CONDITION

Rickets

Rickets is a childhood condition in which growing bones become soft and weak because they do not mineralise properly.

WHAT IT IS
Poor mineralisation of growing bones

BODY SYSTEM
Bones and muscles

MAIN SYMPTOMS
Bone pain, bowed legs, slow growth, widened wrists

WHAT CAUSES IT
Usually low vitamin D, calcium, or phosphate

HOW IT IS DIAGNOSED
Blood tests and wrist or knee X-rays

MAIN TREATMENT
Nutrient replacement and treatment of the underlying cause

CAN IT BE CURED?
Sometimes - nutritional forms often heal fully

IS IT AN EMERGENCY?
Sometimes - seizures or breathing difficulty need emergency care

LONG-TERM OUTLOOK
Usually good when the cause is corrected

Overview

Rickets is a condition that affects bones while a child is growing. The bones do not take up enough calcium and phosphate, the minerals that make them firm. This leaves new bone softer and weaker than it should be.

The most common cause is not having enough vitamin D, calcium, or both. Vitamin D helps the body absorb calcium from food. Less commonly, rickets results from inherited conditions, kidney problems, poor absorption from the gut, or difficulty processing vitamin D.

Rickets can change the shape of growing bones. It may cause bowed legs, thickened wrists or ankles, bone pain, weak muscles, and slower growth. Babies and young children may take longer to sit, crawl, or walk.

Early recognition matters because treatment can strengthen new bone and prevent deformity from getting worse. Nutritional rickets usually improves when the missing nutrients are replaced. Inherited or long-term forms often need ongoing specialist care.

Rickets occurs only in children whose growth plates are still open. Growth plates are areas near the ends of bones where new bone forms. A similar problem in adults is called osteomalacia.

Symptoms

Early rickets may not cause obvious symptoms. Changes can appear gradually as a child grows.

Possible symptoms and signs include:

Some leg bowing is normal in babies and toddlers. It often improves as they grow. Bowing that is marked, uneven, painful, or getting worse should be assessed.

Severe calcium deficiency can cause muscle spasms, tingling, seizures, or an abnormal heart rhythm. These complications are uncommon but need urgent treatment.

- Bone pain or tenderness, especially in the legs, pelvis, spine, or ribs
- Muscle weakness, tiring easily, or difficulty climbing stairs
- Delayed sitting, crawling, standing, or walking
- Slower growth or shorter height than expected
- Legs that bow outward or knees that angle inward
- Wrists or ankles that look wider than usual
- A breastbone that sticks out or small bumps along the ribs
- Delayed tooth development or problems with tooth enamel
- A soft skull in a young baby or a forehead that appears prominent
- Broken bones after relatively minor injuries

Causes and risk factors

Rickets develops when growing bone does not receive or use enough calcium and phosphate. There are several possible reasons.

Nutritional rickets is usually related to low vitamin D, low calcium intake, or both. Vitamin D comes from a limited number of foods, supplements, and the effect of sunlight on skin.

A child may be at greater risk of vitamin D deficiency if they have little sun exposure,

consistently cover most of their skin, or have darker skin. Darker skin contains more melanin, which reduces how quickly sunlight produces vitamin D. This does not mean that normal skin colour is itself unhealthy.

Babies can be at risk because breast milk usually contains little vitamin D. Infant feeding and supplement advice differs by country and by the child's circumstances.

Other causes include:

X-linked hypophosphataemia is one inherited cause. It makes the kidneys lose too much phosphate into the urine. Other rare inherited forms prevent the body from activating vitamin D or responding to it properly.

A child can have more than one risk factor. Finding the cause is important because nutritional and inherited forms require different treatment.

- Conditions that reduce nutrient absorption, such as coeliac disease or inflammatory bowel disease
- Long-term liver or kidney conditions
- Some medicines that affect vitamin D processing
- A very restricted diet or inadequate access to suitable food
- Premature birth, which may reduce mineral stores
- Inherited changes affecting phosphate, vitamin D, or bone mineralisation

Diagnosis

A healthcare professional will ask about symptoms, growth, diet, supplements, sun exposure, medicines, and family history. They will examine the child's legs, wrists, ribs, teeth, muscles, and walking pattern.

Blood tests commonly measure calcium, phosphate, alkaline phosphatase, parathyroid hormone, and vitamin D. Alkaline phosphatase is an enzyme that often rises when bone is trying to mineralise. Kidney and liver tests may also be needed.

Urine tests can show whether the kidneys are losing calcium or phosphate. This is especially useful when an inherited or kidney-related cause is possible.

X-rays of the wrists, knees, or other growing bones can show characteristic widening, fraying, or cupping near the growth plates. Blood results and X-rays are considered together. A low vitamin D result alone does not prove that a child has rickets.

Further tests may look for poor absorption, kidney problems, or an inherited condition. Genetic

testing can help confirm some rare forms, particularly when there is a family history or an unusual laboratory pattern.

Treatment and management

Treatment aims to restore normal bone mineralisation, relieve symptoms, and correct the cause.

Nutritional rickets is usually treated with vitamin D and enough calcium. The amount and form depend on the child's age, test results, diet, and severity. Treatment should be supervised because excessive vitamin D or calcium can also cause harm.

Follow-up blood tests help show whether mineral levels and alkaline phosphatase are improving. X-rays are not always repeated, but they may be used when symptoms are severe or the response is uncertain.

