The Prevalence of Osteoporosis by Forearm Densitometry Among Women in Muang District of Phitsanulok

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Abstract

This study aimed to assess the prevalence of osteoporosis in the middle aged and elderly women in Muang District of Phitsanulok according to the World Health Organization (WHO) guideline. The bone mineral density (BMD) of the forearm was measured by dual energy X-ray absorptiometry (DEXA) among 770 women aged between 35 to 79 years. The results revealed that the prevalence of osteoporosis in women aged 35-40, 41-45, 46-50, 51-55, 56-60 years and more than 60 years were 13.6%, 15.9%, 16.6%, 32.2%, 41.9% and 66.7%, respectively. There was a significant decline in bone density in relation to age ($r = -0.414$, $p < 0.01$). The high prevalence of osteoporosis in elderly women living in the city district of Phitsanulok is a severe public health problem. Thus, health promotion to prevent osteoporosis in high-risk group is urgently required to combat this serious public health problem.

Keywords: Prevalence; Osteoporosis; Phitsanulok; Women; Bone mineral density

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Introduction

Osteoporosis is a bone disease characterized by the decrease of bone mass and an impairment of the structural integrity of trabecular bone. (Avioli, 1993). Factors that may increase the chances of developing osteoporosis include: female gender, a small thin body frame, a family history of osteoporosis, postmenopausal status or advanced age, Caucasian or Asian race, the absence of menstrual periods, anorexia nervosa or bulimia, diet low in dairy products or other sources of calcium and vitamin D, inactive lifestyle, cigarette smoking, and excessive use of alcohol and high salt, protein and caffeine intake. (Bauer et al., 1993; Cummings, 1995; Greenspan, 1994). According to the World Health Organization (WHO), bone mineral density (BMD) below a 2.5 standard deviation (SD) of the young normal adult mean value (T-score < -2.5) is defined as osteoporosis while individuals with BMD between 1 and 2.5 SD below average (T-score = -1 to -2.5) are defined to have osteopenia. (Kanis et al., 1994; World Study Group, 1994).

A previous study suggests that 50 year-old women's lifetime risk of dying from hip fracture from osteoporosis is equal to dying from breast cancer (2.8%) (Albanese, 1977). Mortality due to osteoporosis is greater than the endometrial risk of dying (0.7%) (Sartoris, 1996). International statistics have shown that 200 million women worldwide suffer from osteoporosis (Melton, 1995). One third of people suffering from such a debilitating disease are between the age of 60 and 70 years (De Laet, 1997). Hip fractures are predominately due to osteoporosis. Prevalence of hip fractures is expected to increase from 1.7 million in 1990 to 6.3 million by the year 2050 (Melton, 1986). Fifty percent of such increases are predicted to be seen in Asia alone (Keen, 2003). One in four women who experience hip fracture, the most serious injury associated with osteoporosis, will require long-term nursing home care because they will not be able to walk without assistance (Gueldner, 2000).

It is important to determine the prevalence of osteopenia and osteoporosis to address the overall magnitude of the problem in women. The National Osteoporosis Foundation (NOF) recommends BMD testing for all women older than 65 years (National Osteoporosis Foundation, 1987). Dual energy x-ray absorptiometry-DEXA is an accurate instrument for evaluation of osteoporosis. If osteoporosis is detected early enough, its effects may be prevented, (Nelson, 2002). According to recent research on the prevalence of osteopenia and osteoporosis in Thai women aged between 41-50 years, it was reported that the prevalence of osteopenia and osteoporosis in the Bangkok female population was 41.6 and 10.4 percent, respectively (Tungthitiwong et al., 2003). Sookpeng et al. (2005) conducted a research study to determine the prevalence of osteoporosis in Naresuan University staff members aged 21-60, it was reported that the prevalence of osteopenia and osteoporosis was 54.1 and 6.8 percent, respectively. However, research on prevalence of osteoporosis in a large group of female population in Phitsanulok has not been conducted. Thus, the Department of Radiological Technology at the Faculty of Allied Health Science decided to carry out a project to measure BMD for the public in Muang District of Phitsanulok. The results of BMD measurement were used to assess the prevalence of osteoporosis among the middle aged and elderly women in Muang District of Phitsanulok.

Materials and Methods

Healthy women volunteer aged more than 35 years who joined our BMD measurement service project at primary care unit in Muang District of Phitsanulok between November 2005 and April 2006 were recruited into this study. All subjects signed the consent form prior to data collection. Data on age, weight and height were collected using a structured questionnaire. BMD (g/cm^2) at the 1/10 distal site of the non-dominant forearm was measured by dual-energy X-ray absorptiometry (Panasonic model DXA-70) for all subjects. The coefficients of variation of the instrument were shown to be less than 1%. Estimation of the BMD was made on the forearm site. T-score was calculated by the following equation.

$$T\text{-Score} = \frac{\text{subject's BMD value} - \text{mean young normal BMD value}}{\text{young normal BMD standard deviation}}$$

The BMD value of 0.580 ± 0.037 g/cm^2 (mean $\pm$ SD) from normal young women aged 21-40 years, which was very close to the value obtained from measurement of forearm phantom, was used as the point of reference (Osteoporosis Committee of China Gerontological Society, 1992). The mean BMD of subjects were classified into 5 groups according to age.

