if you experience any of the symptoms described above, you should talk to a doctor. The doctor, through blood tests, will identify a possible iron deficiency. Depending on the outcome, the doctor will propose the most suitable approach to restore iron values in the body to **normal** levels**.** In general, the doctor will recommend a **diet with iron-rich foods** and a possible iron-based nutritional supplement. Depending on whether you are an **adult** or a **child**, your doctor or paediatrician will assess the most appropriate remedies and **dietary supplements** to overcome **deficiencies or increased body requirements for this essential nutrient.**

High blood iron: when should you worry?

High blood iron: when should you worry? We often talk about problems related to low iron values, but even **high blood iron** can cause some disorders. Let's find out the **causes and symptoms of high iron** and what to do in cases of **iron overload**.

What are the causes of high iron and the mechanisms leading to iron overload?

High iron or **iron overload** occurs when **iron values are higher than normal.** Iron overload is usually a condition that occurs when the mechanisms for regulating the metabolism of this essential mineral do not work well. In such cases, there is a **surplus of iron in the body** that causes damage to cells of different severity, depending on the amount of excess iron.

In normal health conditions, iron circulates throughout the body bound to a protein: **transferrin**. In conditions of overload, however, transferrin can no longer bind all the iron circulating in the body. Consequently, "free" or "unbound" iron **(NTBI : Non-Transferrin Bound Iron**) begins to circulate in the body which can promote oxidative stress on cells and thus also damage tissues.

High iron in the blood may be due to:

A) Hereditary hemochromatosis or primitive overload.

This is a metabolic disease with a genetic basis that can generate an excessive accumulation of iron caused by **increased iron absorption in the intestine.** The **symptoms of high blood iron** are apathy, asthenia,

abdominal pain, hepatomegaly (increased liver volume) and abnormal liver enzymes. In the more advanced stages, when the overload is more severe, cirrhosis of the liver, diabetes mellitus (the hemochromatosis is also known as bronzed diabetes due to the bronze colour of the urine and skin), loss of libido and, in women, amenorrhoea (absence of menstrual cycle) can occur. Hereditary hemochromatosis is a rare genetic disease that especially affects, with obvious clinical symptoms, males aged between 40 and 60 years.

B) Secondary iron overload

Hemosiderosis (also known as secondary haemochromatosis or secondary overload) can be caused by repeated blood transfusions. **Blood transfusions** also contain iron, an element used by the body to produce the haemoglobin present in red blood cells. Some types of hereditary anaemia, which have severe haemoglobin deficiencies (e.g., homozygous beta-thalassemia) require continuous blood transfusions that can lead to secondary iron overload.

Secondary iron overload can also develop independently of blood transfusions. This is the case of anaemias with **reduced red blood cell production.** In these case, the symptoms are similar to those of hereditary haemochromatosis and may be aggravated by the damage caused by the anaemias.

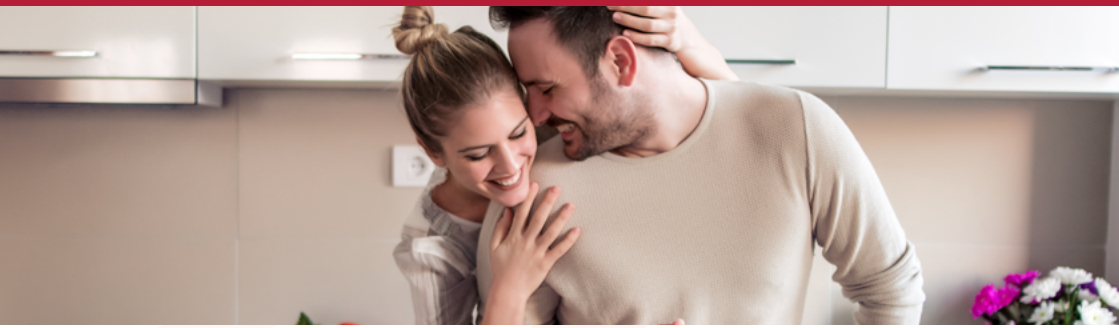
The clinical picture related to an **iron overload** is more or less serious depending on the amount of free iron in the body and the duration of the overload. The organs most affected in cases of serious and prolonged **high blood iron** conditions are: the liver, heart and pancreas. In cases of **high iron**, the doctor will make the diagnosis by carrying out an accurate medical history of the patient.

