

informedhealthonline.org

INDEPENDENT, OBJECTIVE AND EVIDENCE-BASED

Osteoporosis: Can calcium and vitamin D prevent it?



Older people can reduce their risk of osteoporosis by taking calcium supplements every day. It is not clear whether extra vitamin D helps to strengthen people's bones if they do not have a vitamin D deficiency.

Older people can reduce their risk of osteoporosis by taking calcium supplements every day. It is not clear whether extra vitamin D helps to strengthen people's bones if they do not have a vitamin D deficiency.

Osteoporosis is when bones become weaker and brittle because of a loss of bone tissue. Bones affected by osteoporosis are much more likely to break. Even a very minor fall could cause a break or crack in the bone (fracture). The word "osteoporosis" comes from the Greek for bone ("osteo") and porous ("porosis"). It is a common disease in people over the age of 65, but the risk of developing osteoporosis starts increasing from around the age of 50. For women, the risk of osteoporosis also increases quite a lot after the menopause.

Sometimes there are obvious signs that a person has osteoporosis - they may lose some height and stoop over, for example. But often the first sign that someone has developed osteoporosis is when they break a bone. You can read more about osteoporosis and preventing this condition [here](http://www.informedhealthonline.org/index.423.en.html) (URL: <http://www.informedhealthonline.org/index.423.en.html>).

One of the main building blocks of bone is the mineral called calcium. Normal healthy bones turn over calcium regularly. Calcium in our diets is absorbed by our bones, leaks out of them, but then new calcium comes in to offset the loss. One of the factors weakening the bones of people with osteoporosis is that their bones are losing far too much calcium. So one possible approach to preventing osteoporosis is to increase the amount of calcium they consume, either with a calcium-rich diet and/or with the help of dietary supplements. Calcium supplements are available without prescription, either as calcium alone or combined with vitamin D.

Vitamin D helps bones absorb calcium. Many people who are very old have a vitamin D deficiency, partly because they are no longer so active and get less sunlight. Our bodies can make their own vitamin D if we get enough sunlight. But there is also vitamin D in some foods, so that we can also get some vitamin D in our diets or through dietary supplements.

The results of trials in close to 64,000 people over the age of 50

Researchers from three universities in Australia worked together to find out whether dietary supplements can really prevent osteoporosis and, if so, how much supplementation

is needed. They looked for trials that tested what happens when people over the age of 50 take calcium supplements, with or without vitamin D, to try to prevent osteoporosis. The trials had to have found out how many people went on to have fractures, or at least measured the participants' bone-mineral density.

The researchers found 29 trials where almost 64,000 people agreed to be randomised to either take real supplements or fake supplements (placebo). This means the research volunteers in these "randomised controlled trials" did not choose which group they joined: they were given tablets without knowing whether they were really getting extra calcium. Whatever differences there were in their bones at the end of the trial are therefore likely to be because of the differences in the tablets they were taking. In other types of research that are not carried out like this, people who volunteer to take "real" supplements might be more motivated and health-conscious than average. This could influence the results of the research.

The people in the trials were nearly all women. In fact, 92% of the participants were women (92 out of 100). But because so many people participated, there were still thousands of men in the trials: enough for the researchers to be able to show that the results were much the same for men as for women.

The results were clear. People who take these supplements are less likely to lose bone density and their bones are less likely to break. The risk is already reduced within only 3.5 years of taking the supplements, as long as they are taken regularly.

A lower risk of fractured bones

Most of the people who were taking real supplements in the trials had tablets to take every day that contained at least 1,000 mg of calcium. However, not everyone took the tablets very regularly. But even with all the irregular users included, there was an overall reduction in fractures. The number of fractures was researched in over 52,000 people.

People who took real calcium supplements were less likely to fracture their bones. This effect was particularly clear in those over the age of 70 who took the tablets very regularly: an extra 1 out of 30 were spared from having broken bones. In younger people this protective effect was not as apparent, so it is not clear how much they benefit from taking calcium supplements over long

periods of time.

The researchers came to the following conclusions:

- A dose of 1,000 to 1,200 mg calcium a day might be necessary to reduce the risk of fracture, especially if a person's diet is low in calcium.
- Adding less than 800 IU of vitamin D to the calcium might make no difference, but it is also not clear if higher doses of vitamin D will improve the results (IU = international units; an internationally defined measurement for the amount of a substance).
- People at higher risk of fractures benefit more from calcium supplements. That includes people who are much older than 50, people who have a lower body weight, those who have less calcium in their diets or people who are living in institutions.
- People who take supplements have higher bone density in their hips and spines.
- Both women and men benefit from calcium supplementation.

How much might be too much

This research did not look at the issues of safety and adverse effects. The level of 1,000 to 1,200 mg is around the recommended daily level of intake for calcium in Europe and the USA. But, of course, the calcium taken in a supplement is additional to the calcium that people are getting in their diets. The people in these trials had varying amounts of calcium in their diets. European authorities recommend that adults do not have more than a total of 2,500 to 3,000 mg of calcium a day from all sources. The German Federal Institute for Risk Assessment (BfR) has set a recommended level for vitamin D supplements of no higher than 800 IU per day.

