CONDITION

Nutritional rickets

Nutritional rickets is softening of a child's growing bones caused by too little vitamin D or calcium.

WHAT IT IS
Poor mineralisation of growing bones from nutrient deficiency

BODY SYSTEM
Bones and muscles

MAIN SYMPTOMS
Bone pain, slow growth, bowed legs, muscle weakness

WHAT CAUSES IT
Too little vitamin D or calcium

HOW IT IS DIAGNOSED
Blood tests and bone X-rays

MAIN TREATMENT
Vitamin D and calcium replacement

CAN IT BE CURED?
Yes - nutrient replacement usually heals bones

IS IT AN EMERGENCY?
Sometimes - seizures or breathing problems from low calcium

LONG-TERM OUTLOOK
Most children recover with prompt, complete treatment

Overview

Nutritional rickets is a condition that affects growing bones. It happens when a child does not have enough vitamin D, calcium, or both to mineralise bone properly. Mineralisation is the process that makes bones firm and strong.

Vitamin D helps the body absorb calcium from food. Calcium is needed to build bone. When either is lacking, the body may struggle to maintain enough calcium and phosphate in the blood for normal bone growth.

Rickets affects the growth plates near the ends of children's bones. These are areas where new bone forms as a child grows. Poor mineralisation can make bones painful, weak, or misshapen.

Only children with open growth plates develop rickets. A similar loss of bone mineralisation in adults is called osteomalacia.

Nutritional rickets is treatable. Replacing missing nutrients usually allows new bone to mineralise normally. Bone shape can improve as a young child grows, although severe or long-standing deformities may need additional care.

Symptoms

Early rickets may cause few clear symptoms. Changes can become more noticeable as the bones continue to grow or when a child begins standing and walking.

Possible symptoms and signs include:

Young babies may seem irritable or have poor muscle tone. Older children may walk differently, complain of leg pain, or have trouble keeping up with usual activities.

Some children with nutritional rickets develop very low blood calcium. This can cause muscle spasms, tingling, seizures, or breathing difficulty. These symptoms need urgent medical attention.

Not every bowed leg or delay in walking is caused by rickets. Leg shape changes can be a normal part of early childhood, and several other conditions can affect bone growth.

- Bone pain or tenderness, especially in the legs, back, pelvis, or ribs
- Muscle weakness, delayed sitting or walking, or tiring easily
- Slow growth or shorter height than expected
- Bowed legs or knees that angle inward
- Widened wrists or ankles
- Swelling where the ribs meet the breastbone
- Delayed tooth eruption or weak tooth enamel
- A soft skull or delayed closing of the soft spot in a baby's skull

Causes and risk factors

The main causes are vitamin D deficiency, low calcium intake, or a combination of both.

Vitamin D is made in the skin after exposure to sunlight. It is also found in some foods and supplements. Breast milk usually contains only a small amount, so breastfed babies generally

need another source of vitamin D according to local health guidance.

A child may be more likely to develop nutritional rickets if they:

Children living at higher latitudes may make less vitamin D during seasons with weak sunlight. Air pollution, indoor living, cultural clothing practices, and limited access to suitable foods or supplements can also contribute.

Rickets is not always nutritional. Inherited conditions, kidney problems, liver problems, and disorders that cause phosphate loss can produce similar bone changes. These causes need different treatment.

- Receive too little vitamin D during infancy or childhood
- Eat very little calcium-rich or vitamin D-fortified food
- Have dark skin, which makes vitamin D more slowly in sunlight
- Spend little time outdoors or keep most skin covered
- Were born prematurely
- Have limited food choices or severe dietary restriction
- Have difficulty absorbing nutrients because of an intestinal condition
- Take medicines that interfere with vitamin D metabolism

Diagnosis

A healthcare professional will ask about the child's diet, vitamin supplements, growth, development, medical history, and possible symptoms. They will examine the child's bones, teeth, muscles, movement, and growth pattern.

Blood tests are used to look for the biochemical pattern of rickets. These commonly measure calcium, phosphate, alkaline phosphatase, parathyroid hormone, and a form of vitamin D called 25-hydroxyvitamin D.

Alkaline phosphatase is an enzyme linked with bone growth. It is often high in active rickets. Parathyroid hormone helps regulate calcium and may rise when the body is trying to maintain blood calcium.

Calcium levels can be low or normal, so a normal calcium result does not rule out rickets. Vitamin D may be low in vitamin D deficiency but can be normal when low calcium intake is the main problem.

X-rays, usually of a wrist or knee, can show changes at the growth plates. Typical findings include widening, fraying, or cupping at the ends of growing bones. Blood tests and X-ray

findings together usually confirm the diagnosis.

Further tests may be needed if the results do not fit nutritional rickets, if there are signs of kidney or liver problems, or if the child does not improve as expected. This helps distinguish nutritional rickets from inherited or other medical conditions.

Treatment and management

Treatment replaces the nutrients the child is missing. It usually includes vitamin D and enough calcium from food, supplements, or both.

The type, amount, and length of treatment are based on the child's age, test results, diet, and severity of the condition. Treatment doses are different from routine prevention doses, so they should be planned and monitored by a qualified healthcare professional.

A dietitian may help identify practical sources of calcium and vitamin D. Calcium can come from dairy products, calcium-fortified alternatives, and other suitable foods. Vitamin D is present in a smaller range of foods, including some fortified products and oily fish.

Follow-up is important even after symptoms begin to improve. It may include:

Pain and weakness often improve before bone shape does. Supplements usually continue for a planned period, followed by an age-appropriate prevention approach when needed.

