CONDITION

Beriberi

Learn how thiamine deficiency causes beriberi, including nerve and heart symptoms, risk factors, diagnosis, treatment, complications, and when to seek urgent care.

WHAT IT IS
Illness caused by severe thiamine deficiency

BODY SYSTEM
Nervous system, heart and circulation

MAIN SYMPTOMS
Tingling or numbness, muscle weakness, swelling, shortness of breath

WHAT CAUSES IT
Severe thiamine deficiency

HOW IT IS DIAGNOSED
Whole-blood thiamine diphosphate or red-blood-cell transketolase testing

MAIN TREATMENT
Thiamine replacement and cause management

CAN IT BE CURED?
Sometimes - prompt treatment can reverse symptoms

IS IT AN EMERGENCY?
Sometimes - severe breathing trouble or collapse

LONG-TERM OUTLOOK
Often improves with treatment, but nerve damage may persist

Overview

Beriberi is an illness caused by severe deficiency of thiamine, also called vitamin B1. Thiamine helps the body turn food into energy. It is especially important for the brain, nerves, muscles, and heart.

The body stores only a small amount of thiamine. A deficiency can therefore develop within weeks when a person receives very little thiamine, cannot absorb it, or has increased needs. Beriberi is uncommon in people who eat a varied diet with fortified foods, but it can occur with severe malnutrition, heavy alcohol use, prolonged vomiting, certain digestive conditions, or surgery that affects nutrient absorption.

Beriberi is often described in two forms. These forms can overlap:

A rapidly developing cardiovascular form is sometimes called Shoshin beriberi . It can cause a dangerous fall in circulation and requires emergency treatment.

Thiamine deficiency can also cause Wernicke encephalopathy, a brain disorder involving confusion, balance problems, and abnormal eye movements. Wernicke encephalopathy is related to severe thiamine deficiency but is not usually classified as a form of beriberi.

Beriberi matters because untreated deficiency can damage nerves and place serious strain on the heart. Prompt thiamine replacement can prevent progression, and some symptoms may improve quickly. Nerve recovery may take longer, especially when the deficiency has been severe or prolonged.

- Dry beriberi mainly affects the peripheral nerves, which carry signals between the brain, spinal cord, and the rest of the body.
- Wet beriberi mainly affects the heart and circulation, leading to fluid buildup and heart failure.
- Infantile beriberi can affect babies who receive too little thiamine, often because the breastfeeding parent is deficient or because a feeding product lacks enough thiamine.

Symptoms

Symptoms depend on which tissues are most affected. Some people have a combination of nerve, muscle, heart, and digestive symptoms.

Dry beriberi may cause:

Wet beriberi may cause:

Early symptoms can be less specific. They may include poor appetite, irritability, fatigue, abdominal discomfort, or unintended weight loss. These symptoms have many possible causes and do not confirm thiamine deficiency.

Infants may show poor feeding, vomiting, irritability, a weak or unusual cry, breathing difficulty, swelling, or signs of heart failure. A baby with breathing problems, unusual sleepiness, poor responsiveness, or difficulty feeding needs prompt medical assessment.

Call emergency services for severe trouble breathing, chest pain, fainting, blue or gray lips, sudden confusion, inability to stay awake, or signs of collapse. New confusion, major walking difficulty, abnormal eye movements, or rapidly worsening weakness also requires urgent medical care. Routine symptoms such as gradual tingling or mild swelling should still be discussed with a clinician, but they do not always require emergency care.

- Tingling, burning, numbness, or reduced sensation, often beginning in the feet
- Muscle weakness, especially in the legs
- Difficulty walking or an unsteady gait
- Muscle pain or tenderness
- Reduced reflexes
- Loss of muscle tissue
- Trouble using the hands when the condition becomes more advanced
- Swelling in the feet, ankles, or lower legs
- Shortness of breath, especially during activity or while lying flat
- A fast heartbeat or awareness of the heartbeat
- Unusual tiredness and weakness
- Rapid weight gain from fluid retention
- Reduced ability to exercise
- Enlarged neck veins or other signs of heart failure found during an examination

Causes and risk factors

Beriberi develops when the amount of available thiamine is too low for the body's needs. This may happen because of inadequate intake, poor absorption, increased loss, or increased demand.