Results

Seven hundred and seventy women aged from 35 to 79 years were recruited into this study. The mean age was 49.72 ± 8.85 years. The mean weight was 56.82 ± 9.00 kg. Table 1 shows the mean BMD values and their S.D. classified by age groups. The BMD values of each age group were 0.527 ± 0.065, 0.522 ± 0.048, 0.520 ± 0.048, 0.500 ± 0.063, and 0.482 ± 0.069 and 0.435 ± 0.109 g/cm^2, respectively. There was a significant correlation between age and BMD (r= -0.414, p<0.01).

Table 1. The BMD values (g/cm^2) classified by age groups

Age group (years)	BMD ± SD (g/cm^2)
Reference *	0.580±0.037
35-40 (n=132)	0.527±0.065
41-45 (n=138)	0.522±0.048
46-50 (n=169)	0.520±0.048
51-55 (n=149)	0.500±0.063
56-60 (n=86)	0.482±0.069
60+ (n=96)	0.435±0.109

*Osteoporosis Committee of China Gerontological Society, 1992

Table 2 shows the prevalence of osteopenia and osteoporosis in the studied population by age groups. The prevalence of osteoporosis in each age group was 13.6%, 15.9%, 16.6%, 32.2%, 41.9% and 66.7%, respectively.

Table 2. The prevalence of osteopenia and osteoporosis in the study population by age groups

Age group (years)	Prevalence (%)		
	Normal	Osteopenia	Osteoporosis
35-40 (n=132)	45.5	40.9	13.6
41-45 (n=138)	31.2	52.9	15.9
46-50 (n=169)	38.5	45.0	16.5
51-55 (n=149)	24.2	43.6	32.2
56-60 (n=86)	15.1	43.0	41.9
60+ (n=96)	9.4	24.0	66.6
Total (n=770)	29.4	42.6	28.0

Discussion

This was the first study to measure the BMD in large number of female populations in Muang District of Phitsanulok. It was important to determine the prevalence of osteoporosis and osteopenia to address the overall magnitude of the problem. This will allow us to predict the socioeconomic impact of these preventable chronic conditions. Prevention of osteoporosis is especially important in osteopenia groups since they will have the opportunity to achieve and maintain optimal peak bone mass and reduce the risk of subsequent osteoporotic fractures later in life.

The BMD at the forearm of women aged 21-40 years from normal Chinese population reported by the Osteoporosis Committee of the China Gerontological Society (1992) was used as the reference range in this study. The BMD of Chinese population was chosen because their sociodemographic characteristics were expected to be comparable to those of Thai and Phitsanulok female.

The prevalence of osteoporosis in this study differs from the findings of other studies in Thai women. Tungthitiwong et al. (2003) reported the prevalence of osteoporosis in the Bangkok female population aged between 41-50 years as 10.4% when the BMD was measured at hip site. While Jarupanich (2007) reported the prevalence of osteoporosis in Hat Yai female population aged between 41-50 years as 10% when the BMD was measured at lumbar site. The difference in the prevalence of osteoporosis among women in Phitsanulok, Bangkok and Hat Yai may be explained by the difference in physical activity between rural and urban area, as well as a lower body mass index and lower calcium intake by the women in rural area than those of women in urban area (Nelia et al., 2000).

Moreover, the prevalence of osteoporosis in this study was higher than those reported in the previous study by Sookpeng et al (2005) who reported the osteoporosis prevalence of 8.3% when the BMD was measured at forearm site among Naresuan University staff. Although the Naresuan University staffs live in the rural area, they may pay higher attention to health and to prevention of osteoporosis.

The prevalence of osteoporosis in our study was higher than that of others study. This may be explained by the fact that the measurement of BMD at forearm site was a more sensitive indicator for osteoporosis than the measurement of BMD at lumbar and hip site (Arlot et al., 1997).

A limitation of this study should be noted. Since this study focused on women in Muang District of Phitsanulok, the lifestyle, health care behavior and environment living conditions will differ from other populations, therefore the results of this study may not extrapolate to other populations.

Patient education programs are also acknowledged as an effective way of imparting disease-related knowledge to the patients (Edworthy et al., 1995). Sookpeng (2006) conducted a research study using questionnaires to assess knowledge on osteoporosis of women in Muang District of Phitsanulok. The study suggested that women had less knowledge on risk factors associated with osteoporosis than general knowledge on osteoporosis, preventive behavior and treatment of osteoporosis (Sookpeng, 2006). Thus, the health policy should focus on health promotion and education of risk factors associated with osteoporosis.

Conclusion

The prevalence of osteoporosis among women aged 35-40, 41-45, 46-50, 51-55, 56-60 years and more than 60 years living in Muang District of Phitsanulok was 13.6%, 15.9%, 16.6%, 32.2%, 41.9% and 66.7%, respectively. The high prevalence of osteoporosis in elderly women living in the city district of Phitsanulok is a severe public health problem. The data provided by this study could serve as a reference value for Phitsanulok female. The prevention and health promotion to osteoporosis in high-risk group is urgently required to combat this serious public health problem.

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