Severe low calcium may require treatment in hospital, especially if it causes seizures, muscle spasms, heart rhythm problems, or breathing difficulty.

Some children with significant leg deformity need review by an orthopaedic specialist. Bracing or surgery is not usually the first treatment for nutritional rickets. Bone health is corrected first, because deformities may improve with growth after the deficiency is treated.

- Reviewing pain, muscle strength, growth, and bone shape
- Checking that supplements are being taken safely
- Repeating blood tests to confirm mineral balance is improving
- Repeating X-rays when needed to document bone healing
- Investigating another cause if healing is slower than expected

Complications

Untreated rickets can interfere with bone growth and movement. Possible complications include fractures, persistent bone pain, reduced growth, and lasting changes in leg or pelvic

shape.

Weak muscles and painful bones can delay physical development. A child may be slower to sit, crawl, stand, or walk. Dental enamel problems can increase the risk of tooth decay.

Very low calcium can affect nerves, muscles, breathing, and the heart. Seizures are an uncommon but serious presentation. Rarely, severe deficiency can weaken the heart muscle.

Complications are more likely when rickets is severe or remains untreated for a long time. Early treatment lowers the chance of lasting problems. However, an older child with established bone deformity may not have complete correction from nutrient treatment alone.

Prevention

Many cases of nutritional rickets can be prevented by ensuring children receive enough vitamin D and calcium while they are growing.

Babies and children should receive vitamin D supplements when recommended by local health guidance. This is especially important for breastfed babies and children whose diet, skin pigmentation, sun exposure, or health conditions increase their risk.

Infant formula is commonly fortified with vitamin D, but whether an additional supplement is needed may relate to how much formula the baby drinks. A healthcare professional or local child health service can explain the guidance that applies where you live.

Children also need enough dietary calcium. If a child avoids dairy products, suitable calcium-fortified alternatives or advice from a dietitian may be helpful.

Sunlight can contribute to vitamin D production, but the amount made is unpredictable. It changes with skin colour, season, latitude, clothing, and sunscreen use. Deliberate unprotected sun exposure is not a safe substitute for recommended food or supplements.

Do not combine several vitamin products without checking their ingredients. Excessive vitamin D can be harmful.

Not every form of rickets can be prevented. Rickets caused by an inherited condition, kidney disease, or a problem absorbing nutrients may occur despite a balanced diet. These conditions need specific medical care.

Living with it and what to expect

Most children with nutritional rickets improve when the deficiency is identified and fully treated. Blood test results can begin to correct before the skeleton has finished healing.

Pain, irritability, and muscle weakness may improve over weeks. X-ray evidence of healing and changes in bone shape usually take longer. Growth plates need time to form stronger bone, and improvement may continue over months.

Young children have more growth remaining, so some leg deformities may gradually straighten as they grow. Severe deformities, or those found later in childhood, are less likely to correct completely without specialist treatment.

Children can usually return to normal play as pain and strength improve. During early treatment, activity may need to be adjusted if bones are painful or there is concern about fracture risk.

Follow-up continues until symptoms, blood tests, and bone healing are satisfactory. After treatment, an ongoing source of vitamin D and calcium may be needed to prevent the deficiency from returning.

Rickets itself is not contagious. Nutritional rickets does not usually become a lifelong condition once the deficiency and its cause have been addressed. Continued problems or repeated episodes may suggest inadequate nutrient intake, difficulty absorbing treatment, or another cause of rickets.

When to get medical help

Arrange a routine medical appointment if a child has persistent bone pain, muscle weakness, slow growth, delayed movement skills, widened wrists or ankles, or a new change in leg shape.

Medical review is also appropriate if a child has several risk factors for vitamin D or calcium deficiency, even when symptoms are mild. Early changes can be difficult to recognise without an examination and blood tests.

Seek urgent medical advice if the child develops repeated muscle cramps or spasms, marked weakness, or tingling around the mouth or limbs. These can be signs of low calcium.

Call emergency services for:

These emergency symptoms are not the usual course of nutritional rickets, but they require immediate assessment.

- A seizure
- Difficulty breathing or noisy breathing
- Fainting, collapse, or inability to wake normally
- Severe weakness with sudden deterioration

Common questions

Can nutritional rickets be cured?

Yes, nutritional rickets can usually be healed by correcting vitamin D and calcium deficiency. Any underlying dietary or absorption problem also needs attention. Long-standing bone deformity may need orthopaedic care.

Will bowed legs straighten after treatment?

They often improve as a young child's bones heal and grow, but the amount of correction cannot be predicted. Severe deformity or deformity in an older child is less likely to straighten fully on its own.

Is rickets caused only by vitamin D deficiency?

No. Low calcium intake can cause nutritional rickets even when the measured vitamin D level is not very low. Other forms of rickets are caused by inherited conditions, kidney disease, or abnormal phosphate loss.

Can a child get rickets while taking a vitamin supplement?

It is possible if the supplement is not taken regularly, does not provide an appropriate amount, or if calcium intake is very low. Poor nutrient absorption or a non-nutritional form of rickets can also be responsible.

Is rickets the same as osteoporosis?

No. Rickets is a failure to mineralise growing bone and growth plates properly. Osteoporosis means that the amount and internal structure of bone have been reduced. They affect bones in different ways.

How long does rickets take to heal?

Symptoms and blood results may improve within weeks, while X-ray changes and bone shape take months or longer. Healing time is influenced by severity, age, treatment completion, and whether another health problem is present.

Sources

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