Thiamine is found in pork, fish, legumes, seeds, nuts, whole grains, and enriched or fortified grain products. Diets based mainly on polished white rice or other foods with little thiamine can increase risk, particularly when foods are not fortified. Extreme food restriction and severe food insecurity can also lead to deficiency.

Heavy or prolonged alcohol use is an important risk factor. Alcohol can reduce food intake, interfere with thiamine absorption and use, and contribute to other nutritional deficiencies. A person who may be physically dependent on alcohol should seek medical guidance before stopping suddenly because alcohol withdrawal can itself be dangerous.

Other situations associated with thiamine deficiency include:

Some diuretic medicines, often called water pills, may increase urinary thiamine loss. However, people should not stop prescribed medicines on their own. A clinician can consider diet, symptoms, dose, treatment duration, and other risk factors.

Giving a large carbohydrate load to a severely undernourished person can increase thiamine demand. This may occur during refeeding , when nutrition is restarted after prolonged poor intake. Medical teams plan refeeding carefully and may provide thiamine and monitor electrolytes.

Infantile beriberi is more likely when a breastfeeding parent has severe thiamine deficiency. Rarely, it has occurred when an infant-feeding product was improperly formulated. Inherited disorders affecting thiamine transport or metabolism can produce related symptoms, although these are different from typical nutritional beriberi.

- Long-lasting vomiting, including severe vomiting during pregnancy
- Eating disorders or severe dietary restriction
- Bariatric surgery or other gastrointestinal surgery
- Conditions that cause chronic diarrhea or poor nutrient absorption
- Advanced cancer or other illnesses associated with severe malnutrition
- Dialysis and some conditions that increase nutrient losses
- Prolonged use of nutrition that does not contain enough thiamine
- Increased nutritional needs during pregnancy, breastfeeding, serious illness, or recovery from starvation

Diagnosis

There is no single symptom that proves a person has beriberi. A clinician considers the pattern of symptoms together with diet, alcohol use, vomiting, weight changes, medical conditions, surgery, medicines, and access to food.

The physical examination may assess strength, sensation, reflexes, walking, eye movements, mental state, heart rate, blood pressure, breathing, and swelling. The clinician may also look for signs of other nutritional deficiencies.

Blood testing can measure thiamine status. Whole-blood thiamine diphosphate is commonly used because it reflects the active form of thiamine inside red blood cells. Some laboratories use a test involving red-blood-cell transketolase, an enzyme that depends on thiamine. Test availability and interpretation vary, and a normal or borderline result may not always rule out clinically important deficiency.

Other tests help assess the effects of the illness or identify another cause. These may include:

If severe thiamine deficiency is strongly suspected, clinicians may begin treatment before

laboratory results return. A clear improvement after thiamine supports the diagnosis, but it does not replace evaluation for other conditions.

- Blood counts, electrolytes, kidney and liver tests, glucose, and magnesium
- An electrocardiogram to check the heart's rhythm
- Chest imaging or an echocardiogram when heart failure is suspected
- Nerve-conduction studies when nerve symptoms are unclear or persistent
- Tests for digestive disease, infection, or other vitamin deficiencies when appropriate

Treatment and management

Treatment replaces thiamine and addresses the reason the deficiency developed. The route, amount, and duration depend on symptom severity, absorption, and whether the heart or brain may be affected.

People with mild deficiency and reliable intestinal absorption may be treated with oral thiamine under medical supervision. People with severe symptoms, significant vomiting, poor absorption, heart failure, or possible brain involvement often receive thiamine by injection or through a vein. Treatment should not be delayed while waiting for test results when the clinical concern is high.

When urgent glucose is needed for dangerously low blood sugar, it should not be withheld. In a person at risk for severe thiamine deficiency, clinicians generally give thiamine before or at the same time as carbohydrate when practical.

