

Vitamin D and Musculoskeletal Health

What you're feeling

You may notice that your joints feel stiff or ache more than usual. This discomfort is often linked to low vitamin D levels. If you have wear-and-tear arthritis in your knees, you might feel pain in both knees at the same time. You may also experience aches in multiple joints throughout your body. This widespread pain is known as polyarthralgia. The severity of your vitamin D deficiency often matches how severe these symptoms are.

Your daily tasks can become difficult because of this pain. Simple movements like reaching behind your back to fasten a bra or tucking in your shirt may feel hard. You might find it uncomfortable to sleep on your side if your hips or shoulders hurt. For some patients, the pain is worse at night or after activity. While this pain is real, it is not caused by high levels of inflammation in your blood.

If you are an athlete or military personnel, you might be at higher risk for injuries. Low vitamin D is linked to a higher chance of tearing the ligament in your knee. This is called an anterior cruciate ligament tear. It can also make it harder for your knee to heal if you need surgery to fix it. In adolescents, low vitamin D is common and can affect body composition.

If you are having joint replacement surgery, such as for your shoulder or hip, your doctor will check your vitamin D levels. Deficiency is more common in patients who have surgery during the winter months. Addressing this deficiency is important for your recovery. Your doctor may recommend supplements to help maintain optimal levels and support your bone health.

What's actually happening

Vitamin D acts like a key that unlocks calcium absorption in your body. Without enough of it, your bones cannot stay strong and dense. This deficiency is common in many groups. It affects adolescents, leading to unfavorable body composition. It is also highly prevalent in patients with knee wear-and-tear arthritis. In these cases, the severity of the deficiency links to pain in multiple joints, though it does not raise inflammatory markers in the blood.

Your doctor may check your levels before surgery. Deficiency is linked to higher risks for certain injuries and complications. For example, it increases the odds of anterior cruciate ligament tears and reconstruction failure. It is also associated with adverse outcomes after total shoulder joint replacement. In hip fracture surgery, low

levels below 20 ng/mL require attention to prevent poor healing. For open carpal tunnel release, screening helps prevent delayed wound healing.

The role of vitamin D in tendon healing, such as rotator cuff tears, is still being studied. While deficiency does not change muscle gene expression in medium tears, it may increase proinflammatory cytokines. This suggests your body's repair process might be affected. Regular supplementation significantly reduces the likelihood of deficiency, especially in winter or for high-risk groups like athletes. Understanding this link helps your doctor tailor your care to support bone and tissue health.

What we can do about it

Start by checking your vitamin D levels, especially if you are an athlete, military personnel, or older adult. Deficiency is common and linked to higher risks of stress fractures and bone loss. Your doctor may recommend regular screening to guide preventive strategies. For bone health, combining regular exercise with vitamin D is key. High-intensity interval training paired with vitamin D consumption may help prevent bone density reduction as you age. If you have osteoporosis, regular sling core stabilization training based on calcium and vitamin D supplementation can improve bone density and prevent low back pain over time. These lifestyle changes aim to strengthen your bones and reduce injury risk naturally.

If lifestyle changes are not enough, medical management may be needed. Vitamin D deficiency is associated with increased odds of anterior cruciate ligament tears and reconstruction failure. It is also prevalent among adolescents and linked to unfavorable body composition. In arthroplasty patients, deficiency is more common in winter and associated with adverse medical outcomes. Your doctor may prescribe supplementation to correct this. For example, administering an oral 300,000 U single-dose vitamin D regimen can positively impact outcomes following primary total joint arthroplasty. Some patients may need vitamin D 10,000 IU/day for 8 weeks to reach optimal levels. Low-dose supplementation helps sufficient patients maintain healthy levels, while deficient knee replacement patients may benefit from medium-to-high doses, though only 33.7% achieve repletion with this approach. Preoperative screening and supplementation can also help prevent delayed wound healing after open carpal tunnel release surgery.

If symptoms persist despite these measures, your doctor may refer you for specialist assessment. In some cases, a procedure may be considered to address structural issues or severe complications. For instance, advanced techniques like combining systemic and localized vitamin D delivery via 3D-printed nanofiber sheets have shown promise in enhancing tendon-to-bone healing and muscle regeneration in research models. While these are not standard first-line treatments, they represent potential options for complex cases. Your doctor will evaluate whether such interventions are appropriate for your specific condition. Always discuss the benefits and risks of any treatment plan with your healthcare team to ensure it aligns with your health goals.

When to see someone

See your GP if you have persistent joint pain, weakness, or instability that does not improve with rest. Ask for a specialist review if your knee locks or gives way, or if symptoms interfere with your sleep or work. Sudden

worsening of pain warrants immediate attention. Your doctor may check for vitamin D deficiency, which is linked to higher rates of anterior cruciate ligament tears and reconstruction failure. This deficiency is also common in knee wear-and-tear arthritis and can affect body composition in adolescents. If you are scheduled for joint replacement, your team may screen your levels, especially in winter, to help prevent adverse medical outcomes.