

Serve Up



Nutrition and bone health throughout life Fact Sheet

The big 3: key nutrients for building strong bones

1. Calcium

- Vital for strong bones, calcium is a major building block of our skeleton; 99% of the 1 kg of calcium found in the average adult body resides in our bones.
- Bone acts as a reservoir for maintaining calcium levels in the blood, which is essential for healthy nerve and muscle function.
- If you don't supply your body with the calcium it needs, it will respond by taking calcium from your bones and weaken them.
- Certain diseases affect how much calcium is absorbed by the body i.e. Crohn's, coeliac disease, lactose maldigestion and intolerance.
- Milk and other dairy foods are the most readily available sources of calcium.
- Some people have trouble digesting lactose in milk and dairy, but there are other food sources of calcium including green vegetables (e.g., broccoli, curly kale, bok choy); whole canned fish with soft, edible bones such as sardines or pilchards; nuts (almonds and Brazil nuts in particular); and tofu set with calcium.

- The amount of calcium we need to consume varies at different stages in our lives.
- Daily calcium intake recommendations for populations vary between countries but the general consensus is that people are not consuming enough.
- For people who cannot get enough calcium through their diets, supplements may be beneficial. These should be limited to 500-600 mg per day and it is generally recommended that they be taken combined with vitamin D.

2. Vitamin D

- Plays two key roles in the development and maintenance of healthy bones: helps the body absorb calcium from the intestines; ensures correct renewal and mineralization of bone.
- Helps improve muscle strength and balance hence reducing the risk of falls.
- Made in the skin when it is exposed to UV-B rays in sunlight.
- Sunlight does not always promote vitamin D synthesis: the season and latitude, use of sunscreen, city smog, skin pigmentation, a person's age etc., affect how much vitamin D is synthesized in the skin through sunlight.

- Severe deficiency in children can lead to growth retardation and bone deformities known as rickets. Deficiency in adults leads to osteomalacia, which is a 'softening' of the bones due to poor mineralization.
- Low population levels of vitamin D are a cause of concern globally as they can predispose individuals to osteoporosis.
- Dietary sources of vitamin D include: oily fish (e.g., salmon, mackerel and sardines), egg yolk and liver. In some countries milk, margarine and breakfast cereals are fortified with vitamin D.
- Recommended vitamin D intakes vary by age group and needs increase as you age.
- Individuals should try to get 10–20 minutes of sun exposure to bare skin (face, hands and arms) outside peak sunlight hours (before 10 am and after 2 pm) daily – without sunscreen – and taking care not to burn.

3. Protein

- Provides the body with a source of essential amino acids necessary to support the building of bone.
- Insufficient protein intake is detrimental both for the acquisition of peak bone mass during childhood and adolescence – affecting skeletal growth – and for the preservation of bone mass with ageing.
- In older adults, low protein intake is associated with loss of bone mineral density (BMD) – one indicator of bone strength – at the hip and the spine.
- Protein supplementation of hip fracture patients has been shown to reduce post-fracture bone loss, medical complications and rehabilitation hospital stay.
- Protein undernutrition leads to reduced muscle mass and strength which is a risk factor for falls.

The role of micronutrients

- Micronutrients are chemical elements or substances required in trace amounts for the normal growth and development of living organisms.
- There are many micronutrients of importance to bone health with evidence still emerging on their benefits, these include: vitamin K; B vitamins and homocysteine; vitamin A; magnesium; and zinc.

Children and adolescents BUILD maximum peak bone mass

- Critical time for building bone mass as new bone is formed more quickly than old bone is removed causing bones to become larger and denser, this process continues until the mid 20s.
- Building strong bones in early life can make you less vulnerable to osteoporosis in later life.
- A 10% increase in peak BMD may delay the development of osteoporosis by 13 years.

