

## What is osteoporosis?

Osteoporosis is a condition where the bones lose strength and become thin and fragile, increasing the chance of a fracture (a broken bone). This occurs when bones lose mass more quickly than it is replaced, making bones weaker and less dense.

Osteoporosis is very common. Over 1.2 million Australians have been diagnosed with osteoporosis. It is likely the number of affected people is much higher, as osteoporosis can be unrecognised (and therefore untreated) until a bone breaks.

Osteoporosis can occur at any age but becomes more common as people get older. It is most common in postmenopausal women and men over the age of 70 years.

In Australia<sup>1</sup>,

- 1 in 5 women over the age of 50 years has osteoporosis.
- 1 in 20 men over the age of 50 years has osteoporosis.
- 2 in 5 women over the age of 70 years have osteoporosis.
- 1 in 8 men over the age of 70 years has osteoporosis.

Osteoporosis in children (called juvenile osteoporosis) is rare, and most commonly associated with other medical conditions.

## What is osteopenia?

Osteopenia is a Greek word for low bone mass, which is a risk factor for osteoporosis.

In osteopenia, the bones have lost some strength and mass, but not to the same degree as in osteoporosis.

Osteopenia is very common in Australia, and affects half of all men and women over 70 years of age<sup>1</sup>. It is not a disease.



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## What causes osteoporosis?

Bones are made up of proteins (particularly collagen) and minerals (particularly calcium and phosphate), which combine to give bone both flexibility and strength.

Normal healthy bones are constantly remodelled: old bone is removed, and new bone is made. During childhood and adolescence, bones become longer, denser and stronger as new bone is formed faster than it is removed. Across adulthood, bone formation slows. Losing some bone mass and strength is a normal part of ageing.

Osteoporosis develops when bones are broken down too quickly or they are rebuilt too slowly. There are many different reasons why people may develop osteoporosis.

Firstly, the risk for osteoporosis is increased if there is a family history of osteoporosis or fractures (particularly a hip fracture). In other words, genetics play an important role in determining osteoporosis risk.

In women, bone loss happens faster for 5-10 years following menopause, due to a rapid fall in oestrogen levels.

In men, the hormone testosterone plays an important role in keeping bones strong, mainly because some testosterone naturally gets changed into oestrogen. Testosterone levels can fall with age, resulting in loss of bone. Men with low testosterone levels (male hypogonadism) are at increased risk for osteoporosis.

Other risk factors for osteoporosis include:

- Low body weight

- Eating disorders, including anorexia and bulimia
- Lack of weight-bearing exercise / prolonged immobility
- Early menopause (before the age of 45 years)

Medications, particularly:

- Steroid medications such as prednisolone;
- Aromatase inhibitors that dramatically lower oestrogen levels and are used to treat some types of breast cancer; and
- "Androgen deprivation therapy" which may be used to treat men with prostate cancer by reducing testosterone levels.
- Hormone conditions that lead to bone loss (e.g. thyroid disease, overactive thyroid, growth hormone deficiency, primary hyperparathyroidism)
- Medical conditions that limit nutrients being absorbed (e.g. coeliac disease, Crohn's disease, inflammatory bowel conditions)
- Uncontrolled inflammation (such as rheumatoid arthritis or ankylosing spondylitis)
- Chronic kidney or liver disease
- Excessive alcohol consumption
- Smoking

Inadequate calcium and low vitamin D levels may also contribute to osteoporosis. Calcium levels in the blood are critical for many bodily functions, and if there is insufficient calcium in the diet, the body may pull calcium away from the bones (known as secondary hyperparathyroidism). However, calcium and vitamin D (either together or alone) are not adequate or appropriate to treat osteoporosis.

## Symptoms and signs of osteoporosis

There are no specific symptoms caused by osteoporosis. In particular, osteoporosis itself does not cause pain. It is often first diagnosed when a bone breaks (fractures) after minimal trauma. A minimal trauma fracture is defined as one occurring after a fall from a standing height or less. When a fracture occurs after minimal trauma, the chance of another fracture in the future is increased.

The most common fractures with osteoporosis are spine, hip and wrist fractures, although fractures of other bones (e.g. upper arm, pelvis) may occur.

Signs that may indicate a possible spinal fracture due to osteoporosis are: sudden back pain, a height loss of 3cm or more, or the spine developing an abnormal forward curve (called kyphosis).

