

**Ho Chi Minh City Medical Association (Vietnam)**  
**Ho Chi Minh City Osteoporosis Association**  
59B Nguyen Thi Minh Khai Street, District 1, Ho Chi Minh  
City Phone: (84) 8 39309634 - Fax: (84) 8 39301288-

Dear Dr. Hana Ratnawati

On behalf of the Organizing Committee of the Fifth Strong Bone Asia conference, we would like to thank you for your participation in the Conference as an invited speaker.

The Conference has attracted more than 250 doctors, healthcare professionals, and exhibitors and sponsors from ASEAN countries, Australia and Canada. We have been fortunate to have you, and your involvement has resulted in the success of the Conference. We hope that the scientific program has been all that you expected it to be, and that you have taken opportunity to make new connections and renew old acquaintances. We also hope that you have enjoyed your time and experience in Da Nang and Hoi An.

Once again, thank you for your involvement and commitment to the Strong Bone Asia. We look forward to meeting you at the next SBA conference, and wish you the best success in your future activities.

With best regards,



Prof. Tuan V. Nguyen



Ass/Prof. Thu A. Le

**Invited Speaker in “The Fifth Strong Bone Asia Conference”  
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## **EPIDEMIOLOGY AND RISK FACTORS OF OSTEOPOROSIS IN INDONESIA**

*Hana Ratnawati*

*Faculty of Medicine, Maranatha Christian University*

### **Abstract**

Osteoporosis, a systemic skeletal disease characterized by a low bone mass, is a major public health problem, especially in Indonesia. Due to, Indonesia as the world's fourth most populous nation, with estimated more than 239 million people in 2012 and 18.1% (43 million) aged over 50 years. The increasing of life expectancy from 69.3 years (2007) becomes 71.1 years (2012) changed the composition of elderly and led to the higher risk of osteoporosis. In addition, the risk factors of osteoporosis is also increased due to the changes in lifestyle, such as physical inactivity, increased smoking habits and decreased of nutritional intake of calcium and vitamins D.

Indonesian health department stated that the prevalence of osteoporosis in Indonesia about 19.7% of the total population. Indonesian nutrition research and development center in 2005 reported that two of five Indonesian people have a risk of suffering osteoporosis. Approximately 40% of women 50-75 years of age will experience a fracture due to osteoporosis. One study showed that up to age 55 years, men have higher incidence of osteoporosis. This relates to the smoking habit in men (Indonesia as the second number of smokers in the world), and over 55 years the incidence is higher in women, related to menopause and decreased of Calcium intake. There are a number of methods for diagnosing osteoporosis that have been used in Indonesia, such as densitometer, ultrasound densitometer and laboratory examination for osteocalcin, CTx (C-telopeptide) and parathyroid hormon concentration. Osteoporosis is a burden, not only for patients but also for their families. Therefore prevention needs to be a concern early on. Efforts by the Indonesian government is by increasing public knowledge about osteoporosis risk factors and public awareness in preventing osteoporosis by a healthy diet to keep the composition of protein, calcium and vitamin D, weight-bearing exercises, exposure to sunlight, avoid smoking and alcohol. In order to prevent and predict the incidence of fractures, Indonesian Osteoporosis Association (Perosi) in collaboration with WHO, has made a Fracture Risk Assessment Tool (FRAX) for Indonesia, which has been officially operate in April 2012.

### **INTRODUCTION**

Osteoporosis, also known as bone loss, is a bone disease characterized by a loss of bone mass, along with microarchitectural deterioration of the skeleton. The microarchitecture changes of bone tissue due to the body's inability to regulate the mineral content in the bones that leads in the decreased bone strength and increased risk of fractures<sup>1</sup>. In 2000, the United States National Institutes of Health (NIH) proposed a new definition of osteoporosis, which is defined as a skeletal disorder characterized by

