

## "BEAT THE BREAK" - KNOW AND REDUCE YOUR OSTEOPOROSIS RISK FACTORS

Prepared for World Osteoporosis Day 2007

### WHAT IS OSTEOPOROSIS?

Osteoporosis is a disease in which the density and quality of bone are reduced, leading to weakness of the skeleton and increased risk of fracture, particularly of the spine, hip and wrist. Osteoporosis is a global public health problem which currently affects approximately one in three women and one in five men, and is increasing in significance as the population of the world both grows in size and is living longer<sup>(1-3)</sup>. Bone loss doesn't have any symptoms, and often the first sign of having osteoporosis is a fracture. For all these reasons, osteoporosis is often referred to as the "silent epidemic".



Although genetic factors largely determine whether an individual is at heightened risk of osteoporosis, lifestyle factors such as good nutrition and exercise play a key role in building bone during youth, and helping to slow down bone loss in adults and the elderly. The importance of these 'lifestyle' factors is that they are amenable to modification – individuals can take positive

steps to strengthen their bones and reduce their risk of osteoporosis.

### Bone Mineral Density

- Bone mineral density (BMD) should be considered as a conjunction of modifiable and fixed risk factors. Because minerals contribute to bone's inherent strength, low bone mineral density is one of the most important indicators that a person is at risk of a bone fracture. BMD significantly decreases with **age**.

- Measuring BMD by dual energy X-ray absorptiometry (DXA) is presently the only reliable diagnostic test for osteoporosis. People, especially the elderly, who have many modifiable or fixed risk factors, should consult with their doctor about having a BMD scan. The BMD results are an important basis from which to discuss potential changes to lifestyles and potential treatments.

### MAIN RISK FACTORS



Risk factors fall into two main categories, modifiable and fixed. Though there is no way to control the latter, which include age, gender, and family history, there are strategies that can lessen their effect – once the risk is appreciated. Many people have more than one risk factor, which puts them at even greater risk.

#### Modifiable Risks

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

#### Fixed Risks

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

## MODIFIABLE RISK FACTORS

*Modifiable risk factors primarily arise because of unhealthy diet or lifestyle choices. Modifiable risk factors include:*

### Alcohol:

- People with **excessive alcohol consumption** (>2 units daily) have a 40% increased risk of sustaining any osteoporotic fracture, compared to people with moderate or no alcohol intake.
- High intakes of alcohol cause secondary osteoporosis due to direct adverse effects on bone-forming cells, on the hormone that regulates calcium metabolism and poor nutritional status (calcium, protein and vitamin D deficiency) <sup>(4)</sup>

### Smoking:

- People with a past history of **cigarette smoking** and people who smoke are at increased risk of any fracture, compared to non-smokers <sup>(5)</sup>

### Low body mass index:

- Leanness (body mass index (BMI) <20 kg/m<sup>2</sup>) regardless of age, sex and **weight loss**, is associated with greater bone loss and increased risk of fracture.
- People with a BMI of 20kg/m<sup>2</sup> have a two-fold increased risk of fracture compared to people with a BMI of 25 kg/m<sup>2</sup> <sup>(6)</sup>

### Poor nutrition:

- When **insufficient calcium** is absorbed from dietary sources, the body produces more parathyroid hormone, which boosts bone remodelling, mobilizing osteoclasts in the bone to break down and sacrifice bone calcium to supply the nerves and muscles with the mineral they need <sup>(7)</sup>.



- There are indications that protein may act synergistically with vitamin D and calcium <sup>(8)</sup>.

### Vitamin D deficiency:

- **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 <sup>(9)</sup>.

### Eating disorders:

- Osteoporosis can also be compounded by eating disorders such as **anorexia nervosa** and **bulimia** <sup>(10)</sup>.
- Estrogen deficiency in women afflicted by these disorders hastens bone loss in a similar way to that in post-menopausal women, but to make matters worse, these diseases reduce the robust build up of bone mineral density that usually occurs in adolescence and early adulthood. This may be related to both hormone imbalance and nutritional factors.

