



Know and reduce your risk of osteoporosis

Find out how you can help build and maintain strong bones



Osteoporosis – you can make a difference



The ability to recognize and control risk factors has become a corner stone of modern medicine. Management of high blood pressure and serum cholesterol has helped reverse the growing number of deaths due to cardiovascular disease and stroke in developed countries. This is largely because people have adopted exercise, healthier diets, and in some cases, prescription medication to help lower blood cholesterol and blood pressure. Osteoporosis can be fought in a similar manner.

Osteoporosis is a chronic, debilitating disease whereby the mass and quality of bone are reduced. The bones become porous and fragile, the skeleton weakens, and the risk of fractures greatly increases. The loss of bone occurs “silently” and progressively, often without symptoms until the first fracture occurs, most commonly at the wrist, spine or hip. Osteoporotic fractures negatively affect quality of life and often result in pain, loss of function and, in the worse cases, death. The impact of the disease on relatives should not be ignored, as they must devote time and energy helping a family member who lacks autonomy.

Approximately one out of three women over 50 will have a fracture due to osteoporosis (more than breast cancer) as will one out of five men over 50 (more than prostate cancer).

Critical years for building bone mass are during childhood and adolescence, when

new bone is formed more quickly than old bone is removed, causing bones to become larger and denser. This pace continues until around the mid 20's when maximum bone density is normally reached. Bone tissue loss generally begins after the age of about 40.

Over the last few decades, doctors and researchers have compiled vast amounts of information on osteoporosis risk factors. Many of these factors can be reduced by individual action, and those that cannot be reduced through lifestyle changes can be lessened by taking measures to increase bone health.

Modifiable Risks

- Alcohol
- Smoking
- Low body mass index
- Poor nutrition
- Eating disorders
- Insufficient exercise
- Low dietary calcium intake
- Vitamin D deficiency
- Frequent falls

Fixed Risks

- Age
- Female gender
- Family history
- Previous fracture
- Race/ethnicity
- Menopause/hysterectomy
- Long term glucocorticoid therapy
- Primary/secondary hypogonadism in men

Know your risk factors

Risk factors fall into two main categories, modifiable, which are those we can change, and fixed, those we can't change. Though there is no way to control the fixed risk factors, which include age, gender, and family history, there are strategies that can lessen their effect.

Bone mineral density (BMD) is an important indicator of a person's risk of bone fracture. In fact, measuring BMD by Dual energy X-ray absorptiometry (DXA) is presently the only reliable test for diagnosing osteoporosis.

A bone mineral density scan is a simple, painless, non-invasive procedure, and should be considered as useful as blood pressure, blood cholesterol and other routine physical

tests that can help prevent disease and mortality. People, especially the elderly, who have many modifiable or fixed risk factors, should consult with their doctor about having a BMD scan. The BMD result is an important basis from which to discuss potential changes to lifestyle and potential treatments.

Modifiable risk factors are mainly the result of unhealthy diet or lifestyle choices. They include poor nutrition, low body mass index, eating disorders, alcohol, smoking, and insufficient exercise.

Fixed risk factors include gender, age, family history, the presence of a previous fracture, race or ethnicity, and the onset of menopause or a history of hysterectomy.



Do you know your osteoporosis risk factors?

All these behaviours are clinically-proven osteoporosis risk factors. The good news is that osteoporosis risk can be reduced by positive lifestyle choices, and the disease can be easily diagnosed and effectively treated. For more information on your personal risk, take the IOF One-Minute Osteoporosis Risk Test on page 11.

Modifiable Risk Factors

Most modifiable risk factors directly impact bone biology and result in a decrease in bone mineral density (BMD), but some of them also increase the risk of fracture independently of their effect on bone itself.

