CONDITION

Vitamin D deficiency rickets

Vitamin D deficiency rickets is childhood bone weakness caused by too little vitamin D and often too little calcium.

WHAT IT IS
Childhood bone softening affecting growing bones

BODY SYSTEM
Bones and muscles

MAIN SYMPTOMS
Bowed legs, bone pain, delayed growth, muscle weakness

WHAT CAUSES IT
Too little vitamin D, often with low calcium

HOW IT IS DIAGNOSED
Blood tests and bone X-rays

MAIN TREATMENT
Vitamin D and calcium replacement

CAN IT BE CURED?
Yes - treatment usually heals growing bones

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

LONG-TERM OUTLOOK
Usually good when identified and treated early

Overview

Vitamin D deficiency rickets is a condition that affects growing bones in children. It happens when the body does not have enough vitamin D to absorb and use calcium and phosphate properly. These minerals help make bones firm.

Without enough mineral, newly formed bone stays soft. Because children's bones are still growing, the soft areas near the ends of long bones can widen or bend. These areas are called growth plates.

Rickets can affect bone shape, growth, movement, and muscle strength. A child may develop bowed legs, swollen-looking wrists or ankles, bone pain, or delayed physical development. Babies may have low calcium before obvious bone changes appear.

Rickets specifically affects children whose growth plates are still open. Adults with a similar problem develop osteomalacia , which means softening of mature bone.

Vitamin D deficiency rickets is usually treatable. Improvement is more likely when the condition is found early and the child receives enough vitamin D and calcium. Other types of rickets can be caused by inherited conditions or kidney problems and may need different treatment.

Symptoms

Early vitamin D deficiency may not cause clear symptoms. Changes can develop slowly and may be mistaken for normal differences in growth.

Possible symptoms and signs include:

Some leg bowing is common in babies and young toddlers and is not always rickets. The child's age, growth pattern, examination, and test results help distinguish normal development from a bone problem.

A severe calcium shortage can cause muscle cramps or spasms, tingling, seizures, or an abnormal heartbeat. Babies may have pauses in breathing or difficulty feeding. These symptoms need urgent assessment.

- Bowed legs or, less often, knees that angle inward
- Widened wrists, ankles, or knees
- Bone or muscle pain, often in the legs or back
- Muscle weakness or tiring easily
- Delayed sitting, crawling, standing, or walking
- Slower growth or short height for age
- A soft skull in a baby
- A chest that appears prominent where the ribs meet the breastbone
- Delayed tooth development or weak tooth enamel
- Irritability or reluctance to walk

Causes and risk factors

The body makes vitamin D when uncovered skin is exposed to ultraviolet B light from the sun.

Vitamin D also comes from certain foods, fortified products, and supplements.

Rickets can develop when a child does not get enough vitamin D, cannot absorb it, or does not receive enough calcium. Low calcium intake can contribute even when vitamin D levels are not extremely low.

Factors that can increase the chance of deficiency include:

Breast milk supports infant nutrition but usually does not provide enough vitamin D by itself. Supplement recommendations differ by country and by the child's circumstances.

Rare inherited conditions can also cause rickets. These may affect phosphate balance, vitamin D processing, or the body's response to vitamin D. They are not the same as straightforward vitamin D deficiency rickets. A child who does not improve as expected may need testing for one of these conditions.

- Little exposure to sunlight
- Darker skin, especially in places with limited sunlight
- Clothing that covers most of the skin
- A diet containing little vitamin D or calcium
- Exclusive breastfeeding without recommended vitamin D supplementation
- A breastfeeding parent who has severe vitamin D deficiency
- Premature birth
- Conditions that reduce nutrient absorption, such as coeliac disease
- Long-term liver or kidney conditions
- Some medicines that change how vitamin D is processed

Diagnosis

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

Blood tests usually measure:

Results must be interpreted together. For example, a blood calcium result may be normal because the body is taking calcium from bone to keep the level in the blood stable.

X-rays of the wrist or knee can show typical growth-plate changes. These include widening, irregular edges, and a cupped or frayed appearance at the ends of bones. X-rays can also

identify fractures or marked bending.

Further urine tests, genetic tests, or specialist assessments may be needed if the results are unusual, there is a family history of rickets, or standard treatment does not lead to expected improvement.

- 25-hydroxyvitamin D , the main test of the body's vitamin D supply
- Calcium and phosphate, minerals needed for bone strength
- Alkaline phosphatase , an enzyme often raised when rickets is active
- Parathyroid hormone , which can rise as the body tries to maintain calcium levels
- Kidney and sometimes liver function

Treatment and management

Treatment replaces vitamin D and makes sure the child receives enough calcium. Oral vitamin D is commonly used, but the form, schedule, and length of treatment are chosen according to the child's age, test results, symptoms, and underlying cause.

Calcium may come from food, a supplement, or both. Calcium is important because giving vitamin D without correcting a major calcium shortage may not fully heal the bones.

Care may include:

A child with severe low calcium may need hospital care. Calcium may then be given directly into a vein while the heart and blood levels are monitored.

Pain and muscle weakness often begin to improve before bone shape changes. Growth plates usually take longer to heal. Persistent leg deformity may gradually straighten as a young child grows, but this is not guaranteed.