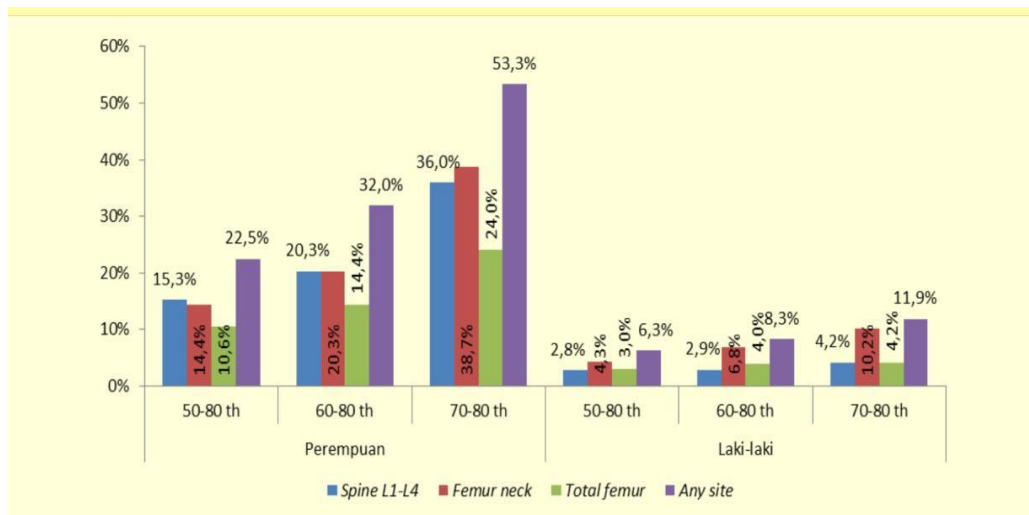
compromised bone strength predisposing a person to an increased risk of fractures. Bone strength reflects the integration of two main features, bone mineral density (BMD), which accounts for almost 70% of bone strength, and bone quality, which accounts for 30%<sup>2</sup>. Osteoporosis is often referred as silent disease because it does not show specific symptoms or specific signs, patients often do not realize osteoporosis until one day they experience fracture<sup>3</sup>.

Osteoporosis can be found all over the world and is still a problem in the field of public health, especially in developing countries. According to WHO data (2012), osteoporosis ranks second, under heart disease as a major world health problem. According to data from the International Osteoporosis Foundation (IOF), more than 30% of women worldwide have a fracture risk due to osteoporosis, while in men, the risk is 13%. The number of fractures due to osteoporosis worldwide reaches 1.7 million people and estimated will continue to increase until 6.3 million people in 2050. There are 75 million people with osteoporosis in Europe, Japan and America, whereas in China 84 million people, and there are 200 million people with osteoporosis worldwide<sup>4,5</sup>. The bone density of European and Asian people is lower compare to African people, making it easier to develop osteoporosis<sup>6</sup>. The number of fractures in Asia is higher than that in European countries combined. Of all fractures cases in the world, approximately 17% was occur in Southeast Asia, 29% in West Pacific, and 35% in Europe<sup>7</sup>.

The prevalence rate of osteoporosis in Asian people may be even higher because many osteoporosis cases lack to diagnosed because the cost for examining osteoporosis is still considered too expensive for Asian people. In addition, the number of elderly people in Indonesia is estimated will be increase by 414 percent in the period 1990-2025, while menopausal women will increase to 24 million in 2015. That is why public awareness is needed to avoid the risk factors of osteoporosis and fractures cases due to osteoporosis<sup>8</sup>. The objectives of this review are to identify the epidemiology and determine the risk factors of osteoporosis, especially in Indonesian population.

### **Epidemiology of Osteoporosis in Indonesia**

The prevalence of osteoporosis in women increases with age due to decreased concentration of the estrogen at menopause. In men, the prevalence of osteoporosis also increases with age, but not as much as in women. In women, the prevalence of osteoporosis can be up to 4 times higher than that of men<sup>6</sup>. In the following figure showed the prevalence of osteoporosis in men and women by age group.