Management may also include:

Magnesium is important because the body needs it to use thiamine properly. Low magnesium can limit the response to thiamine replacement.

People should not try to manage suspected beriberi with food or over-the-counter supplements alone. Heart failure and neurologic symptoms need medical assessment, and another condition may be responsible. Supplements also do not correct an untreated cause such as ongoing vomiting or malabsorption.

Heart rate, breathing, and fluid-related symptoms may improve relatively quickly after effective treatment. Numbness and weakness often improve more slowly over weeks or months. Long-standing nerve damage may not completely resolve.

- A nutritionally complete eating plan
- Correction of magnesium and other electrolyte deficiencies

- Treatment of vomiting, diarrhea, or an absorption disorder
- Supervised care for alcohol use disorder
- Careful nutrition support for severe malnutrition
- Standard medical treatment for heart failure or fluid buildup when needed
- Physical or occupational therapy for weakness, walking difficulty, or loss of function

Complications

Untreated wet beriberi can lead to worsening heart failure. Fluid may collect in the lungs or other tissues, making breathing difficult. Severe cardiovascular beriberi can cause very low blood pressure, poor blood flow to organs, abnormal heart rhythms, and circulatory collapse.

Dry beriberi can cause progressive nerve damage. A person may develop marked leg weakness, falls, inability to walk, chronic pain, loss of sensation, or muscle wasting. Reduced feeling in the feet can also make injuries harder to notice.

Severe thiamine deficiency may occur with Wernicke encephalopathy. Without timely treatment, this brain disorder can progress to lasting memory problems known as Korsakoff syndrome. People with severe malnutrition may also have deficiencies of other vitamins and minerals, which can complicate recovery.

Infantile beriberi can worsen rapidly because infants have limited thiamine stores and high nutritional needs. Possible complications include heart failure, breathing failure, seizures, and developmental harm.

Follow up

Follow-up helps confirm that symptoms are improving and that the underlying cause has been addressed. The timing depends on how severe the illness was. A person treated in the hospital may need early review, while someone with a milder deficiency may be monitored through scheduled outpatient visits.

At follow-up, the clinician may reassess strength, walking, sensation, swelling, breathing, weight, and heart rate. Blood tests may be repeated when they are useful for monitoring nutrition, magnesium, or other abnormalities. Persistent heart symptoms may require cardiology care, while ongoing numbness or weakness may require neurology or rehabilitation services.

Long-term prevention should focus on the specific cause. This might involve nutritional

support after bariatric surgery, treatment for chronic vomiting or malabsorption, help with alcohol use, or access to reliable food. Pregnant or breastfeeding people with restricted intake or prolonged vomiting should discuss nutrition with their maternity care team.

Seek urgent care if symptoms return or worsen, particularly shortness of breath, rapid swelling, fainting, confusion, new difficulty walking, or repeated vomiting that prevents fluids and food from staying down. Stable, gradually improving symptoms can usually be discussed at the next planned visit unless the treating clinician has advised otherwise.

Sources

- National Institutes of Health, Office of Dietary Supplements. Thiamin: Fact Sheet for Health Professionals. U.S. Department of Health and Human Services. Accessed March 8, 2025.
- World Health Organization, Department of Nutrition for Health and Development. Thiamine Deficiency and Its Prevention and Control in Major Emergencies. WHO/NHD/99.13. Geneva: World Health Organization; 1999.
- Whitfield KC, Bourassa MW, Adamolekun B, et al. Thiamine deficiency disorders: diagnosis, prevalence, and a roadmap for global control programs. Annals of the New York Academy of Sciences. 2018;1430(1):3-43. doi:10.1111/nyas.13919.
- Frank LL. Thiamin in clinical practice. Journal of Parenteral and Enteral Nutrition. 2015;39(5):503-520. doi:10.1177/0148607114565245.
- Merck Manual Professional Edition. Thiamin Deficiency. Merck & Co., Inc. Accessed March 8, 2025.