**Potassium deficiency**

Certain conditions can cause potassium deficiencies, or hypokalemia. These include:

* kidney disease
* overuse of diuretics
* excessive sweating, diarrhea, and vomiting
* magnesium deficiency
* use of antibiotics, such as carbenicillin and penicillin

The symptoms of hypokalemia are different depending on how severe your deficiency is.

A temporary decrease in potassium may not cause any symptoms. For example, if you sweat a lot from a hard workout, your potassium levels may normalize after eating a meal or drinking electrolytes before any damage is done.

However, severe deficiencies can be life-threatening. Signs of a potassium deficiency include:

* extreme fatigue
* muscle spasms, weakness, or cramping
* irregular heartbeat
* constipation, nausea, or vomiting

Hypokalemia is usually diagnosed with a blood test. Your doctor may also order an electrocardiogram of your heart and an arterial blood gas test to measure pH levels in your body.

**Toxicity value**

According to the Mayo Clinic, a normal range of potassium is between 3.6 and 5.2 millimoles per liter (mmol/L) of blood. A potassium level higher than 5.5 mmol/L is critically high, and a potassium level over 6 mmol/L can be life-threatening.

* >2.5 mol/kg of potassium can theoretically overwhelm the capabilities of the kidneys and cause hyperkalaemia. (Each KCL tablet contains 8 mmol)
* Massive ingestions of >40 x 600 mg tablets prompts early planning for dialysis.
* Small ingestions are usually benign in patients with a normal renal function.
* Patients with renal or cardiac impairment are at increased risk.
* Children: 3 x 600mg tablets could potentially cause severe hyperkalaemia in a 10 kg toddler.
* Clinical features:
* GI symptoms (abdominal pain, nausea and vomiting), ileus and perforation have also occurred.
* Lethargy, weakness, paraesthesia and hyporeflexia
* Paralysis and bradycardia herald cardiac arrest (serum K > 8 mmol/L)

**Calcium deficiency**

The following conditions or lifestyle habits may result in low calcium levels, also known as hypokalemia:

* bulimia, anorexia, and some other eating disorders.
* mercury exposure
* overconsumption of magnesium
* long-term use of laxatives
* prolonged use of some medicines, such as chemotherapy or corticosteroids
* chelation therapy used for metal exposure
* lack of parathyroid hormone
* people who eat a lot of protein or sodium may excrete calcium.
* some cancers
* high consumption of caffeine, soda, or alcohol
* some conditions, such as celiac disease, inflammatory bowel disease, Crohn’s disease, and some other digestive diseases
* some surgical procedures, including removing the stomach
* kidney failure
* pancreatitis
* vitamin D deficiency
* phosphate deficiency

The body eliminates some calcium in sweat, urine, and feces. Foods and activities that encourage these functions may reduce the levels of calcium in the body

**Toxicity value**

The normal range is 2.1–2.6 mmol/L (8.8–10.7 mg/dL, 4.3–5.2 mEq/L), with levels greater than 2.6 mmol/L defined as hypercalcaemia. Moderate hypercalcaemia is a level of 2.88–3.5 mmol/L (11.5–14 mg/dL) while severe hypercalcaemia is > 3.5 mmol/L (>14 mg/dL).

**Magnesium deficiency**

Magnesium deficiency is a condition in which the amount of magnesium in the blood is lower than normal. The medical name of this condition is hypomagnesemia.

Every organ in the body, especially the heart, muscles, and kidneys, needs the mineral magnesium. It also contributes to the makeup of teeth and bones. Magnesium is needed for many functions in the body. This includes the physical and chemical processes in the body that convert or use energy (metabolism).

When the level of magnesium in the body drops below normal, symptoms develop due to low magnesium.

Common causes of low magnesium include:

* Alcohol use
* Burns that affect a large area of the body
* Chronic diarrhea
* Excessive urination (polyuria), such as in uncontrolled diabetes and during recovery from acute kidney failure
* Hyperaldosteronism (disorder in which the adrenal gland releases too much of the hormone aldosterone into the blood)
* Kidney tubule disorders
* Malabsorption syndromes, such as celiac disease and inflammatory bowel disease
* Malnutrition
* Medicines including amphotericin, cisplatin, cyclosporine, diuretics, proton pump inhibitors, and aminoglycoside antibiotics
* Pancreatitis (swelling and inflammation of the pancreas)
* Excessive sweating

**Toxicity value**

Consequences related to serum concentration:

* 4.0 mEq/L decreased reflexes
* >5.0 mEq/L Prolonged atrioventricular conduction
* >10.0 mEq/L Complete heart block
* >13.0 mEq/L cardiac arrest

The therapeutic range for the prevention of the pre-eclampsic uterine contractions is: 4.0-7.0 mEq/L. As per Lu and Nightingale, serum Mg2+ concentrations associated with maternal toxicity are:

* 7.0-10.0 mEq/L - loss of patellar reflex
* 10.0-13.0 mEq/L - respiratory depression
* 15.0-25.0 mEq/L - altered atrioventricular conduction and (further) complete heart block
* >25.0 mEq/L - cardiac arrest

**Chloride deficiency**

Because chloride is an electrolyte, an imbalance can lead to very serious results, especially when coupled with a disease such as cancer. However, it is very rare that our diets lack chloride because chloride is abundant in food. Nevertheless, chloride deficiencies can still occur as the result of other causes such as sweating, chronic diarrhea, and vomiting. Vomiting can cause a loss of hydrochloric acid in the stomach, which can lead to an acid-base imbalance. Diuretics can also cause a low blood chloride level. Illnesses such as kidney and adrenal gland problems can also cause a low blood chloride level. Alkalosis is a life-threatening condition that results from a chloride deficiency. Symptoms of alkalosis include muscle weakness, loss of appetite, irritability, dehydration, and lethargy.

Hypochloremia is an electrolyte imbalance and is indicated by a low level of chloride in the blood. The normal adult value for chloride is 97-107 mEq/L.

Chloride in your blood is an important electrolyte and works to ensure that your body's metabolism is working correctly. Your kidneys control the levels of chloride in your blood. Therefore, when there is a disturbance in your blood chloride levels, it is often related to your kidneys. Chloride helps the acid and base balance in the body.

Causes of Hypochloremia:

* Loss of body fluids from prolonged vomiting, diarrhea, sweating or high fevers.
* Drugs such as: bicarbonate, corticosteroids, diuretics, and laxatives.

Symptoms of Hypochloremia:

Many people do not notice any symptoms, unless they are experiencing very high or very low levels of chloride in their blood.

Dehydration, fluid loss, or high levels of blood sodium may be noted.

You may be experiencing other forms of fluid loss, such as diarrhea, or vomiting.

**Toxicity value**

A metabolic panel measures the levels of several electrolytes in your blood, including:

* carbon dioxide or bicarbonate
* chloride
* potassium
* sodium

Normal levels of chloride for adults are in the 98–107 mEq/L range. If your test shows a chloride level higher than 107 mEq/L, you have hyperchloremia.

**Iron deficiency**

Anemia occurs when you have a decreased level of hemoglobin in your red blood cells (RBCs). Hemoglobin is the protein in your RBCs that is responsible for carrying oxygen to your tissues.

Iron deficiency anemia is the most common type of anemia, and it occurs when your body doesn’t have enough of the mineral iron. Your body needs iron to make hemoglobin. When there isn’t enough iron in your blood stream, the rest of your body can’t get the amount of oxygen it needs.

While the condition may be common, many people don’t know they have iron deficiency anemia. It’s possible to experience the symptoms for years without ever knowing the cause.

In women of childbearing age, the most common cause of iron deficiency anemia is a loss of iron in the blood due to heavy menstruation or pregnancy. A poor diet or certain intestinal diseases that affect how the body absorbs iron can also cause iron deficiency anemia.

Doctors normally treat the condition with iron supplements or changes to diet.

Symptoms of iron deficiency anemia

The symptoms of iron deficiency anemia can be mild at first, and you may not even notice them. According to the American Society of Hematology (ASH), most people don’t realize they have mild anemia until they have a routine blood test.

The symptoms of moderate to severe iron deficiency anemia include:

* general fatigue
* weakness
* pale skin
* shortness of breath
* dizziness
* strange cravings to eat items that aren’t food, such as dirt, ice, or clay
* a tingling or crawling feeling in the legs
* tongue swelling or soreness
* cold hands and feet
* fast or irregular heartbeat
* brittle nails
* headaches

Causes of iron deficiency anemia

According to the ASH, iron deficiency is the most common cause of anemia. There are many reasons why a person might become deficient in iron. These include:

* Inadequate iron intake
* Pregnancy or blood loss due to menstruation
* Internal bleeding
* Inability to absorb iron
* Endometriosis

**Toxicity value**

The amount of iron ingested may give a clue to potential toxicity. The therapeutic dose for iron deficiency anemia is 3–6 mg/kg/day. Toxic effects begin to occur at doses above 10–20 mg/kg of elemental iron. Ingestions of more than 50 mg/kg of elemental iron are associated with severe toxicity.

* A 325-mg tablet of ferrous sulfate heptahydrate has 65 mg (20%) of elemental iron
* A 325-mg tablet of ferrous gluconate has 39 mg (12%) of elemental iron
* A 325-mg tablet of ferrous fumarate has 107.25 mg (33%) of elemental iron
* 200 mg ferrous sulfate, dried, has 65 mg (33%) of elemental iron

In terms of blood values, iron levels above 350–500 μg/dL are considered toxic, and levels over 1000 μg/dL indicate severe iron poisoning.