**Fig 1. Osteoporosis prevalence in Indonesia based on gender and age group**

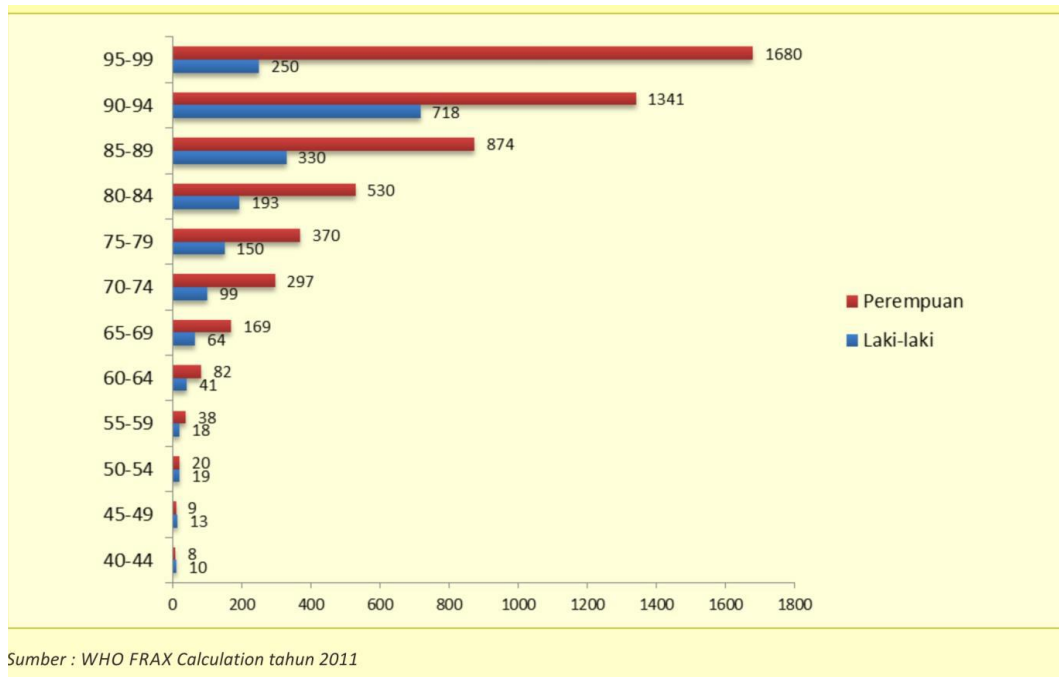
The data based on research by Gunawan Tirtaraja, Bombang Setyohadi, LS Weynand, Q Zhou in Pusat Osteoporosis Jakarta, RS. Medistra in collaboration with Departemen Penyakit dalam Universitas Indonesia, GE Healthcare, Madisn, WI, USA dan GE Healthcare, Shanghai, China, year 2006.

The Bone Mineral Density (BMD) measurement was performed at 4 different locations, L1-L4 spine, femur-neck, total femur and any site. The prevalence of osteoporosis increased by age both in men and women. The highest prevalence of osteoporosis is in the 70-80 years age group, both in women and men, especially in L1-L4 vertebrae. The prevalence of osteoporosis in women is 36% while in men is 4.2%, it means the ratio is 1: 8,6. If the examination is carried out at any location, the prevalence of osteoporosis in women 53%, meaning that more than half of women in Indonesia with the age group of 70-80, have experienced osteoporosis. Indonesian Osteoporosis Association in 2007, reported that the proportion of osteoporosis in the population over 50 years of age is 32.3% in women and 28.8% in men<sup>6</sup>.

Study from the International Osteoporosis Foundation (IOF) revealed that 1 in 4 women in Indonesia with an age range of 50-80 years have a risk of developing osteoporosis. Osteoporosis affects most postmenopausal women, due to the hormone estrogen decreased. Women have a higher risk of osteoporosis than men because women experience pregnancy, breastfeeding and menopause. Men still have a risk of developing osteoporosis because men also influenced hormones decreased be age. However, osteoporosis in men usually comes later<sup>5</sup>.

Osteoporosis is one of the most common causes of fractures in elderly people and especially in women. The high prevalence of osteoporosis will be followed by an

increased incidence of fractures. In the following figure showed the incidence of fractures based on sex and age group.

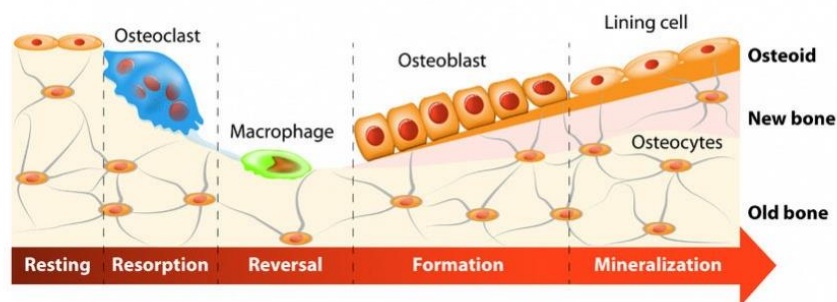


**Fig 2. Hip fracture incidence in Indonesia based on sex and age group (2011)<sup>6</sup>.**

The data based on research by Gunawan Tirtaraja, Bombang Setyohadi, LS Weynand, Q Zhou in Pusat Osteoporosis Jakarta, RS. Medistra in collaboration with Departemen Penyakit dalam Universitas Indonesia, GE Healthcare, Madisn, WI, USA dan GE Healthcare, Shanghai, China, year 2006.