If diet is contributing, support may include suitable calcium-rich foods and safe vitamin D supplementation. A dietitian can help when a child has allergies, follows a restricted diet, or has difficulty eating enough.

Treatment for other forms is tailored to the cause. It may include:

Bone deformities may improve as stronger bone forms, especially in younger children. Surgery is sometimes considered for severe or persistent deformity, usually after the underlying mineral problem has been treated.

Do not start high-dose vitamin D or phosphate without professional guidance. Similar-looking forms of rickets can require very different treatment.

- Managing a condition that prevents nutrient absorption
- Treating an underlying kidney or liver problem
- Phosphate replacement and active forms of vitamin D for some phosphate-wasting conditions
- Targeted treatment such as burosumab for some people with X-linked hypophosphataemia
- Physiotherapy for weakness, mobility, or joint strain
- Dental care when tooth enamel or abscesses are a concern

Complications

Untreated rickets can affect growth, movement, and bone shape. Possible complications include persistent bowed legs or knock knees, short stature, bone pain, muscle weakness, and fractures.

Changes to the chest or spine may occur in severe cases. A very soft rib cage can make breathing harder in an infant. Low calcium can occasionally cause seizures, muscle spasms, or heart rhythm problems.

Dental enamel may be weaker, and some inherited forms are linked with repeated dental abscesses. Long-term phosphate-wasting conditions can also cause joint stiffness, altered walking, and strain on the hips, knees, or ankles.

Not every child develops these problems. The risk is generally lower when rickets is recognised and treated before substantial bone deformity develops.

Prevention

Some nutritional rickets can be prevented by ensuring that children receive enough vitamin D and calcium. National recommendations for infant and childhood vitamin D supplements differ, so follow the advice used in your country and any guidance provided for your child.

A balanced diet may include calcium from dairy foods, fortified alternatives, tofu made with calcium, or other suitable sources. Vitamin D is present in relatively few foods, although some products are fortified.

Sunlight can help the skin produce vitamin D, but the amount produced changes with season, location, skin colour, clothing, and time outdoors. Sun exposure should not be increased to the point of sunburn, and sunlight alone may not reliably meet a child's needs.

Rickets caused by an inherited genetic change cannot currently be prevented. Early diagnosis, family testing when appropriate, and regular treatment may reduce its effects. Rickets related to kidney, liver, or absorption problems may not be fully preventable either, but monitoring can help identify mineral problems earlier.

Living with it and what to expect

With effective treatment, nutritional rickets usually begins to heal over the following weeks and months. Pain and muscle weakness may improve before bone shape changes. Blood tests often show improvement as new bone mineralises.

Growth plates can remodel, meaning that bones may gradually correct some deformity as they

grow. Younger children generally have more growth remaining, but it is not possible to promise that bowed legs or other changes will fully straighten. Persistent deformity may need orthopaedic assessment.

Follow-up is routine rather than an emergency when a child is otherwise well. Appointments may track height, leg alignment, walking, diet, symptoms, and blood results. Continuing treatment for the recommended period is important even if the child appears better.

Inherited rickets usually requires care over years. Treatment may continue through childhood and sometimes into adulthood. Monitoring can include growth, kidney health, dental health, hearing, mobility, and the effects of treatment.

Most children with treated nutritional rickets can return to usual play and activity as comfort and strength improve. A child with pain, weakness, fractures, or major deformity may need temporary activity changes and support from physiotherapy or orthopaedics.

When to get medical help

Arrange a routine medical assessment if a child has persistent or worsening bowed legs, bone pain, muscle weakness, delayed walking, slow growth, widened wrists or ankles, or repeated fractures.

Assessment is also appropriate if a child has risk factors for vitamin D or calcium deficiency and develops concerning symptoms. Children with kidney, liver, or absorption conditions may need planned monitoring even when they feel well.

Seek urgent medical help if a child develops:

Call emergency services for a seizure, severe breathing difficulty, collapse, or loss of consciousness. These symptoms can have many causes and should not be assumed to be rickets.

- Painful muscle spasms or marked stiffness
- Sudden worsening weakness
- A suspected broken bone
- Increasing difficulty breathing
- Unusual sleepiness or reduced responsiveness

Common questions

Can rickets be cured?

Nutritional rickets can often heal when vitamin D and calcium are restored. Bone pain and weakness usually improve, although established deformity may not fully disappear. Inherited forms are often managed rather than permanently cured.

Can adults get rickets?

No. Rickets affects open growth plates, so it occurs during childhood. Adults can develop osteomalacia, which is poor mineralisation of mature bone and may have similar causes.

Will bowed legs from rickets straighten?

They may improve as treatment strengthens bone and the child grows. The amount of correction is influenced by age, severity, and the cause. Severe or persistent bowing may require orthopaedic treatment.

Is rickets contagious?

No. Rickets cannot spread between people. It results from problems with nutrients, mineral handling, another health condition, or inherited genetic changes.

Is rickets the same as osteoporosis?

No. Rickets means that growing bone has not mineralised properly. Osteoporosis means that normally mineralised bone has become less dense and more fragile. The conditions affect bone in different ways.

Is sunlight enough to prevent rickets?

Not always. Vitamin D production from sunlight is affected by season, location, skin colour, clothing, and time outdoors. Some children need supplements even when they spend time outside.

Sources

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