



## A Review on the Complications and Management of Osteoporosis

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### ABSTRACT

Osteoporosis is a skeletal disease that is characterized by low bone mineral density. It also disrupts the microarchitectural of the bone. In leads to increased bone fragility and risk of fractures. Even while it occurs in persons of various ages and ethnicities (including Caucasians and whites), it is more common among Caucasians (whites), elderly people, and women. Osteoporosis is becoming a global epidemic as the world's population ages and lives longer. Osteoporosis affects an estimated 200 million individuals worldwide. It affects a 3<sup>rd</sup> of women and one in every 12 men. This increases morbidity as well as mortality due to several complications. Thus, it is essential to improve diagnostic methods and to introduce early intervention to prevent this disease. Lifestyle modification is an important recommendation for the population at risk. There are several pharmacological interventions that could be taken to prevent osteoporosis as vitamin D and calcium supplements and to treat osteoporosis as bisphosphonates and anabolic drugs. The most important step in the treatment is tailored to the individual patients and to optimize the treatment according to each case individually. Therefore, increasing doctor awareness, which promotes improved awareness among the general public, will be useful in averting this epidemic.



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### INTRODUCTION

Osteoporosis is a disease that affects bone mineral density (BMD) which leads to increased bone fragility and more susceptibility to pathologic fractures with minor trauma. Osteoporosis also affects the microarchitecture of bone which also contributes to increased incidence of fractures (NIH Consensus Development Panel, 2001). Osteoporosis is defined by a T-score of dual X-ray absorptiometry (DXA) of -2.5 or more standard deviation below the average of a young adult (Melton *et al.*, 1992). The most affected population of osteoporosis is in postmenopausal women, as they lose hormonal

protection after a certain age. Some studies mentioned that 40% of Caucasian women are diagnosed of osteoporosis after the age of menopause (Burge *et al.*, 2007; Ray *et al.*, 1997).

Osteoporosis has many complications, but the most common one is osteoporotic fractures. The risk of fractures during the life of a patient with osteoporosis is as high as 40%. The most common site for osteoporotic fractures in the spine, hips and wrist bones. However, almost all other bones are prone to fractures, such as humerus or ribs (Center *et al.*, 1999).

Patients described those fractures to reduce the quality of their lives dramatically as they become bedridden. Furthermore, osteoporotic fractures do reduce not only the quality of life but also increase the mortality rate, especially the spine and hip fractures. In addition to increased mortality, osteoporosis increases the hospitalization rates with subsequent other complications such as pneumonia and thromboembolic events (Center *et al.*, 1999).

Bone is a living tissue that is in a constant renewing process by degenerating osteoclasts and building osteoblasts. Osteoporosis disrupts this physiologic process and makes bone become weak and brittle. Also, osteoporosis makes bone to be lost but not renewed (Unnanuntana *et al.*, 2010).

The most important step in managing such a disease is the early diagnosis. Early diagnosis requires a high index of suspicion since elderly patients have multiple existing comorbidities. Osteoporosis has an insidious onset and could be asymptomatic initially. Thus, it is most frequently diagnosed after the occurrence of clinical fractures (Unnanuntana *et al.*, 2010; Vestergaard *et al.*, 2005). So, therapy at this point aims to prevent future fractures. This mandates the presence of risk assessment among elderly and susceptible individuals. This may also reduce the costs if the risk assessment becomes a national screening program (Hodgson *et al.*, 2003; Compston *et al.*, 2009; Brown and Josse, 2002).

There are several risk factors that contribute to being diagnosed by osteoporosis. These risk factors include age, low body mass index, previous pathological fractures, family history, use of glucocorticoids, smoking and alcohol (Kanis, 2002). Measurements of BMD by DXA is a reliable method of diagnosis (Cummings *et al.*, 2002).

Nevertheless, there are other tools, such as the fracture risk assessment tool (FRAX). This tool also predicts the ten-year risk of having a fracture of the hip as well as the ten-year chance of having a major fracture in the spine or other major site (Black *et al.*,

1996).

There are several ways to manage osteoporosis. Pharmacological interventions are divided into two main categories: antiresorptive drugs and anabolic drugs. Antiresorptive drugs decrease bone resorption rate while anabolic drugs enhance bone formation. For the time being, there are several approved drugs to prevent the risk of osteoporotic fractures (Cummings *et al.*, 1998; Mcclung *et al.*, 2001; Harris *et al.*, 1999). Some studies reported evidence of reduced vertebral fractures using novel agents. The most commonly used antiresorptive drugs are bisphosphonates which have a safety profile and are the largest class (Cummings *et al.*, 1998). They can be used orally or intravenously, also they are inexpensive and widely used, especially among postmenopausal women and older men across the globe. On the other hand, anabolic drugs are limited to the use of the parathyroid hormone, which is given subcutaneously (Daddona *et al.*, 2011).

This review aims to spotlight the complications of osteoporosis and the various interventions to manage osteoporosis.