The incidence of hip fracture increases by age, both in men and women. The highest incidence in women is in the 95-99 year age group as many as 1680 cases. In male, the highest incidence is in the 90-94 years age group, 718 cases. This may be due to the fact that women live longer than men, so there are fewer cases of hip fracture in men in the 95-99 year age group. The ratio between men and women in hip fracture is 1: 1.9 in the 90-94 years age group, while in the 85-89 year age group and 80-84 years age group the ratio is around 1: 2.76. When compared with the situation in Japan, the incidence of vertebral fractures was 5.1% and 14% for men and women in their 60s<sup>2</sup>. It turns out that the ratio of hip fracture in men and women in the age group of 60 years is also 1: 2,7. Data from Hospital Information System (SIRS, 2010) showed that the incidence of osteoporosis-induced upper thigh fractures is around 200 out of 100,000 cases at the age of 40 years. By 2050, it is estimated that the number of hip fractures will increase 2-fold in women and 3-fold in men<sup>6</sup>. The WHO report showed that 50% of all fractures are upper thigh fractures that can influenced life-long disability and death<sup>5</sup>.

Bone metabolism is a dynamic process that balances between bone formation and bone resorption. Osteoporosis is initiated by an imbalance between resorption and formation of bone. There are three types of bone cells which are osteoclasts, osteoblasts, and osteocytes that play a role in bone remodeling process. Firstly, preosteoclast will be stimulated and differentiate by cytokines and growth factors become active osteoclast. Osteoclast will digest mineral matrix, known as bone resorption. At the end of the resorption, osteoblast precursor than recruited, proliferate and differentiate into mature osteoblast and will synthesize new bone matrix, known as bone formation. The matrix then mineralises to generate new bone. At the end the bone become quiescence, osteoblasts become resting bone lining cells on the newly formed bone surface<sup>9</sup>.



**Fig 3. The bone remodelling process<sup>10</sup>**

Bone is continuously remodelled and in a healthy young adult the rates of deposition and resorption is about the same. An imbalance in bone resorption as compared to bone formation can lead to osteoporosis<sup>9</sup>.

Around 40 years, osteoporosis begin occurs in cortical bone due to the rate of resorption is faster than the rate of bone formation. In women the risk is greater because estrogen levels begin to decline at the age of 35-40 years, while in men, testosterone levels fall at the age of 65 years. Decreased in estrogen will be followed by menopause and leads to increase of bone resorption and decrease of bone formation and osteoporosis to begin. Three places that are prone to osteoporosis are spine, pelvis and wrists. The occurrence of osteoporosis also depends on the peak adult bone mass, which usually at the age of 30. If the peak bone mass is low, it means the skeleton is not strong during youth, the bones can become fragile more quickly followed by osteoporosis. The peak period of Bone Mineral Density for all bones is around 30-39 years. The highest bone density was seen in the Spine L1-L4 at the age of 35 years, namely 1.12gr / cm<sup>2</sup>. The lowest bone density was seen in the Trochanter thigh bone<sup>6</sup> (Figure 4).



**Fig 4. BMD results on spine and femur in Indonesian women (2006)<sup>6</sup>**

The data based on research by Gunawan Tirtaraja, Bombang Setyohadi, LS Weynand, Q Zhou in Pusat Osteoporosis Jakarta, RS. Medistra in collaboration with Departemen Penyakit dalam Universitas Indonesia, GE Healthcare, Madisoon, WI, USA dan GE Healthcare, Shanghai, China, year 2006.

### **Risk Factors of Osteoporosis**

The identification of the risk factors of osteoporosis is important in order to prevent postmenopausal osteoporosis and may be helpful in case finding and prevention strategies. The risk factors can be divided into modifiable risk factors such as diet and lifestyle and non-modifiable risk factors<sup>6</sup>.

#### **Modifiable Risk Factors**

Modifiable risk factors mean that we can prevent osteoporosis if we eliminate these risk factors<sup>6,7,11</sup>.

- Lack of physical activity will hinder the bone formation process
- Low calcium and vitamin D intake: Parathyroid hormone is the major regulator of calcium homeostasis. If the body's calcium is decreased, parathyroid hormone will secrete and it will take calcium from other parts of the body, including from bones and contribute to bone loss. The researcher confirmed that parathyroid hormone directly increased the number of osteoblast. The peak bone in Indonesian women is not achieved because of low calcium consumption. It can be stated that usually the calcium intake of Indonesian people is low, which is less than 300 mg, whereas the daily intake of calcium is 1000 mg. After the peak bone mass is achieved, it is still necessary to maintain adequate calcium intake. As we get older, the absorption of calcium will decrease.
- Cigarette smoking and excessive alcohol consumption considered as risk factors for osteoporosis and can increase the osteoporotic fractures. This is because caffeine and

alcohol inhibit the osteoblast cells for the formation of the bone.

- Steroid medications also can cause osteoporosis.

