



Osteoporosis Overview

National Institutes of Health Osteoporosis and Related Bone Diseases National Resource Center

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Osteoporosis, or porous bone, is a disease characterized by low bone mass and structural deterioration of bone tissue, leading to bone fragility and an increased risk of fractures of the hip, spine, and wrist. Men as well as women are affected by osteoporosis, a disease that can be prevented and treated. In the United States, more than 53 million people either already have osteoporosis or are at high risk due to low bone mass.

What is bone?

Bone is living, growing tissue. It is made mostly of collagen, a protein that provides a soft framework, and calcium phosphate, a mineral that adds strength and hardens the framework.

This combination of collagen and calcium makes bone both flexible and strong, which in turn helps bone to withstand stress. More than 99 percent of the body's calcium is contained in the bones and teeth. The remaining 1 percent is found in the blood.

Throughout one's lifetime, old bone is removed and new bone is added to the skeleton. During childhood and teenage years, new bone is added faster than old bone is removed. As a result, bones become larger, heavier, and denser. Bone formation outpaces resorption until peak bone mass (maximum bone density and strength) is reached, typically by the late 20s. After that time, bone resorption slowly begins to exceed bone formation.

For women, bone loss is fastest in the first few years after menopause, and it continues into the postmenopausal years. Osteoporosis – which mainly affects women but may also affect men – will develop when bone loss occurs too quickly or when bone formation occurs too slowly. Osteoporosis is more likely to develop if you did not reach optimal peak bone mass during your bone-building years.

Risk factors

Certain risk factors are linked to the development of osteoporosis and contribute to an individual's likelihood of developing the disease. Many people with osteoporosis have several risk factors, but others who develop the disease have no known risk factors. Some risk factors cannot be changed, but you can change others.

Risk factors you cannot change:

- **Sex.** Your chances of developing osteoporosis are greater if you are a woman. Women have less bone tissue and lose bone faster than men because of the changes that happen with menopause.
- **Age.** The older you are, the greater your risk of osteoporosis. Your bones become thinner and weaker as you age.
- **Body size.** Small, thin-boned women are at greater risk.
- **Ethnicity.** White and Asian women are at highest risk. African American and Hispanic women have a lower but significant risk.
- **Family history.** Fracture risk may be due, in part, to heredity. People whose parents have a history of fractures also seem to have reduced bone mass and may be at risk for fractures.

Risk factors you can change:

- **Sex hormones.** Abnormal absence of menstrual periods (amenorrhea), low estrogen level (menopause), and low testosterone level in men can bring on osteoporosis.
- **Anorexia nervosa.** Characterized by an irrational fear of weight gain, this eating disorder increases your risk for osteoporosis.
- **Calcium and vitamin D intake.** A lifetime diet low in calcium and vitamin D makes you more prone to bone loss.
- **Medication use.** Long-term use of certain medications, such as glucocorticoids and some anticonvulsants, can lead to loss of bone density and fractures.
- **Lifestyle.** An inactive lifestyle or extended bed rest tends to weaken bones.
- **Cigarette smoking.** Smoking is bad for bones as well as the heart and lungs.
- **Alcohol intake.** Excessive consumption of alcohol increases the risk of bone loss and fractures.

Prevention

To reach optimal peak bone mass and continue building new bone tissue as you age, you should consider several factors.

Calcium. An inadequate supply of calcium over a lifetime can contribute to the development of osteoporosis. Many published studies show that low calcium intake appears to be associated with low bone mass, rapid bone loss, and high fracture rates. National nutrition surveys show that many people consume less than half the amount of calcium recommended to build and maintain healthy bones. Food sources of calcium include low-fat dairy products, such as milk, yogurt, cheese, and ice cream; dark green, leafy vegetables, such as broccoli, collard greens, bok choy, and spinach; sardines and salmon with bones; tofu; almonds; and foods fortified with calcium, such as orange juice, cereals, and breads. Depending on how much calcium you get each day from food, you may need to take a calcium supplement.