Alcohol

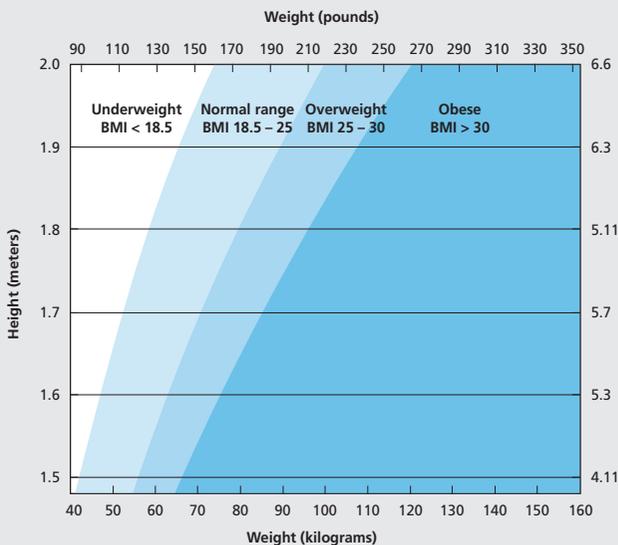
Studies have shown that more than two units of alcohol per day can increase the risk of osteoporotic and hip fractures in both men and women. More than four units of alcohol per day can double the fracture risk. While some of this increased risk is due to decreased bone mineral density, which may be a result of a toxic effect of alcohol on the bone forming cells, some of the risk is also due to other poorly understood factors, which may include general deteriorating health and the increased likelihood of falling, especially in the elderly.

Smoking

Smoking also increases the risk of osteoporotic fractures. Studies of nearly 60,000 people in Canada, U.S.A., Europe, Australia and Japan show that smoking increases the risk of hip fracture by up to 1.5 times. Although the risk of fracture from smoking increases with age, cigarette smoke has an early effect on bones. Studies carried out in Sweden showed that young male smokers, 18-20 years old, have reduced bone mineral density and an increased risk of osteoporosis later in life.

Low Body Mass Index

The body mass index, or BMI, is a measure of how lean someone is and can be used as a guide to measure his or her osteoporosis risk. (See below to determine how to measure BMI). Doctors believe that a BMI of 20 to 25 is ideal. Anyone with a BMI of 25 or



Body Mass Index (metric and imperial)

How to calculate Body Mass Index (BMI)

Body mass index (BMI) is a measure of body fat based on height and weight that applies to both adult men and women.

BMI Categories:

- Underweight = below 18.5
- Normal weight = 18.5-24.9
- Overweight = 25-29.9
- Obesity = 30 or greater



higher is considered overweight, and anyone with a BMI over 30 is considered obese. BMI below 19 is considered underweight and a risk factor for osteoporosis.

Poor nutrition increases osteoporosis risk

A low BMI is often associated with poor nutrition. Poor nutrition can also affect bone health, particularly when diets are insufficient in calcium. Calcium is an essential part of bone mineral and it is also important for muscles, nerves and other cells in the body. To measure your calcium intake, go to the calcium calculator on the IOF website www.iofbonehealth.org

Vitamin D is also essential, since it helps calcium absorption from the intestines into the blood. At least 800 international units of vitamin D and 1,000 to 1,200 mg of calcium daily can protect against osteoporosis. In children and adults, casual exposure of the face, hands and arms for as little as 10-to-15 minutes a day outside peak sunlight hours (before 10am and after 2pm) is usually sufficient vitamin D for most people.



Getting Enough Calcium?

Recommended daily allowance	(mg)
Women, premenopause	1000
Women, postmenopause	1300
Men, 19 to 65	1000
Men, over 65	1300
Adolescents, 10 to 18	1300

Foods rich in calcium	(mg)
Milk (250 ml/8.75fl oz)	297
Low Fat Yoghurt (150 g/5 oz)	243
Cheese (cheddar type-40 g)	296
Steamed Tofu (100 g/3.5 oz)	510
Curly Kale (112 g/4 oz)	168
Figs (4 fruit/220 g)	506
Sardines (in oil, 100 g/4 fish)	500
Peeled Orange	75
Almonds (26 g/12 whole)	62
Broccoli (112 g/4 oz)	45

Data from "Bone Appetit,"
IOF Popular Report 2006

Studies have also shown that protein intake can help maintain healthy bones. Elderly men and women with lower intake of protein have greater hip and vertebral loss than those who eat higher amounts of protein. There are many good sources of protein, of both animal and vegetable origin. Lean red meat, poultry and fish are excellent sources of animal protein, as are eggs and dairy foods. Vegetable sources of protein include pulses, nuts, grains and soya products.