### **Non-modifiable risk factors**

The non-modifiable of osteoporosis are:<sup>6,7,11</sup>

- Family history with osteoporosis: it is estimated that 80% of bone density is genetically inherited.
- Female gender: Osteoporosis is more common in women. This is due to the influence of estrogen, which begins to decrease from 35 years and menopause which occur at around 45-50 years. Pregnancy also become the risk factor, because the fetus development requires a lot of calcium from the mother.
- Age: It is estimated that during life, women will lose bone mass 30% -50%, while men 20% -30%. At 75-85 years, women have 2 times higher risk than men of experiencing trabecular bone loss due to the aging process, decreased calcium absorption and increased parathyroid hormone function<sup>12</sup>.
- Asian and Caucasian race: Race also makes a difference where whites or Asian descent are at greatest risk. This is due to the low calcium consumption of Asian women.
- Body size: small, thin-bone have a greater risk of osteoporosis.

Since there are some modifiable risk factors, we should prevent osteoporosis in the following ways, as suggested by Rahmani (2009), especially in postmenopausal women and older men<sup>13</sup>.

- Weigh-bearing exercise that includes impact (e.g., walking, jogging or aerobics), 30 minutes, 3 times weekly.
- Adequate calcium intake, 1200-1500 mg/day
- Adequate vitamin D intake, 800 IU/day
- Smoking cessation
- Avoid alcohol intake
- Avoid steroid medications in long term<sup>6</sup>

### **CONCLUSION**

- The highest prevalence of osteoporosis is in the 70-80 years age group, both in women and men, especially in L1-L4 vertebrae.
- Women in Indonesia with an age range of 50-80 years are more susceptible to osteoporosis than men, with a ratio of 4 : 1 due to the hormone estrogen decreased after the postmenopause.



- In men and women, the incidence of hip fracture increases by age and the ratio of hip fracture in men and women in the age of 60s is 1 : 2,7.
- Identification of the risk factors is important in order to prevent osteoporosis
- Osteoporosis can be prevented from an early age by cultivating healthy habits. Behaviors that need to be defined are consuming a nutritionally balanced diet with elements rich in fiber, low fat and rich in calcium, exercising regularly, not smoking, not consuming alcohol and coffee regularly. These all can reduce morbidity, mortality and costs due to osteoporosis and associated fractures through an integrated and comprehensive approach through health promotion and disease management.

## REFERENCES

1. Cianferotti L, Brandi ML. Guidance for the diagnosis, prevention and therapy of osteoporosis in Italy. *Clinical Cases in Mineral and Bone Metabolism* 2012; 9(3):170-8
2. Orimo H et al. Japanese 2011 guidelines for prevention and treatment of osteoporosis executive summary. *Arch Osteoporos* 2012; 7:3–20. DOI 10.1007/s11657-012-0109-9
3. Misnadiarly. *Osteoporosis Pengenalannya, Faktor Risiko, Pencegahan, dan Pengobatan*. Jakarta, Permata Puri Media, 2013.
4. Purwoastuti. *Waspada OSTEOPOROSIS*. Yogyakarta: Kanisius, 2009.
5. Pedoman Pengendalian Osteoporosis. [http://www.hukor.depkes.go.id/up\\_prod\\_kepmenkes/KMKNo.114](http://www.hukor.depkes.go.id/up_prod_kepmenkes/KMKNo.114)
6. Pusat data dan informasi Kementerian Kesehatan Republik Indonesia. ISSN: 2442-7659 (2012)
7. Suzuki T. Risk factors for osteoporosis in Asia. *J Bone Miner Metab* 2001; 19(3):133-141.
8. La Ode, Sarif. *Asuhan Keperawatan Gerontik*. Yogyakarta: Nuha Medika, 2012.
9. Tanaka Y, Nakayamada S, Okada Y. Osteoblasts and osteoclasts in bone remodeling and inflammation. *Curr drug targets inflamm allergy*. 2005, 4(3)
10. Ammerman JM. Solid Growth: Bone Grafts' Role in Spine Surgery and Fusion Success. <https://www.spineuniverse.com/treatments/surgery/solid-growth-bone-grafts-role-spine-surgery-fusion-success>.
11. Rachner TD, Khosra S, and Hofbauer LC. New horizon in osteoporosis. *Lancet*. 2011; 377(9773): 1276–1287. doi:10.1016/S0140-6736(10)62349-5.
12. Torok R, Oance. A Study of Risk Factors and T- Score Variability in Romanian Women with Postmenopausal Osteoporosis. *Iranian J Publ Health, Vol. 42, No. 12, Dec 2013, pp. 1387-1397*
13. Rahmani P, Morin S. Prevention of osteoporosis-related fractures among postmenopausal women and older men. *CMAJ* 2009, 181(11)