One of the trials included in this research is the big American Women's Health Initiative trial in women after the menopause. More than 18,000 women were in the group given daily supplements that included 1,000 mg of calcium plus 400 IU of vitamin D. One adverse effect that the researchers identified was a small increase in kidney stones (renal calculi or hypercalcaemia). Compared to the women taking placebos, that happened to about 4 more women out of every 1,000 women who took the supplements. But the women who developed kidney stones were not necessarily those who had particularly high levels of calcium in their diets.

Researchers from the US government Agency for Health Care Quality and Research concluded that the development of kidney stones is the only potential adverse effect that has been identified in trials. However, the World Health Organization (WHO) has identified kidney stones as a possible effect of high vitamin D intake. If you are concerned about your risk of kidney stones, making sure you drink water regularly might help lower that risk.

You can read more about how much calcium you can get in your diet without supplements and other ways to prevent osteoporosis [here](http://www.informedhealthonline.org/index.423.en.html) (URL: <http://www.informedhealthonline.org/index.423.en.html>) . Researchers are also still studying whether or not calcium supplements might be able to prevent bowel (colorectal) cancer. You can read about the research into that [here](http://www.informedhealthonline.org/index.88.en.html) (URL: <http://www.informedhealthonline.org/index.88.en.html>) .

Author: German Institute for Quality and Efficiency in Health Care (IQWiG)

Glossary

calcium

Calcium is an important mineral for human health. It is one of the building blocks for bones and teeth, and it is necessary for blood clotting, the muscles and the nerves. Calcium occurs in milk and milk products, as well as in green leafy vegetables. People can get a calcium deficiency if they have a chronic inflammatory bowel disease, as well as in pregnancy or during breastfeeding.

World Health Organization (WHO)

The World Health Organization is a United Nations agency. Based in Geneva, it is concerned with matters of public health on an international level. Its objective is to obtain the highest possible level of health for all people worldwide. Health is understood here as being a “state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”. To reach this aim the WHO develops guidelines and standards in health-related areas, coordinates activities in the fight against infectious diseases, launches global vaccination programs and analyzes health and disease data worldwide. More information is available at www.who.int.

dietary supplement

Dietary supplements (also known as food supplements or nutritional supplements) are concentrated vitamins, minerals, trace elements, fibers and/or other substances that are intended to supplement the diet. Advocates of dietary supplements claim that they have a certain, often preventive or strengthening effect on the body. They are available as capsules, pills, powder or ampules, for example. From a legal point of view, dietary supplements rank among foods and therefore – as opposed to medications – do not need official approval. More information is available on the website of the German Federal Institute for Risk Assessment (Bundesinstitut für Risikobewertung, BfR): [To the BfR website \(in English\)](#)

Sources

Cranney A, Horsley T, O'Donnell S, Weiler H et al. *Effectiveness and safety of vitamin D in relation to bone health. Evidence Report/Technology Assessment Number 158*. Rockville: Agency for Healthcare Research and Quality (AHRQ). August 2007. [Full text (URL: <http://www.ahrq.gov/downloads/pub/evidence/pdf/vitamind/vitad.html>)]

German Federal Institute for Risk Assessment (BfR). *Use of Minerals in Foods*. Berlin: BfR. 2004. [Full text (URL: http://www.bfr.bund.de/cm/238/use_of_minerals_in_foods.html)]

German Federal Institute for Risk Assessment (BfR). *Use of Vitamins in Foods*. Berlin: BfR. 2004. [Full text (URL: http://www.bfr.bund.de/cm/238/use_of_vitamins_in_foods.html)]

Huang HY, Caballero B, Chang S, Alberg A et al. *Multivitamin/mineral supplements and prevention of chronic disease. Evidence Report/Technology Assessment Number 139*. Rockville: Agency for Healthcare Research and Quality (AHRQ). May 2006. [Full text (URL: <http://www.ahrq.gov/downloads/pub/evidence/pdf/multivit/multivit.html>)]

Tang BMP, Eslick GD, Nowson C, Smith C, Bensoussan A. Use of calcium or calcium in combination with vitamin D supplementation to prevent fractures and bone loss in people aged 50 years and older: a meta-analysis. *Lancet* 2007; 370: 657-666. [PubMed summary (URL: <http://www.ncbi.nlm.nih.gov/pubmed/17720017?dopt=Abstract>)]

World Health Organization (WHO) and Food and Agriculture Organization (FAO) of the United Nations. *Vitamin and mineral requirements in human nutrition*. 2nd edition. Geneva: United Nations. 2004. [Full text (URL: <http://whqlibdoc.who.int/publications/2004/9241546123.html>)]

The German Institute for Quality and Efficiency in Health Care (IQWiG)

The German Institute for Quality and Efficiency in Health Care (IQWiG) was established by legislation to provide evaluations of the effectiveness, quality and efficiency of healthcare services. This includes the assessment of medicines as well as the publication of health information for consumers and patients.

Evidence basis of our health information

Our information is based primarily on systematic reviews of the effects of health care. Systematic reviews are necessary to gain an objective picture of health care. In order to do this, a clear question is formulated. Researchers then find all the relevant studies that could answer this question. They then evaluate those studies.

You can find a list of the evidence and other scientific literature on which this information is based at **www.informedhealthonline.org**

Disclaimer

This information was prepared and published by the German Institute for Quality and Efficiency in Health Care (IQWiG). It is based on the evidence and other scientific literature available at the time of publication. The information is intended for the use of patients in Germany. It is not intended to for use to diagnose illnesses and the information is not intended to substitute for medical advice.