Eating disorders

Eating disorders such as anorexia and bulimia can dramatically reduce calcium intake and accelerate mineral loss from bone. The extreme weight loss caused by anorexia and bulimia affect women's ovaries, which stop producing hormones. Estrogen deficiency in younger women contributes to bone loss in much the same way that estrogen deficiency after menopause does.

The earlier in life these disorders strike and the longer they go untreated, the more severe the bone loss that may occur. Anorexia patients with an average illness duration of about six years are found to have an annual fracture rate seven times greater than that of healthy women of the same age. Osteoporosis develops in about 35 to 50 percent of cases of anorexia.

Insufficient exercise

People who regularly exercise are less likely to have a hip fracture than those with a sedentary lifestyle. Women who sit for more than nine hours a day are 50% more likely to have a hip fracture than those who sit for less than six hours a day. Higher levels of leisure time, sporting activities and

household chores, and fewer hours of sitting each day were associated with a significantly reduced relative risk for hip fracture.

Bones respond

when they are "stressed," in other words, when they are forced to bear more weight than they are used to. This can be achieved by "weight bearing" or impact exercises such as walking, running, lifting weights, jumping, or dancing.

Frequent falls

While some diseases can affect the dynamics of bone biology and lead to a weakening of the bone matrix, other diseases can increase the risk for fracture by increasing the likelihood of falls. Some of these factors, such as short-sightedness, may appear innocuous; others can be life-threatening, such as Alzheimer's disease and other neurological diseases. Other factors that can precipitate a fall include environmental hazards, such as slippery or uneven walkways and obstacles underfoot. These can pose a serious risk for fracture, especially for the elderly. Medications with sedative properties or that affect balance should also be considered risk factors for hip, wrist, and other fractures. Many of these risk factors have synergistic effects. Muscle weakness reduces balance, for example, which makes it harder for people to negotiate hazards on sidewalks or in the home.

Fixed Risk Factors



Although fixed risk factors cannot be changed, we need to be aware of them so we can take steps to reduce bone mineral loss.

Age

Ninety percent of hip fractures occur in people aged 50 and older. This is partly because of reduced bone mineral density. But age can also be a risk factor that is independent of bone mineral density. In other words, older adults with normal BMD are more likely to suffer a fracture than younger people. Elderly people need to be aware not only of the possibility of having weaker bones, but also of the increased likelihood of sustaining a fracture from a fall.

Gender

Women, particularly post-menopausal women, are more susceptible to bone loss than men because their bodies produce less

estrogen. This hormone supports bone formation. Careful monitoring of bone mineral density in post-menopausal women, combined with weight bearing exercise, proper diet, and control of other risk factors can help fight osteoporosis.

Although women are more likely to sustain an osteoporotic fracture, men are not spared from osteoporosis. Some 20-25 percent of all hip fractures occur in men and they have higher rates of fracture-related mortality than women.

Family history

Scientists are uncovering subtle variations in the human genetic code that make some people more susceptible to bone loss than others. In fact, parental history of fracture is a fixed risk factor that is independent of bone mineral density, suggesting that there are additional factors beyond bone health that make people susceptible to fracture.

Previous fracture

Recently, combined analysis of multiple, worldwide studies have shown that people with a prior osteoporotic fracture have an increased risk of any type of fracture compared to people who have never had a broken bone. This is true for both men and women, with both



genders almost twice as likely to have a second fracture compared to people who are fracture free. While the reason a history of prior fracture should increase the risk of future fractures is not clear, it may be related to an increased propensity to fall or poor ability to protect oneself from injury.

Race/ethnicity

The genetics of osteoporosis are also reflected in the fact that different ethnicities and races have varying susceptibilities to the condition. The disease is more common in Caucasian and Asian populations, and the incidence of hip and spine fracture is lower in Africans than Caucasians. Possible bone structure differences such as greater peak bone mass, a slower rate of bone loss after menopause, and better quality of bone microarchitecture may explain such differences. However, further studies and research are needed.

Menopause/hysterectomy

Loss of estrogen leads to an increase in bone remodeling. In elderly people this remodeling predominantly

results in bone loss rather than formation. Hysterectomy, if accompanied by removal of the ovaries, may also increase the risk for osteoporosis because of estrogen loss. Postmenopausal women, and those who have had their ovaries removed, must be particularly vigilant about their bone health. While hormone replacement therapy may help prevent loss of bone mineral, these treatments can also increase the risk of heart disease and cancer.