Can high blood iron be caused by excessive dietary intake?

If you are following an **iron-rich** diet or taking iron-rich dietary supplements, **it is unlikely that there will be a surplus of this nutrient**. Our body, in normal health conditions, **is able to regulate the intestinal absorption of iron** in order to prevent overloading. If blood tests show **high iron values**, the doctor will investigate the causes and assess the most suitable approach to bring the iron values back to normal.

What are the remedies for high blood iron?

If laboratory tests indicate **high blood iron values,** the doctor will proceed with identifying the cause of the iron overload. **High iron in the body** is often related to hereditary haemochromatosis or secondary overload following blood transfusions. In these cases, the doctor will assess the severity of the overload and proceed with prescribing chelation therapy to reduce the amount of free iron.



What are the normal iron values in blood tests?

Keeping **blood iron values** under control is also important for those who do not suffer from anaemia or iron deficiency. In this in-depth article, we will find out what the normal values of iron in blood tests are and which tests are useful for keeping **blood iron levels**, i.e., the balance and metabolism of iron in our body, under control.

What are the normal values of iron in the blood?

Iron is an essential nutrient for the body and plays an important role in the formation of haemoglobin, myoglobin and various biochemical and metabolic processes in the body. Both a **deficiency** and an **excess of iron** can lead to imbalances, therefore, it is important to keep the amount of iron in the body under control.

Iron always circulates in the blood bound to proteins that prevent it from binding with other molecules. Free iron in the blood could react with other substances and cause damage to the body. Therefore, when measuring iron values in the body, free iron is not measured in the form of atoms or, to be more precise, ions, but rather iron bound to the specific proteins that regulate its transport and storage.

Iron in the blood is measured by three values:

- **Serum iron**, which measures the amount of circulating iron bound to transferrin;
- **transferrin level**, which measures the amount of this, the protein that transports iron to the organs and tissues where erythropoiesis

occurs, i.e., the synthesis of red blood cells;
- **ferritin level**, which measures the amount of this protein that regulates the deposit and storage of iron in the liver, muscles and bone marrow.

These laboratory tests are usually performed when **iron deficiency anaemia** (sideropenic anaemia) is suspected or when there is a condition of asthenia and general malaise characterised by the typical symptoms of iron deficiency, such as paleness of the skin and mucous membranes, headache, increased irritability, breathing and sleep disturbances. The measurement of **serum iron**, **transferrin** and **ferritin level** also serves to monitor the development of certain blood disorders.

Iron blood analysis: the values

The reference values given below may vary slightly from one laboratory to another, depending on the reference population or method of analysis used. For the reference intervals, it is recommended to consider those specified in the report. Consult your doctor for the correct interpretation of the test results.

ANALYSIS	VALUES (REFERENCE RANGE)
SERUM IRON	Men: 65 - 170 mcg/dL Women: 50 - 160 mcg/dL Children: 50 - 120 mcg/dL Babies: 100 - 250 mcg/dL
TRANSFERRIN	Men: 215 - 366 mg/dL Women: 250 - 380 mg/dL
FERRITIN (IRON)	Men: 24 - 330 mcg/L Women: 11 - 300 mcg/L

Other analysis related to blood iron values:

Total iron binding capacity (TIBC)

This value is usually measured together with serum iron and is useful for understanding the maximum potential amount of transferrin to bind iron. When the result is less than or equal to the lower limit of the reference range, it means that the transport capacity of the iron is not optimal. Low TIBC values associated with high amounts of circulating iron mean that the body is no longer able to keep the iron in balance and the circulating ion can become toxic.

The **TIBC values** are: 255-450 µg/dL

Transferrin saturation

This is a value (expressed as a percentage) calculated by dividing the serum iron by the TIBC. In adults, the optimal situation is when transferrin saturation is between 20 and 50%. In children, transferrin saturation must be over 16%.

Transferrin reserve capacity (UIBC)

This value indicates the portion of unsaturated transferrin with iron. The measurement can be carried out by direct examination or the UIBC can be calculated by subtracting the TIBC value from that of serum iron.