An orthopaedic specialist may assess severe or lasting deformity. Braces are not routinely helpful for every child, and surgery is generally considered only for substantial deformity that remains after the rickets has been treated.

Children should not receive repeated high-dose vitamin D without supervision. Too much vitamin D can cause harmful calcium levels and affect the kidneys.

- Vitamin D replacement under clinical guidance
- Adequate calcium from suitable foods or supplements
- Treatment of an absorption, liver, or kidney condition
- Review of medicines that may affect vitamin D

- Repeat blood tests to check mineral levels and healing
- Follow-up X-rays when bone changes were significant

Complications

Untreated or severe rickets can interfere with normal bone growth. Possible complications include:

A narrowed or misshapen pelvis can occur after severe, long-standing rickets, although this is less likely when the condition is treated early.

The chance of lasting problems is influenced by the child's age, how severe the changes are, how long they have been present, and whether the underlying cause can be corrected.

- Lasting bowing or other changes in bone shape
- Delayed growth
- Bone pain and reduced physical activity
- Muscle weakness and delayed movement skills
- Fractures
- Dental enamel problems
- Low-calcium seizures or muscle spasms
- Rarely, breathing or heart rhythm problems from severe low calcium

Prevention

Many cases of nutritional vitamin D deficiency rickets can be prevented by providing enough vitamin D and calcium during growth.

Infants and children may need vitamin D supplements according to national guidance. Recommendations are not identical everywhere and may differ for premature babies, children with darker skin, those with limited sun exposure, or those with medical conditions that affect absorption.

Helpful measures include:

Food sources of vitamin D include oily fish, egg yolk, and fortified products. Calcium can come from milk, yoghurt, cheese, fortified alternatives, and other suitable foods.

Sunlight helps the body make vitamin D, but safe exposure is affected by skin tone, season,

location, clothing, and sun-protection advice. Sunburn should be avoided, and sunlight alone may not reliably prevent deficiency.

Rickets caused by an inherited condition cannot be prevented through diet or sunlight. Early recognition and ongoing specialist treatment can help limit its effects.

- Using age-appropriate vitamin D supplements when recommended
- Including calcium-rich foods as the child's diet develops
- Choosing vitamin D-fortified foods where available
- Attending growth and nutrition reviews for children at higher risk
- Managing conditions that interfere with nutrient absorption

Living with it and what to expect

Most children with nutritional vitamin D deficiency rickets improve with appropriate vitamin D and calcium treatment. Muscle strength, comfort, and activity may improve over weeks, while blood tests and X-ray changes can take several months to settle.

Young bones can remodel, meaning they gradually change shape as the child grows. Mild bowing may therefore improve after the growth plates heal. Severe deformity, or deformity found later in childhood, is less likely to correct completely without specialist care.

Follow-up is important even when the child seems better. It confirms that mineral levels are safe, the bones are healing, and growth is progressing. A healthcare professional may also review diet and the longer-term supplement plan.

Rickets can return if vitamin D or calcium intake becomes inadequate again, or if an underlying absorption problem continues. Children with chronic kidney, liver, digestive, or inherited conditions may need longer-term monitoring.

After healing, most children can take part in ordinary school, play, and physical activity. Activity may need to increase gradually if there is pain, weakness, a fracture, or marked leg deformity.

When to get medical help

Arrange a routine medical appointment if a child has persistent bowed legs, widened wrists or ankles, bone pain, delayed walking, muscle weakness, slow growth, or risk factors for vitamin D deficiency. These findings do not always mean rickets, but they should be assessed.

Seek prompt medical advice if a child cannot bear weight, has sudden severe bone pain,

develops a new limb deformity, or may have a fracture.

Call emergency services if a child:

These can be signs of dangerously low calcium or another urgent condition.

- Has a seizure
- Has difficulty breathing or pauses in breathing
- Becomes unusually unresponsive
- Develops severe muscle spasms
- Collapses or has signs of a serious abnormal heartbeat

Common questions

Can bowed legs straighten after vitamin D treatment?

They may. Mild bowing in a younger child often improves as the rickets heals and the bones continue to grow. More severe or long-standing deformity may not fully straighten. An orthopaedic assessment can help if the shape remains abnormal after treatment.

Is vitamin D deficiency rickets permanent?

The active condition is usually reversible when vitamin D and calcium deficiency are corrected. Some bone-shape changes can remain, particularly when treatment begins late or deformity is severe.

Can a child have rickets with a normal calcium blood test?

Yes. The body may increase parathyroid hormone and release calcium from bone to keep the blood calcium level within range. Diagnosis therefore uses several blood results, the examination, and often X-rays rather than calcium alone.

Is rickets contagious?

No. Vitamin D deficiency rickets cannot pass between people. It results from problems with vitamin D, calcium, absorption, or metabolism.

Is rickets the same as osteoporosis?

No. Rickets affects how growing bone becomes mineralised and changes the growth plates. Osteoporosis means bones have lost strength and density but are normally mineralised. Osteomalacia is the related soft-bone condition in adults.

How long does rickets take to heal?

Symptoms may start improving within weeks, but blood-test and X-ray recovery commonly

takes months. Bone shape can continue changing over years as a child grows. The timeline is influenced by severity, age, calcium intake, and the underlying cause.

Sources

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