

Letter to Editor

P. Eswara Rao

Tutor, Department of biochemistry, NRI Institute of Medical Sciences, Sangivalasa Bhimili

Date of submission: 26th Sep 2015; Date of Publication: 31st Oct 2015

HYPOKALEMIA

Definition

Hypokalemia is a lower-than-normal amount of potassium in the blood. It may result from a number of conditions

Causes

Potassium is needed for cells, especially nerve and muscle cells, to function properly. You get potassium through food. The kidneys remove excess potassium in the urine to keep a proper balance of the mineral in the body.

Hypokalemia is a metabolic disorder that occurs when the level of potassium in the blood drops too low.

Possible causes of hypokalemia include:

- Certain antibiotics (carbenicillin, gentamicin, amphotericin B)
- Certain drugs, called diuretics, that can cause excess urination
- Diarrhea (including the use of too many laxatives, which can cause diarrhea)
- Diseases that affect the kidney's ability to retain potassium (for example, Liddle syndrome, Cushing syndrome, hyperaldosteronism, Bartter syndrome, Fanconi syndrome)
- Eating disorders (such as bulimia)
- Eating large amounts of licorice or using products such as herbal teas and chewing tobaccos that contain licorice made with glycyrrhizic acid (this substance is no longer used in licorice made in the United States)
- Excessive sweating
- Excessive vomiting
- Kidney problems
- Lack of enough potassium in diet (rarely)

Symptoms

A small drop in potassium usually doesn't cause symptoms. However, a big drop in the level can be life threatening.

- Abnormal heart rhythms (dysrhythmias), especially in people with heart disease
- Breakdown of muscle fibers (rhabdomyolysis)
- Constipation
- Fatigue
- Muscle weakness or spasms
- Paralysis (which can include the lungs)

In rare cases, habitual consumption of large amounts of black licorice has resulted in hypokalemia. Licorice contains a compound (i.e., glycyrrhizic acid) with similar physiologic effects to those of aldosterone, a hormone that increases urinary excretion of potassium. Low dietary intakes of potassium do not generally result in hypokalemia (5). However, research indicates that insufficient dietary potassium increases the risk of a number of chronic diseases.

Low potassium- Potassium Deficiency – Hypokalemia

It is unlikely to have a dietary deficiency of potassium as it is present in a large number of foods. Deficiency can occur when there are large losses resulting from excessive urination or from prolonged vomiting and diarrhea. Low potassium can occur from the use of certain medicines. A potassium deficiency can also occur in those who adhere to a low potassium diet.

Exams and Tests

Health care provider will take a sample of your blood to check **potassium levels**.

Other tests might include:

- Arterial blood gas
- BUN and creatinine
- Electrocardiogram
- Glucose, magnesium, calcium, phosphorous, thyroxine, or aldosterone

Treatment

Mild hypokalemia can be treated by taking potassium supplements by mouth. Persons with more severe cases may need to get potassium through a vein (intravenously).

One type of hypokalemia that causes paralysis occurs when there is too much thyroid hormone in the blood (**thyrotoxic periodic paralysis**). Treatment lowers the thyroid hormone level, and raises the potassium level in the blood.

Outlook (Prognosis)

Taking potassium supplements can usually correct the problem. Without proper treatment, potassium levels in severe cases can drop low enough to cause death.

Possible Complications

In severe cases, patients can develop paralysis that can be life threatening. Hypokalemia also can lead to dangerous irregular heartbeat. Over time, lack of potassium can lead to kidney damage (hypokalemic nephropathy).

Prevention

Eating a diet rich in potassium can help prevent hypokalemia.

HYPERKALEMIA

Definition: Hyperkalemia is a condition caused by higher than normal levels of potassium in the bloodstream.

Causes, incidence, and risk factors:

Potassium has many functions in the body. It helps to regulate the activity of all muscle tissue -- smooth muscles (such as the muscles in the intestines), the muscles of the heart, and skeletal muscles. Potassium is part of the enzyme reactions in digestion and metabolism. It is also part of homeostasis, the mechanism that maintains a balance between the many electrical and chemical processes of the body.

Almost all (98%) potassium in the body is found inside the cells (intracellular). Only about 2% occurs in the fluids

outside of the cells (extracellular). Potassium can move into and out of cells.

Blood tests reflect only the extracellular potassium levels, and do not indicate the amount of potassium within the cells. Movement of potassium into or out of cells can change the blood potassium level (serum potassium) when there is no change in the total amount of potassium in the body.

Hyperkalemia occurs when the level of potassium in the bloodstream is higher than normal. This may be related to increase in total body potassium or excessive release of potassium from the cells into the bloodstream.

The kidneys normally excrete excess potassium from the body. Therefore, most cases of hyperkalemia are caused by disorders that reduce the kidneys' ability to excrete **potassium**. **Insufficient kidney function may result from disorders including (but not limited to):**

- Acute kidney failure
- Chronic kidney failure
- Lupus nephritis
- Rejection of a kidney transplant
- Obstructive uropathy
- Glomerulonephritis

The hormone aldosterone (see the aldosterone test) regulates kidney excretion of sodium and potassium. Lack of aldosterone can result in hyperkalemia with an increase in total body potassium. Addison's disease is one disorder that causes reduced aldosterone production.