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## How is osteoporosis diagnosed?

### 1. Fragility fracture

Anyone who has had a fragility or minimal trauma fracture is defined as having osteoporosis. This is true regardless of what the bone density level is (see below).

Fractures of the small bones of the hands or feet, ankles, the sternum, skull or bones of the face are generally not considered osteoporotic fractures.

### 2. Medical History

Your doctor will ask you questions about your general health and medical history, including your other health conditions, medications, family history, fracture history, falls risk, and your current diet and physical activity levels.

### 3. Bone mineral density (BMD) test

Your doctor may test your bone mineral density. The best way to measure this is using a DEXA scan (Dual Energy X-ray Absorptiometry scan). This is a safe, fairly quick (10-15 minutes) and painless imaging procedure. It involves lying fully clothed on a platform while a scanner passes over you to take pictures of your hip and spine. DEXA scans may be repeated as necessary to monitor the condition and response to treatment. The radiation exposure from a DEXA scan is very low – less than one tenth of a standard chest X-ray.

## How is osteoporosis treated?

Treatment plans are tailored to your needs and may include medications to preserve bone health and/or making changes to your lifestyle to prevent bone loss.

### Lifestyle behaviours

Your doctor will discuss some behavioural changes you can make to help preserve or increase your bone strength and slow down the process of bone loss.

### What do the results of the BMD test mean?

Results are generally reported as a T-score. This score compares the measured bone density to that of a healthy 30-year-old. A T score of 0 means you have the same bone density as a healthy 30-year-old, while if it is greater than 0 (for example +1.2) your bone density is above average for a young person. A negative T score means it is below average for a young person. The bottom of the normal range is a T score of -1.

- **T-scores at or above -1.0** indicate normal bone density.
- **T scores between -1.0 and -2.5** indicate osteopenia.
- **T scores at or below -2.5** indicate osteoporosis.

Z scores are also reported. These compare your bone density to a person of the same age as you.

### 4. Blood test

Your doctor may want to undertake blood tests to look for factors that might contribute to bone loss, including measurement of kidney function, vitamin D, calcium, phosphate, thyroid hormones, and sometimes parathyroid hormone. This involves taking a small amount of blood and sending it to a laboratory for testing. Your doctor will discuss the results with you.

These may include changes to your:

**Physical activity** – Exercise is important to keep bones strong and maintain bone density. Exercise also increases muscle strength and improves balance, which are important to avoid falls and fractures. General recommendations for exercise include some weight-bearing exercise (e.g. walking), resistance training (e.g. weights) and exercises that improve balance (e.g. tai chi, gentle yoga). The type of exercise should be tailored to your individual needs and abilities; and discussing a new exercise program with your doctor, accredited exercise physiologist or physiotherapist is a great idea.

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## How is osteoporosis treated? (cont'd)

**Diet** – Including 3 serves of calcium-containing foods every day will help you get enough calcium in your diet. Dairy foods are the best source of calcium and are also an excellent source of protein. Other foods like sardines and bony fish also contain some calcium. Calcium supplementation may be necessary to help you reach the recommended daily intake (1000mg for most adults; 1300mg for women over 50 years and men over 70 years). However, once an adequate calcium intake is achieved, there is little additional benefit to bone health.

For more information about the calcium content of foods, see the calcium fact sheet on the Osteoporosis Australia website.

**Sun exposure/Vitamin D** – For most Australians, the main source of vitamin D is from exposure of the skin to sunlight. However, it is important to balance the need for sunlight for vitamin D against the risk of sun damage to our skin. Vitamin D helps the body absorb calcium. The amount of time in the sun needed to make enough Vitamin D depends on where you live, the season, and your skin type. Your doctor may check your Vitamin D level and may recommend a supplement if levels are too low.

**Smoking** – People who don't smoke have higher bone density than those who do. Quitting smoking can help improve your bone density.

**Alcohol intake** – Reducing your alcohol intake to recommended levels for good health can help bone health.

## Medications

The purpose of medication is to reduce the risk of fractures. This can happen through two possible approaches:

slowing down bone loss to preserve existing bone mass (most medications currently prescribed for osteoporosis work through this mechanism)

building more bone (currently in Australia this approach is limited to people with very severe osteoporosis)

A number of medications are available, and your doctor will discuss the options with you so you can choose one that best suits your situation.