Calcium needs change during one's lifetime. The body's demand for calcium is greater during childhood and adolescence, when the skeleton is growing rapidly, and during pregnancy and breastfeeding. Postmenopausal women and older men also need to consume more calcium.

Recommended calcium intakes

Life-stage group	mg/day
Infants 0 to 6 months	200
Infants 6 to 12 months	260
1 to 3 years old	700
4 to 8 years old	1,000
9 to 13 years old	1,300
14 to 18 years old	1,300
19 to 30 years old	1,000
31 to 50 years old	1,000
51- to 70-year-old males	1,000
51- to 70-year-old females	1,200
>70 years old	1,200
14 to 18 years old, pregnant/lactating	1,300
19 to 50 years old, pregnant/lactating	1,000

Source: Food and Nutrition Board, Institute of Medicine, National Academy of Sciences, 2010.

Also, as you age, your body becomes less efficient at absorbing calcium and other nutrients. Older adults also are more likely to have chronic medical problems and to use medications that may impair calcium absorption.

Vitamin D. Vitamin D plays an important role in calcium absorption and bone health. Food sources of vitamin D include egg yolks, saltwater fish, and liver. Many people obtain enough vitamin D naturally; however, studies show that vitamin D production decreases in older adults, in people who are housebound, and for people in general during the winter. Adults should have vitamin D intakes of 600 IU (International Units) daily up to age 70. Men and women over age 70 should increase their uptake to 800 IU daily.

Exercise. Like muscle, bone is living tissue that responds to exercise by becoming stronger. Weight-bearing and resistance exercises are the best for your bones. Examples of weight-bearing exercises include walking, hiking, jogging, climbing stairs, playing tennis, and dancing. Resistance exercises include lifting weights and using weight training machines.

Smoking. Smoking is bad for your bones as well as your heart and lungs. Women who smoke have lower levels of estrogen compared with nonsmokers, and they often go through menopause earlier. Smokers also may absorb less calcium from their diets.

Alcohol. Regular consumption of 2 to 3 ounces a day of alcohol may be damaging to the skeleton, even in young women and men. Those who drink heavily are more prone to bone loss and fracture, because of both poor nutrition and increased risk of falling.

Medications that cause bone loss. Several medications can contribute to bone loss. For example, the long-term use of glucocorticoids (medications prescribed for a wide range of diseases, including arthritis, asthma, Crohn's disease, lupus, and other diseases of the lungs, kidneys, and liver) can lead to a loss of bone density and fracture.

Bone loss also can result from long-term treatment with certain antiseizure drugs, such as phenytoin (Dilantin)¹ and barbiturates; gonadotropin-releasing hormone (GnRH) drugs used to treat endometriosis; excessive use of aluminum-containing antacids; certain cancer treatments; and excessive thyroid hormone. It is important to discuss the use of these drugs with your doctor and not to stop or change your medication dose on your own.

Symptoms

Osteoporosis is often called a silent disease because bone loss occurs without symptoms. People may not know that they have osteoporosis until their bones become so weak that a sudden strain, bump, or fall causes a hip to fracture or a vertebra to collapse. Collapsed vertebrae may initially be felt or seen in the form of severe back pain, loss of height, or spinal deformities such as kyphosis (severely stooped posture).

Detection

Following a comprehensive medical assessment, your doctor may recommend that you have your bone mass measured. A bone mineral density (BMD) test is an important measure of your bone health. BMD tests can identify osteoporosis, determine your risk for fractures (broken bones), and measure your response to osteoporosis treatment. The most widely recognized BMD test is a central dual-energy x-ray absorptiometry, or central DXA test. It is painless – a bit like having an x-ray, but with much less exposure to radiation. It can measure bone density at your hip and spine. BMD tests can:

- Detect low bone density before a fracture occurs.
- Confirm a diagnosis of osteoporosis if you already have one or more fractures.
- Predict your chances of fracturing in the future.
- Determine your rate of bone loss, and monitor the effects of treatment if the test is conducted at intervals of a year or more.