- Approximately half of our bone mass is accumulated during adolescence.
- While genetics contributes up to 80% of the variance in peak BMD, modifiable factors such as diet and physical activity also affect bone mass accrual. Gender and ethnicity also play a role.
- The age of peak calcium accretion is 14 years in boys and 12.5 years in girls.
- Milk and other dairy products are the source of up to 80% of dietary calcium intake for children from the second year of life onwards.
- Children are consuming less milk than they did 10 years ago and this decrease may be related to increased consumption of sweetened beverages.
- Anorexia nervosa negatively impacts BMD and bone strength.
- Overweight and obese children have low bone mass and area for their weight and are more likely to sustain repeated fracture at the wrist than normal-weight children.
- A healthy body weight during childhood and adolescence contributes to optimal bone health.

Adults MAINTAIN bone health and avoid premature bone loss

- Bone tissue loss generally begins at the age of 40 years, when we can no longer replace bone tissue as quickly as we lose it.
- Pregnant women must get adequate calcium and vitamin D, to optimize the development of their baby's skeleton.
- Poor pre-natal growth is associated with reduced adult bone mineral content at peak bone mass and in later life, and also increased risk of hip fracture.
- After menopause, women undergo a period of rapid bone loss, as bone resorption outstrips formation, due to the lack of protective oestrogen.
- Consuming more than 2 units of alcohol per day can increase the risk of suffering a fragility fracture, while more than 4 units per day can double fracture risk.
- A body mass index (BMI) <19 is considered underweight and is a risk factor for osteoporosis.
- During adulthood a comparative period of balance between new bone being formed and old being removed maintains bone mass. It is important to keep this balance by adopting bone-healthy behaviours including getting enough of the correct nutrients.

Seniors SUSTAIN mobility and independence into your old age

- Taking preventative measures including ensuring a healthy diet will slow the rate of bone thinning and reduce the risk of having osteoporosis-related fractures.

- In men, bone loss tends to accelerate after the age of 70 years.
- Calcium levels may be lower in seniors due to decreased consumption i.e., poor appetite, illness, social and economic factors with malnutrition being common; decreased intestinal absorption of calcium (exacerbated by low vitamin D status) and decreased retention of calcium by the kidneys.
- Vitamin D levels may be lower because of less frequent exposure to sunlight for the housebound, decreased function of the skin to synthesize vitamin D and decreased renal capacity to convert vitamin D to its active form.
- To maintain physical function, older people need more dietary protein than the young.
- Supplementary protein or higher dietary intake of protein by older people who have been hospitalized with hip fracture has been shown to improve bone density, reduce the risk of complications and reduce rehabilitation time.
- Preventing muscle wasting (sarcopenia) in seniors is important because it lowers the risk of falls and associated injuries, including fragility fractures.
- People aged over 50 years who have suffered a previous fracture as a result of a fall from standing height or less, should speak to their health-care professional about getting tested for osteoporosis.
- Although bone healthy nutrition, exercise, and avoidance of negative lifestyle habits are important, drug therapies are critical for fracture protection in patients at high risk for fractures. A 30–50% reduction in fracture incidence can be achieved with 3 years of pharmacotherapy.
- Controlling osteoporosis risk factors and complying with treatment regimens, where prescribed, can ensure seniors live mobile, independent, fracture-free lives for longer.

Recommended daily allowances: calcium and vitamin D

Recommended daily allowances (RDA) for populations may vary between countries. The IOM 2010 (Institute of Medicine of the US National Academy of Sciences) recommendations are shown in the table below.

Life-stage group	Calcium RDA (mg/day)	Vitamin D RDA (IU/day)
Infants 0-6 months	*	**
Infants 6-12 months	*	**
1-3 years old	700	600
4-8 years old	1,000	600
9-13 years old	1,300	600
14-18 years old	1,300	600
19-30 years old	1,000	600
31-50 years old	1,000	600
51-70 year old males	1,000	600
51-70 year old females	1,200	600
>70 years old	1,200	800
14-18 years old, pregnant/lactating	1,300	600
19-50 years old, pregnant/lactating	1,000	600

*For infants, adequate intake is 200 mg/day for 0–6 months of age and 260 mg/day for 6–12 months of age.

**For infants, adequate intake is 400 IU/day for 0–6 months of age and 400 IU/day for 6–12 months of age.

IU: International Unit

The International Osteoporosis Foundation recommends that seniors aged 60 years and over take a supplement at a dose of 800 to 1000 IU/day for falls and fracture protection.