In general, most medication prescribed for osteoporosis approximately halves the risk of a minimal trauma fracture compared with not taking any medication.

The different groups of medications include:

- **Bisphosphonates** – These can be taken as an oral tablet (weekly or monthly) or by an intravenous infusion (usually yearly). Bisphosphonates are taken up into the bone where they switch off the cells that break down bone. Their effects on bone can last past the time they are taken – providing ongoing bone protection.
- **Denosumab** – This therapy acts to slow down bone loss by blocking the cells which break down bone. It is administered as an injection once every 6 months but wears off quite quickly after the six month mark. It is important that denosumab is given on time and not stopped without a plan for alternative treatment as both any improvement in bone density and fracture prevention are rapidly lost after stopping the medication
- **Hormone replacement therapy (HRT)** – This therapy contains oestrogen, which increases calcium absorption, reduces bone loss and helps maintain bone density. It is most suitable for women who are recently post-menopausal and for women less than 60 years.

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## Medications (cont'd)

- **Testosterone therapy** – In men with low testosterone levels, testosterone replacement therapy can improve bone density and strength. This therapy can be administered by injection, or a gel that is rubbed into the skin. However, testosterone therapy has not been shown to prevent fracture.
- **Selective estrogen receptor modulators (SERMs)** – This therapy acts like estrogen in the bone but not in the breast, which makes it a suitable treatment option for women at high risk of breast cancer (SERMs also reduce the risk of breast cancer). SERMs have only been proven to reduce the risk of spinal fractures rather than fractures that occur elsewhere.
- **Teriparatide** – This is a medication containing part of a natural hormone called parathyroid hormone. Unlike the other treatments that work by reducing the breakdown of bone, this works by actively building new bone. It is given by a daily self-injection for a period of 18 months (2 years in some countries). In Australia, the Pharmaceutical Benefit Scheme will only fund this medication for people with more than one fracture and who have continued to fracture despite being on one of the other osteoporosis treatments AND have a very low bone density.

Like any medications, side effects can occur in some people. Serious side effects are mostly associated with long term use. The benefits of treatment far outweigh the risks of rare side effects.

**Medications and dental treatment** – A rare dental complication called osteonecrosis of the jaw (ONJ) can arise in people on some osteoporosis medications, mainly oral or intravenous bisphosphonates and denosumab. Good dental care can make a huge difference to the risk of osteonecrosis, even through simple measures such as good teeth cleaning.

Ideally, people who need dental work, such as extractions (having teeth pulled out), implants or root canal surgery, should have this done before starting these medications. However, the current International Task Force on ONJ does not recommend that everyone must stop taking medications for dental work; rather, if dental work is needed when you are on these medications, this should be discussed beforehand with your dentist and doctor.<sup>2</sup>

## What can I do to help?

Adopting the behaviours listed above into your everyday life can help preserve bone health.

**Make your environment safe** – As osteoporosis causes the bones to become fragile, even a minor fall can result in a broken bone. Making your environment safe is an important way to prevent accidental falls. An occupational therapist can provide practical information and help you adapt your home.

Some strategies to prevent falls include the following:

- Remove or secure rugs, carpets and bathmats.
- Attach handrails to stairs and bathroom fittings.
- Wear your prescription glasses.
- Have regular eye checks.
- Wear flat, comfortable shoes with orthotics if required.
- Use walking aids.
- Keep main walkways inside and outside the house clear.
- Attach non-slip tape to stairs.
- Remove tripping hazards around the house, such as cords and children's toys.
- Keep rooms well lit.
- Correcting vitamin D deficiency.
- Balance training exercises, such as Tai Chi.



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## FAQs about osteoporosis

### *How will having osteoporosis impact my everyday life?*

Finding out you have osteoporosis can be quite alarming. The good news is there are things you can do to avoid a fracture. This may mean regular exercise, reducing alcohol and stopping smoking, increasing calcium-rich foods in your diet, and taking any medication your doctor has prescribed. Preventing falls around your home will also reduce the risk of fractures. This may include removing tripping hazards and attaching handrails inside and outside your home.

### *What is the best type of exercise to do with osteoporosis?*

This will differ for everyone, as your exercise program needs to be tailored for your needs. In general, exercises that promote weight-bearing, balance and strength are recommended. It is best to avoid high impact exercises (e.g. parachute-jumping), and those that require rapid twisting of the spine (e.g. golf), as these can put too much stress and strain on your bones. Your physiotherapist and/or exercise physiologist can help design an exercise program for you.