¹ Brand names included in this publication are provided as examples only, and their inclusion does not mean that these products are endorsed by the National Institutes of Health or any other government agency. Also, if a particular brand name is not mentioned, this does not mean or imply that the product is unsatisfactory.

Treatment

A comprehensive osteoporosis treatment program includes a focus on proper nutrition, exercise, and safety issues to prevent falls that may result in fractures. In addition, your doctor may prescribe a medication to slow or stop bone loss, increase bone density, and reduce fracture risk.

Nutrition. The foods we eat contain a variety of vitamins, minerals, and other important nutrients that help keep our bodies healthy. All of these nutrients are needed in balanced proportion. In particular, calcium and vitamin D are needed for strong bones and for your heart, muscles, and nerves to function properly. (See “Prevention” section for recommended amounts of calcium.)

Exercise. Exercise is an important component of an osteoporosis prevention and treatment program. Exercise not only improves your bone health, but it increases muscle strength, coordination, and balance, and leads to better overall health. Although exercise is good for someone with osteoporosis, it should not put any sudden or excessive strain on your bones. As extra insurance against fractures, your doctor can recommend specific exercises to strengthen and support your back.

Therapeutic medications. Several medications are available for the prevention and/or treatment of osteoporosis, including: bisphosphonates; calcitonin; estrogen (hormone therapy); estrogen agonists/antagonists (also called selective estrogen receptor modulators or SERMs); parathyroid hormone (PTH) analog; parathyroid hormone-related protein (PTHrp) analog; RANK ligand (RANKL) inhibitor; and tissue-selective estrogen complex (TSEC).

Fall prevention

Preventing falls is a special concern for men and women with osteoporosis. Falls can increase the likelihood of fracturing a bone in the hip, wrist, spine, or other part of the skeleton. In addition to the environmental factors listed in this section, falls can also be caused by impaired vision or balance, chronic diseases that affect mental or physical functioning, and certain medications, such as sedatives and antidepressants. It is important that individuals with osteoporosis be aware of any

physical changes that affect their balance or gait, and that they discuss these changes with their health care provider. Here are some tips to help eliminate the environmental factors that lead to falls.

Outdoors:

- Use a cane or walker for added stability.
- Wear rubber-soled shoes for traction.
- Walk on grass when sidewalks are slippery.
- In winter, carry salt or kitty litter to sprinkle on slippery sidewalks.

Indoors:

- Keep rooms free of clutter, especially on floors.
- Keep floor surfaces smooth but not slippery.
- Wear supportive, low-heeled shoes even at home.
- Avoid walking in socks, stockings, or slippers.
- Be sure carpets and area rugs have skid-proof backing or are tacked to the floor.
- Be sure stairwells are well lit and that stairs have handrails on both sides.
- Install grab bars on bathroom walls near the tub, shower, and toilet.
- Use a rubber bath mat in the shower or tub.
- Keep a flashlight with fresh batteries beside your bed.
- If using a step stool for hard-to-reach areas, use a sturdy one with a handrail and wide steps.
- Add ceiling fixtures to rooms lit by lamps.
- Consider purchasing a cordless phone so that you don't have to rush to answer the phone when it rings, or so that you can call for help if you do fall.
- Be careful on highly polished floors that become slick and dangerous when wet.
- Use plastic or carpet runners when possible.

Resource

For more information on osteoporosis, contact the:
NIH Osteoporosis and Related Bone Diseases National Resource Center
Website: <https://www.bones.nih.gov>

If you need more information about available resources in your language or another language, please visit our website or contact the NIH Osteoporosis and Related Bone Diseases ~ National Resource Center.

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For your information

This publication contains information about medications used to treat the health condition discussed here. When this publication sheet was developed, we included the most up-to-date (accurate) information available. Occasionally, new information on medication is released.

For updates and for any questions about any medications you are taking, please contact the U.S. Food and Drug Administration toll free at 888-INFO-FDA (463-6332) or visit its website at <https://www.fda.gov>. For additional information on specific medications, visit Drugs@FDA at <https://www.accessdata.fda.gov/scripts/cder/daf>. Drugs@FDA is a searchable catalog of FDA-approved drug products.

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