Primary/secondary hypogonadism in men

Androgens are needed in the development of peak bone mass and to maintain bone mass. Hypogonadal young men with low testosterone levels have low bone density, which can be increased through testosterone replacement therapy. At any age, acute hypogonadism, such as that resulting from orchiectomy for prostate cancer, accelerates bone loss to a similar rate as seen in menopausal women. The bone loss following orchiectomy is rapid for several years, which then reverts to the gradual loss that normally occurs with aging.



Secondary Risk Factors

Secondary risk factors are less common but they can have a significant impact on bone health and fracture incidence. These risk factors include other diseases that directly or indirectly affect bone remodeling. In addition, conditions that affect mobility and balance can contribute to the increased risk of falling and sustaining a fracture.

Medical treatments affecting bone health

Some medication may have side effects that directly weaken bone or increase the risk of fracture due to fall or trauma. Patients taking any of the following medication should consult with their doctor about increased risk to bone health:

- Glucocorticosteroids – oral or inhaled
- Certain immunosuppressants (calcmodulin/calcineurine phosphatase inhibitors)
- Thyroid hormone treatment (L-Thyroxine)
- Certain steroid hormones (medroxyprogesterone acetate, leutenising hormone releasing hormone agonists)
- Aromatase inhibitors
- Certain antipsychotics
- Certain anticonvulsants
- Certain antiepileptic drugs
- Lithium
- Methotrexate
- Antacids
- Proton pump inhibitors



Disorders that affect the Skeleton

- Asthma
- Nutritional/gastrointestinal problems (Crohn's disease etc.)
- Rheumatoid arthritis
- Hematological disorders/malignancy
- Some inherited disorders
- Hypogonadal states (Turner syndrome/ Klinefelter syndrome, amenorrhea etc.)
- Endocrine disorders (Cushing's syndrome, hyperparathyroidism, diabetes, etc.)
- Immobility
- Certain drugs

Actions to keep bones healthy

Because risk factors vary by age and from person-to-person, there is no one-size-fits-all solution for preventing osteoporosis. Instead, you need to consider your situation and consult with your doctor to adopt a diet, exercise plan and lifestyle that maximizes bone health.

Recognizing osteoporosis risk factors early in life and taking appropriate action can have enormous positive impact on bone health in later years. Young people should focus on building the peak bone mass that will keep them in good stead for the rest of their lives. A diet rich in calcium and vitamin D (which can also be obtained from sunlight) and weight-bearing exercise help promote bone mineral density. Smoking, alcohol, and undernourishment should be avoided. Over-exercising in young girls can lead to menstrual irregularities, which are due to an imbalance in hormone production, including reduced secretion of estrogen, by the ovaries.

A regular, well structured exercise regimen has been demonstrated to help protect against osteoporosis, osteoporosis-related fractures, and can also help in rehabilitation in adulthood. Exercises that improve posture and balance will help protect from falls and reduce the likelihood of having a first, or further bone fractures.

Pre-menopausal women and middle-aged men should strive to maintain their bone health by adopting good lifestyle choices and monitoring their secondary risk factors. People should be encouraged to take the IOF One-Minute Osteoporosis Risk Test (see page 11).

Risk factors also change with age. As people get older they should consider age-specific risk factors and continue to take appropriate steps, such as fall prevention, to keep their bones healthy and fracture free.

Post-menopausal women are at the stage in life when they are at greatest risk of osteoporosis. They need to be aware of any special risk factors and consult with their doctor about taking routine bone mineral density tests. Diet and exercise are as important as ever.

Men share some of the same risk factors as women. In addition, waning testosterone levels can lead to osteoporosis in men in a similar way to menopause in women. Men can get more detailed information from the 2004 IOF Thematic Report "Osteoporosis in Men" (www.iofbonehealth.org).

People who have had a previous fracture after 50 years of age should be particularly



careful, because a history of fracture increases the risk of further bone damage.