### Insufficient exercise:

- People with a more **sedentary lifestyle** are more likely to have a hip fracture than those who are more active. For example, 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 <sup>(11)</sup>.

### Frequent falls:

- Visual impairments, loss of balance, neuromuscular dysfunction, dementia, immobilization, and use of sleeping pills which are quite common conditions in elderly persons, significantly increase the **risk of falling** and accordingly increase the risk of fracture <sup>(12)</sup>.
- Ninety percent of hip fracture result from falls <sup>(13)</sup>.

## FIXED RISK FACTORS

*There are also fixed risk factors that increase a person's risk for osteoporosis and bone fractures.*

### Age:

- The vast majority of hip fractures (90%), for example, occur in people **aged 50 and older** <sup>(14)</sup>. This is partly because of reduced bone mineral density – as people pass through their 20s, 30s and 40s into middle age, the bone remodelling balance tips in favour of bone mineral loss, bringing with it an increased risk of fracture.
- But age can also be a risk factor that is independent of bone mineral density. In other words, even older adults with normal BMD are more likely to suffer a fracture than younger people.



### Female gender:

- **Women**, particularly post-menopausal women, are more susceptible to bone loss than men, because their bodies produce less estrogen. This hormone supports osteoblast survival and tips the balance of bone remodelling in favour of bone formation <sup>(15)</sup>.
- Women are more likely to sustain any osteoporotic fractures than men <sup>(16)</sup>. Lifetime risk of any fracture ranges between 40-50% in women whereas it ranges between 13-22% in men.

### Family history:

- A **parental history of fracture** (particularly a family history of hip fracture) confers an increased risk of fracture that is independent of bone mineral density (BMD) <sup>(17)</sup>.

### Previous fracture:

- A **previous fracture** increases the risk of any fracture by 86%, compared with individuals without a prior fracture <sup>(18)</sup>.
- Both genders are almost twice (1.86 times) as likely to have a second fracture compared to people who are fracture free. This increased risk cannot be explained by bone mineral density alone, because low BMD accounts for only about 8% of the increased risk.

### Race/ethnicity:

- Osteoporosis is more common in **Caucasian and Asian** populations <sup>(19, 20)</sup>.
- The incidence of osteoporosis and fractures of the hip and spine is lower in black than in white subjects <sup>(21, 22)</sup>.

### Menopause/hysterectomy:

- **Hysterectomy**, if accompanied by removal of the ovaries, may also increase the risk for osteoporosis because of estrogen loss. Post-menopausal women, and those who have had their ovaries removed, must be particularly vigilant about their bone health.

### Long term glucocorticoid therapy:

- Long-term **corticosteroids** use is a very common cause of secondary osteoporosis <sup>(23)</sup> and is associated with an increased risk of fracture <sup>(24)</sup>.

### Rheumatoid arthritis:

- **Rheumatoid arthritis** and diseases of the endocrine system can take a heavy toll on bones. Hyperparathyroidism, for example, results in elevated levels of parathyroid hormone, which signals bone cells to release calcium from bone into the blood.

### Primary/secondary hypogonadism in men:

- Like **estrogen deficiency** in women (which is observed in case of primary or secondary amenorrhea and premature menopause), androgen deficiency in men, (primary or secondary hypogonadism) increases the risk of fracture <sup>(25)</sup>.
- At any age, acute hypogonadism, such as that resulting from orchidectomy for prostate cancer, accelerates bone loss to a similar rate as seen in menopausal women. The bone loss following orchidectomy is rapid for several years, then reverts to the gradual loss that normally occurs with aging.



## SECONDARY RISK FACTORS

*Secondary risk factors are less prevalent 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 remodelling and conditions that affect mobility and balance, which can contribute to the increased risk of falling and sustaining a fracture.*

### Disorders that affect the skeleton

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

### Medical Treatments Affecting Bone Health

Some medications 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 medications should consult with their doctor about increased risk to bone health.

- Glucocorticosteroids – oral or inhaled
- Certain immunosuppressant (calmodulin/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

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