### Complications of Osteoporosis

The most common predicted complication of osteoporosis fractures. It is important to mention that osteoporosis is an asymptomatic disease at the initial stages. It is commonly diagnosed when the patient develops an unexpected fracture from minor trauma. This enhances the diagnosis when the fracture is at a major skeletal site with an age older than 50. Pathogenesis of osteoporosis is simply summarized by the imbalance between bone resorption and bone formation (Compston *et al.*, 2013; Cooper and Melton, 1992). Fractures cause chronic moderate to severe pain, disability and increased mortality. Hip fractures increase the mortality rate by 15-20% within a year. With this type of fracture, men are at higher risk than women till the age of menopause. Furthermore, this increases the risk of future fractures (Melton *et al.*, 2013). Patients who have hip fractures need also nursing home care. They also suffer from low quality of life, social withdrawal, depressive symptoms and reduced self-esteem (Melton *et al.*, 2013). Osteoporosis is characterized by fragility fractures which are defined as spontaneous fractures or fractures after a minor trauma (Papaioannou *et al.*, 2010).

It is reported that vertebral fractures could happen without any activity, trauma or even fall. They are the predictors of future fracture risk. It is estimated that vertebral fractures increase the risk for subsequent fracture by fivefold at other sites (Ensrud *et al.*, 2007; Kanis *et al.*, 2004). Patients with osteo-

porosis may present with loss of height caused by vertebral compression due to stress fractures. This can be detected by increased occiput-to-wall distance which is called "dowager's hump". The vertebral fractures occur mostly at the thoracic level. This also restricts lungs movement resulting in restrictive pulmonary diseases with secondary heart problems (Siminoski *et al.*, 2006; Kanis *et al.*, 2008). However, dorsal kyphosis might be seen with old age, which makes it not a diagnostic criterion for osteoporosis.

### Management of Osteoporosis

The first step in approaching a patient with osteoporosis is a detailed history and physical examination with a thorough BMD assessment, x-ray imaging for assessment of different bone sites and 10-year fracture estimation using the WHO tool (Bischoff-Ferrari *et al.*, 2005). There is a special consideration for postmenopausal women and men older than 50 years. They should be assessed for osteoporosis risk to determine further testing. Although osteoporosis is preventable and treatable, many people are not diagnosed at the appropriate time. And this causes a delay in the therapy, which increases the risk for osteoporosis-related fractures.

There are universal recommendations for adequate intake of calcium and vitamin D for all patients for osteoporosis prevention and even in a treatment program. Also, a good weight-bearing exercise is recommended for almost all patients. Smoking cessation and reduction in alcohol intake are also at the top of recommendations, along with careful exercise to prevent falling (Vasikaran *et al.*, 2011; Tannenbaum *et al.*, 2002; Ross *et al.*, 2011). There is also a necessary of external calcium to maintain calcium level with promotes good bone formation and prevents bone resorption. This is essential for older patients since they have low calcium levels. The Institute of Medicine (IOM) recommends the intake of a dose of 1000 mg/day for men aged 50-70 years and a dose of 1200 mg/day for postmenopausal women and men over 70 (Ross *et al.*, 2011; Moyer, 2013).

Vitamin D is necessary for better calcium absorption, bone health and good muscle performance. The IOM recommends a daily dose of 600 IU for the age under 70 and 800 IU after the age of 70 (Bischoff-Ferrari *et al.*, 2005; Dawson-Hughes *et al.*, 2004). It is important for those individuals to have a balanced diet rich in vitamin D and calcium as milk, juices, cereals, saltwater fish and liver. Many older populations have a deficiency in vitamin D as well as patients with gastrointestinal tract problems with absorption. This supports the need of vitamin

D supplements among them.

As mentioned before in the review, bisphosphonates are the most commonly used antiresorptive medications. In postmenopausal women, alendronate is used to prevent osteoporosis. 10-years trials have reported it is effective in postmenopausal women (Bone *et al.*, 2004). Efficacy and safety after 10 years are not well-established. Another drug used for the prevention and treatment of osteoporosis among men and women is risedronate. On the other hand, ibandronate has been proved to reduce the risk of spinal fractures among postmenopausal women diagnosed with osteoporosis. However, there is no supporting evidence about this drug to prevent non-spinal fractures (Chesnut *et al.*, 2004). In the case of glucocorticoid-induced osteoporosis, it is recommended to use zoledronic acid. Hormonal therapy is very recommended for postmenopausal women, especially estrogen. It shows a reduced risk of osteoporosis (Chesnut *et al.*, 2004).

Health care professionals must be aware of contraindications and complications of bisphosphonates therapy. This treatment should not be used in patients with upper gastrointestinal bleeding and any anatomic abnormality in the esophagus. Hypersensitivity to drugs and renal failure should be checked before prescribing these medications. It is reported that intravenous use of ibandronate and zoledronate causes acute phase reactions with the first dose and could remain for several days in some patients (Shane *et al.*, 2010). Raloxifene should not be used infertile women before menopause because it is linked to venous thromboembolic disease (Siris *et al.*, 2005).

It is important to mention that there is no evidence for combination therapy for either treating or preventing osteoporosis. In most patients, there is a need for long term treatment. Patients should be maintained using one single agent. However, it is recommended to review the treatment for patients on alendronate after 5 years and for risedronate and ibandronate after 3 years. Patients at high risk of osteoporotic fractures should continue the treatment without any stop.

### CONCLUSION

Osteoporosis is a salient disease with fractures complications. It is reported that 50% of women and 20% of men are exposed to osteoporosis after the age of 50 years and will experience an osteoporosis-related fracture. These fractures have many consequences on their social and mental health as well as on increasing mortality rate among them. This increases the burden on the health system at the

national level. However, osteoporosis can be prevented by early diagnosis and better intervention with a good choice of medical treatment. Therefore, it is recommended to have national screening programs for the prevention of osteoporosis and some guidelines for the management of osteoporosis.

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#### Conflict of Interest

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