UIBC = TIBC - serum iron.

Haemoglobin (Hb) values

Although they do not give a direct indication of the amount of iron in the body, haemoglobin values are usually taken into account, along with serum iron, transferrin and ferritin values, when **iron deficiency anaemia** is suspected.

The **normal values of haemoglobin (Hb)** are:

- **Men:** 13.4 - 17.5 g/dL
- **Women:** 12 - 15.5 g/dL
- **Pregnant women:** 11 - 14 g/dL

The **average haemoglobin values in children and adolescents** are (depending on age and gender):

- **Birth:** average 16.5 g/dL
- **First month:** average 14.0 g/dL
- **2 months:** average 11.5 g/dL
- **3-6 months:** average 11.5 g/dL
- **From 6 months to 2 years:** average 12.0 g/dL
- **2-6 years:** average 12.5 g/dL
- **6-12 years:** average 13.5 g/dL
- **12-18 year old girls:** average 14.0 g/dL
- **12-18 year old boys:** average 14.5 g/dL

Haematocrit

Together with the haemoglobin values, haematocrit, which represents the volume of blood (expressed as a percentage) occupied by red blood cells, is often measured.

Haematocrit values:

Men: 40 - 54 %
Women: 36 - 46 %
Babies: 53 - 69 %

What are the causes of anaemia?

Anaemia is a pathological condition that manifests when **haemoglobin levels in the blood are below normal.** There are many types of anaemia which differ mainly according to their causes. In this article, we will look specifically at the **causes of sideropenic anaemia** or **iron deficiency anaemia**.

Anaemia: causes and disorders

Normal haemoglobin (Hb) values in adults are as follows:

- 13.4 - 17.5 g/dL in men;
- 12 - 15.5 g/dL in women.

When lower values are measured, we're dealing with **low haemoglobin**. Anaemias are diseases characterised by **haemoglobin values below normal**. This results in a reduced ability to transport oxygen from the red blood cells.

Three main types of anaemia can be distinguished according to their causes:

1. **Anaemias caused by blood loss;**
2. **Anaemia with reduced red blood cell production** that may be related to **iron deficiency**, **vitamin B_{12} deficiency** or bone marrow cancer;
3. **Anaemia with increased red blood cell destruction** caused by genetic causes (e.g., **sickle-cell anaemia**), related to **autoimmune diseases**, **infections** or **malaria**.

Anaemia affects around a quarter of the world's population. Some types of anaemia, such as**Mediterranean anaemia**,**sickle-cell anaemia** or**Fanconi anaemia** are **hereditary in origin** and have a lower incidence than**iron deficiency anaemia**, which affects around 700 million people worldwide. **Iron deficiency** anaemia is most commonly found in **women**, **children** and the **elderly**. It is estimated that, in Italy, 7.1% of women and 2.8% of men suffer from iron deficiency due to food-related reasons.

Anaemia-related symptoms may vary depending on the **rate at which anaemia sets in**. Slowly-developing anaemia may be characterised by a feeling of **general tiredness**, **muscle weakness**, **difficulty breathing** (even at rest), **headaches** and **irritability**. When anaemia occurs quickly (e.g., as a result of trauma or significant blood loss) a **feeling of fainting**, **confusion** and **increased thirst** occurs. **Pale skin and mucous membranes** occur especially when haemoglobin values are significantly lower than normal. Depending on the **causes of the anaemia**, there may be some variability in the type and intensity of the disorders.

Iron deficiency anaemia: causes

When there is a **lack of iron in the body** some of the symptoms listed above may occur. In these cases, the doctor will **check blood haemoglobin levels**, circulating iron levels in the blood (**serum iron**), **transferrin** and **ferritin level** by prescribing blood tests. **Haematocrit**, a blood test that indicates (as a percentage) the volume of blood occupied by red blood cells, can also be a useful diagnostic investigation tool. In any case, the doctor will make the diagnosis by taking an accurate history of the patient.

How do you overcome iron deficiency anaemia by acting on the causes?

When **iron deficiency anaemia** is iasgnosed by the doctor, he/she may prescribe:

- a **diet of iron-rich foods;**
- a possible intake of **food supplements** or **medicines containing iron**.