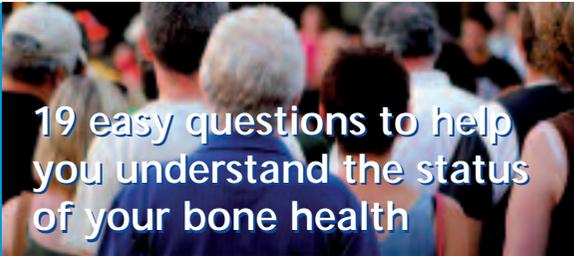
Elderly people may want to consider hip protectors, and should pay particular attention to conditions that might lead to falls. Exercise becomes critical for the muscle strength and physical balance necessary to protect against falls.

If needed, there are prescription medicines available, such as bisphosphonates, parathormone, SERMs and strontium ranelate, to be taken in combination with calcium and vitamin D supplements, to help prevent bone loss.

Be proactive – fight osteoporosis

Knowing the risks is the first step in the fight against osteoporosis. People who believe they are at increased risk because of one or more modifiable or fixed risk factors, need to work with their doctor to develop a strategy to prevent osteoporosis and keep their bones healthy.

Remember, secondary risk factors, including other diseases and medication, can lead to osteoporosis. People who are concerned about osteoporosis should seek advice from their healthcare provider.



19 easy questions to help you understand the status of your bone health

Are you among the one in three women, and the one in five men around the world who will be affected by osteoporosis?

Osteoporosis weakens bones and causes fractures which can result in severe disability.

Take this IOF One-Minute Osteoporosis Risk Test and find out if you are at risk.

What you cannot change – your family history

1. Have either of your parents been diagnosed with osteoporosis or broken a bone after a minor fall (a fall from standing height or less)? yes no
2. Did either of your parents have a "dowager's hump"? yes no

Your personal clinical factors

These are fixed risk factors that one is born with or cannot alter. But that is not to say that they should be ignored. It is important to be aware of fixed risks so that steps can be taken to reduce loss of bone mineral.

3. Are you 40 years old or older? yes no
4. Have you ever broken a bone after a minor fall, as an adult? yes no
5. Do you fall frequently (more than once in the last year) or do you have a fear of falling because you are frail? yes no
6. After the age of 40, have you lost more than 3 cm in height (just over 1 inch)? yes no

7. Are you underweight (is your Body Mass Index less than 19 kg/m²)?
(See: "How to calculate you BMI") yes no
8. Have you ever taken corticosteroid tablets (cortisone, prednisone, etc.) for more than 3 consecutive months (corticosteroids are often prescribed for conditions like asthma, rheumatoid arthritis, and some inflammatory diseases)? yes no
9. Have you ever been diagnosed with rheumatoid arthritis? yes no
10. Have you been diagnosed with an over-reactive thyroid or over-reactive parathyroid glands? yes no

For women:

11. For women over 45: Did your menopause occur before the age of 45? yes no
12. Have your periods ever stopped for 12 consecutive months or more (other than because of pregnancy, menopause or hysterectomy)? yes no
13. Were your ovaries removed before age 50, without you taking Hormone Replacement Therapy? yes no

For men:

14. Have you ever suffered from impotence, lack of libido or other symptoms related to low testosterone levels? yes no

What you can change – your lifestyle factors

Modifiable risk factors which primarily arise because of diet or lifestyle choices.

15. Do you regularly drink alcohol in excess of safe drinking limits (more than 2 units a day)? yes no
16. Do you currently, or have you ever, smoked cigarettes? yes no
17. Is your daily level of physical activity less than 30 minutes per day (housework, gardening, walking, running etc.)? yes no
18. Do you avoid, or are you allergic to milk or dairy products, without taking any calcium supplements? yes no
19. Do you spend less than 10 minutes per day outdoors (with part of your body exposed to sunlight), without taking vitamin D supplements? yes no

If you answered "yes" to any of these questions, it does not mean that you have osteoporosis. Diagnosis of osteoporosis can only be made by a physician through a bone density test. We recommend that you show this test to your doctor, who will

advise whether further tests are necessary. The good news is that osteoporosis can be diagnosed easily and treated. Talk to your local osteoporosis society about what changes you might make in your lifestyle to reduce your osteoporosis risk.

The International Osteoporosis Foundation (IOF) is an independent non-profit, non-governmental organization dedicated to the worldwide fight against osteoporosis. For further information, and for contact details for national osteoporosis societies worldwide, visit IOF's website at www.iofbonehealth.org

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