Any time potassium is released from the cells, it may accumulate in the extracellular fluid and the bloodstream. Acidosis (acidic condition of the body) results in movement of potassium from inside the cells to the extracellular fluid.

Tissue trauma causes the cells to release potassium into the extracellular fluid. This includes:

- Traumatic injury
- Surgery
- Gastrointestinal bleeding
- Tumors
- Burns
- Hemolytic conditions (disorders that cause blood cells to burst)
- Rhabdomyolysis from drug ingestion, alcoholism, coma, or certain infections

If kidney function is adequate, and sufficient amounts of aldosterone are present, tissue trauma alone rarely results in hyperkalemia. A normally functioning kidney will excrete the excess potassium that has been released from the cells.

Increased intake of potassium may cause hyperkalemia if kidney function is poor. Salt substitutes often contain potassium, as do many "low-salt" packaged foods. Hyperkalemia may be caused by medications, including medications that affect kidney function (potassium sparing diuretics, such as spironolactone, amiloride, or triamterene) and potassium supplements (especially intravenous potassium).

Hyperkalemia can have serious, potentially life-threatening effects on the body. A gradual increase in potassium, as may occur with chronic renal failure, may be better tolerated than a sudden increase. Slightly higher than normal potassium

levels may be well tolerated by some persons with chronic renal failure.

Symptoms:

Hyperkalemia often has no symptoms. Occasionally, the following signs or symptoms may be seen:

- Nausea
- Irregular heartbeat (this may be an emergency symptom if prolonged or severe)
- Slow, weak, or absent pulse (emergency symptom)
- A deficiency of potassium causes weakness, fatigue, heart rhythm problems, paralysis, and kidney dysfunction.

Hyperkalemia or high blood level of potassium occurs when the level of potassium in the bloodstream is higher than normal. This may be related to increase in total body potassium or excessive release of potassium from the cells into the bloodstream. The kidneys normally excrete excess potassium from the body. Therefore, most cases of hyperkalemia are caused by disorders that reduce the kidneys' ability to excrete potassium. These conditions include acute kidney failure, chronic kidney failure, lupus nephritis, rejection of a kidney transplant, obstructive uropathy, and glomerulonephritis.

Signs and tests:

- The pulse may be slow or irregular.
- Serum potassium is high.
- ECG may show potentially lethal arrhythmias :
 - Bradycardia (slower-than-normal heart beat) that progressively slows.
 - Heart block that may become complete heart block.
 - Ventricular fibrillation.
- ECG may show changes indicative of hyperkalemia

How is hyperkalemia diagnosed?

Blood is withdrawn from a vein (like other blood tests). The potassium concentration of the blood is determined in the laboratory. If hyperkalemia is suspected, an electrocardiogram (ECG) is often performed, since the ECG may show changes typical for hyperkalemia. The ECG will also be able to identify cardiac arrhythmias that result from hyperkalemia.

How is hyperkalemia treated?

Treatment of hyperkalemia must be individualized based upon the underlying cause of the hyperkalemia, the severity of symptoms or appearance of ECG changes, and the overall health status of the patient. Mild hyperkalemia is usually treated without hospitalization especially if the patient is otherwise healthy, the ECG is normal, and there are no other associated conditions such as acidosis and worsening kidney function. Emergency treatment will be necessary if hyperkalemia is severe and has caused changes in the ECG. Severe hyperkalemia is best treated in the hospital, oftentimes in the intensive care unit, under continuous heart rhythm monitoring.

Treatment of hyperkalemia may include any of the following measures, either singly or in combination:

- A diet low in potassium (for mild cases).
- Discontinue medications that increase blood potassium levels.

- Intravenous administration of glucose and insulin, which promotes movement of potassium from the extracellular space back into the cells.
- Intravenous calcium to temporarily protect the heart and muscles from the effects of hyperkalemia.
- Sodium bicarbonate administration to counteract acidosis and to promote movement of potassium from the extracellular space back into the cells.
- Diuretic administration to decrease the total potassium stores through increasing potassium excretion in the urine. Please note that most diuretics increase kidney excretion of potassium. Only potassium sparing diuretics mentioned above decrease kidney excretion of potassium.
- Medications known as cation-exchange resins, which bind potassium and lead to its excretion via the gastrointestinal tract.
- Dialysis, particularly if other measures have failed or if renal failure is present.

Treatment of hyperkalemia naturally also includes treatment of any underlying causes (e.g. kidney disease, adrenal disease, tissue destruction) of hyperkalemia.

REFERENCES

1. Schwartz principles of surgery
2. Rintoul principles of surgery
3. Kratz 2003
4. Harsions Principles & Internal Medicine.
5. Text book of Bio-chemistry 4th edition of Lubert Stryer