Iron deficiency, may be sometimes also associated with a **deficiency of vitamin B_{12} and folic acid:** in these cases, the doctor will provide a diet rich in foods that also contain vitamin B_{12}, such as meat, eggs, fish, soy and grins and folic acid (green leafy vegetables are particularly rich in this nutrient).

Specific physiological conditions (pregnancy, breastfeeding, menstruation) or pathological conditions (diseases that decrease **iron absorption** in the intestine) can aggravate **a condition** of **iron deficiency already present in the body**. In these cases, the doctor will assess the best diet to balance the iron deficiency and will consider whether to recommend a **dietary supplement** to compensate for the deficiency or increased demand for iron by the body.

How do you absorb the right amount of iron?

Iron is an essential nutrient for the well-being of the body. Absorbing the right daily amount is important for the proper activity of many metabolic functions and to maintain normal levels of haemoglobin in the blood. Let's find out **how to absorb the right amount of iron daily.**

The importance of absorbing the right amount of iron daily

Before talking about **how to absorb the right amount of iron daily**, it is important to analyse the mechanism of iron absorption consumed through **diet** .

The **iron present in food** is absorbed by enterocytes, the cells that make up the epithelium of the intestinal mucosa. From here, **iron is transported to the liver and spleen** for storage or is used immediately for the formation of certain proteins useful for transporting oxygen **(haemoglobin, myoglobin**) and certain enzymes (**cytochromes**).

Not all iron that is consumed through food is absorbed by the body in the same way. There are in fact two types of food iron:

- **Haem iron**, present in animal-based food;
- **Non-haem iron** or **inorganic iron**, present in plant-based food.

Haem iron a derives from haemoglobin and myoglobin present in the animal-based food matrix (meat, liver, spleen, fish) and is more easily absorbed by our body. This is because specific sites are present on the cells for binding haem iron (iron bound to the porphyrins that make up the **haem group of haemoglobin**). Haem iron is also more "protected" by the action

of substances that can inhibit the intestinal absorption of this essential nutrient.

Non-haem iron, on the other hand, does not have specific absorption sites on the surface of intestinal cells. Furthermore, in the basic environment of the intestine, non-haem iron is present in the form of trivalent iron (Fe^{3+}). To be absorbed by cells, trivalent iron must be reduced to bivalent iron (Fe^{2+}). This reduction reaction is operated by an enzyme, **duodenal cytochrome B**. This absorption mechanism is slower than the absorption mechanism of haem iron. In addition, **non-haem iron** is more exposed to possible binding with substances that may decrease its absorption.

Absorbing iron through food: which foods to avoid and which foods to prioritise

The **substances that hinder the absorption of iron** are as follows:

- calcium (present in abundance in milk and dairy products);
- phytates (present in grains);
- oxalates (present in some vegetables, such as spinach);
- tannins (present in coffee, tea, chocolate and wine).

Vitamin C, on the other hand, helps the body to absorb iron in the intestine. **Vitamin C-rich foods** are a valuable support for **diets** dedicated to people with from iron **deficiency**.

What to do you when diet is not enough to absorb the right amount of iron daily?

Under normal health conditions, a healthy and balanced diet is sufficient to ensure the body has the right supply of all nutrients, including iron. In **women**, some specific physiological conditions such as **menstrual cycle**, **pregnancy** or **breastfeeding** can lead to **increased iron consumption by the**

body and consequently an increased need for this nutrient. **Children and adolescents** also have an increased need for iron to **support growth, for normal immune system function and for normal cognitive development**.

In addition, certain conditions in the intestine may decrease the **absorption of iron consumed through diet**.

If diet alone is not sufficient to address the **deficiencies** or **increased bodily iron requirements**, specific dietary **supplements** may be used.

The **Sucrosomial® Iron** contained in the **SiderAL® range** of **food supplements** passes the gastric environment intact and is easily absorbed in the intestine. **Sucrosomial® Technology** reduces the most common **iron-related** side effects, such as heartburn, intestinal irritation, mucous membrane and tooth discolouration. The characteristic taste of iron is also improved, resulting in a pleasant taste and which, therefore, is more easily administered to children.

Supplements are not intended as a substitute for a varied, balanced diet and a healthy lifestyle.

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