### *Do bisphosphonates have any side-effects?*

Like most medications, bisphosphonates can have side effects in some people. They can cause indigestion, reflux, diarrhoea, and nausea. Very rarely, long term treatment may cause very rare side effects, such as osteonecrosis of the jaw and atypical fractures of the femur (thigh bone). Duration of treatment depends on several things including your age, why you began the treatment in the first place, how well your bones have responded to treatment and if you have had any fractures while on treatment. Duration of treatment is best discussed with your doctor, who will tailor your osteoporosis treatment to your individual needs.

### *I have already broken a bone. Should I talk to my doctor about osteoporosis?*

Yes, especially if you are over 50 years or have other risk factors for osteoporosis. Osteoporosis can be evaluated and treated even when your bone is still broken. Starting treatment and preventative steps early are important to reduce your chances of breaking another bone.

### *Should I be taking other vitamins or mineral supplements?*

Many vitamins and minerals are important for bone health. The best way to ensure you are getting all the nutrients you need is by having a healthy, balanced diet, which includes fruit and vegetables, dairy products, grains, eggs and meat, and getting out in the sun a little each day. Taking supplements is only helpful if you are not meeting your nutritional needs through your diet or lifestyle. Some supplements can interfere with other medications and medical conditions. It is strongly recommended to discuss any supplements or alternative medicines with your doctor before taking them.

### *I am a vegan. What foods can I eat that contain calcium?*

There are other sources of calcium besides dairy foods. These include fortified almond, soy or rice drinks, extra firm or silken tofu, pulses (beans, chickpeas, lentils), sesame seeds, tahini, kale, bok choy, oats, broccoli and some dried fruits (prunes, figs, raisins, apricots). However, absorption of calcium from these food sources may not be as efficient as from dairy foods – for example, many of these food sources contain oxalates or phytates, both of which interfere with calcium absorption. If you avoid dairy in your diet, it may be appropriate to talk with a dietician about ensuring calcium intake and absorption.

### *Does caffeine increase the risk of fractures?*

The role of caffeine in increasing the risk of fractures is currently unclear.<sup>3</sup> However, the dairy (milk) that many people consume along with their caffeinated drinks (coffee and tea) can provide a rich source of calcium and protein, important for bone health. This likely outweighs any negative effect of caffeine on bone, which – if it exists – is likely to be small.

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## FAQs about osteoporosis (cont'd)

### *I am over 50 and have osteopenia. Do I need medication?*

Generally, people in their fifties who are otherwise healthy will have a low risk of fracture, even if they have osteopenia on a bone density test. It is a good idea to discuss your concerns with your doctor. In addition, your doctor may use an online tool called an absolute fracture risk calculator which may help to predict the likelihood of a fracture based on your age, DEXA results and history of previous fracture. For those without other major risk factors for fracture, lifestyle modification may be the way to go, reserving medication for when a person is older and has a higher absolute fracture risk.

### *Where can I get more information?*

Your doctor/GP (general practitioner)

Find an Endocrinologist: <http://www.hormones-australia.org.au/find-an-endocrinologist/>

Visit Osteoporosis Australia for information about osteoporosis, osteopenia (low bone density) and prevention. Website includes fact sheets, information on diagnosis, tips on calcium /vitamin D / exercise and expert videos: <http://www.osteoporosis.org.au/>

Visit Know Your Bones to self-assess your bone health online. Know Your Bones was developed by Osteoporosis Australia and the Garvan Institute of Medical Research. The self-assessment provides a report and may identify areas of risk, if required the results can be discussed with your doctor. The website is based on key findings from Garvan's long running study of osteoporosis in Australia and helps consumers understand their risk of osteoporosis. Know Your Bones website: <http://www.knowyourbones.org.au/>

The International Osteoporosis Foundation: <https://www.iofbonehealth.org/>

Jean Hailes for Women's Health: <https://jeanhailes.org.au/health-a-z/bone-health/what-is-osteoporosis>

Healthy Male: <https://www.healthymale.org.au/>

### *Where can I go to for support?*

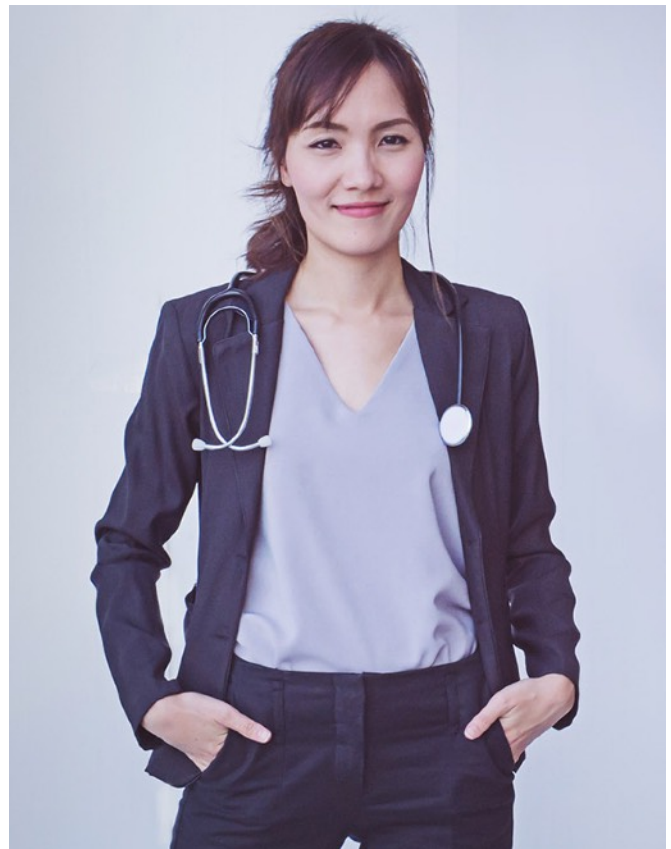
For support groups and resources, see Osteoporosis Australia, the leading consumer body representing people with osteoporosis in Australia: <https://www.osteoporosis.org.au/>

For help with an exercise program, see a physiotherapist or exercise physiologist.

For help with adapting your environment, talk to your doctor about seeing an occupational therapist.

For support with eating and body image disorders, see the Butterfly Foundation: <https://www.thebutterflyfoundation.org.au/>

For support with menopause, see the Australasian Menopause Association: <https://www.menopause.org.au/>



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## When to see your doctor

If you are over 50 and have any risk factors for osteoporosis, you should see your doctor for a check-up. If you are over 50 and have had a bone break from a minor fall, you should discuss osteoporosis and its management with your doctor.

## Questions to ask your doctor

Seeing your doctor or having a medical problem can be stressful. It often takes time for information to sink in and it is very common to feel overwhelmed by what is happening.

Sometimes it helps to write down questions before you go.

Some questions that might be useful for you are:

- Am I at risk of osteoporosis?
- Do I need medication for my osteoporosis?
- Do I need to take supplements? How much do I need?
- What are my choices for medication?
- How long do I need to take my medicines?
- Does my medication have any side effects?
- How often do I need to have a bone mineral density test?
- Where does my bone mineral density test take place? How long does it take?
- What else can I do to make my bones stronger?
- Should I see a physiotherapist?
- Should I see an occupational therapist?



## Common terms and definitions

**Absorption** – (In relation to digestion) The movement of nutrients from the digestive tract into the blood stream.

**Collagen** – A protein that forms the structure of bone.

**Fracture** – A broken bone

**Intravenous infusion** – A liquid medication administered directly into the vein. This is sometimes referred to as a “drip”.

**Male Hypogonadism** – A condition in men where the testes do not function normally, resulting in low testosterone

**Menopause** – The time where a woman stops having menstrual cycles (or periods).

**Vitamin D** – A vitamin (which is also a hormone) that is important for calcium absorption from the gut

## References

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2. Khan AA, Morrison A, Kendler DL, Rizzoli R, Hanley DA, Felsenberg D, et al. Case-Based Review of Osteonecrosis of the Jaw (ONJ) and Application of the International Recommendations for Management From the International Task Force on ONJ. *J Clin Densitom.* 2017;20(1):8-24.
3. Grosso G, Godos J, Galvano F, Giovannucci EL. Coffee, Caffeine, and Health Outcomes: An Umbrella Review. *Annu Rev Nutr.* 2017;37:131-156.

## About this fact sheet

*The content on this page was medically reviewed by Associate Professor Warrick Inder, Prof Emma Duncan, Professor Peter Ebeling and Associate Professor Frances Milat.*

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