GYNAECOLOGY

Factors Associated with Bone Mineral Density in Women Attending Menopause Clinic at Hat Yai Regional Hospital.

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ABSTRACT

Objective   To determine risk factors of osteoporotic and osteopenic women.

Design   Descriptive study.

Setting   Hat Yai Regional Hospital.

Subjects   430 pre-menopausal and post-menopausal women attending menopausal clinic.

Main outcomes measures   Bone mineral density (BMD) was measured at the lumbar spine and the femoral neck using dual photon absorptiometer (Lunar Expert-XL).

Results   Overall, 19.3%, 83 in 430 of women were osteopenia (BMD < 1.0 to 2.5 SD), osteopenia at one skeletal site revealed in 76 of 83 cases (91.6%); among these, 70 of 83 cases (84.4%) were osteopenic lumbar spines, 6 of 83 (7.2%) were osteopenic femoral neck. Only 7 of 83 cases (8.4%) were osteopenic lumbar spines and femoral neck. 20 of 430 women (4.7%) were osteoporosis (BMD < 2.5 SD).   Osteoporosis at one skeletal site occurred in 19 of 20 cases (95.0%); all of them were osteoporotic lumbar spines. Only 1 of 20 cases (5.0%) was osteoporotic lumbar spines and femoral neck. Osteopenia and osteoporosis in this study were not correlated with history of osteoporosis among members of family, non-hormone intake, insufficient calcium food, alcohol intake, coffee intake, smoking, or non-exercise. Low body mass index (BMI) was highly significant correlated with osteoporosis and osteopenia among post-menopausal women.

Conclusion   The result of the study suggests that BMI is an important determinant of bone density in this population.

Key words: bone mineral density, menopausal women

Osteoporosis is an increasing health care concern as population age throughout the developed and developing country. The social and economic costs of osteoporosis are due to its clinical outcome of fracture which increases exponentially with age. Bone mineral density (BMD) is the most easily measured and accurate predictor of fracture risk. For any individual, BMD is the combination of their peak bone density and subsequent bone loss, both of which are influenced by genetic, hormonal and environmental factors.[1]

Options for prevention and treatment have increased substantially with the Food and Drug Administration's recent approval of alendronate

(a bisphosphonate) and nasal calcitonin for treatment of osteoporosis. Some are concerned that these new agents will unduly reduce the use of estrogen, which should remain the mainstay for prevention of bone loss and fractures in postmenopausal women. New therapeutic approaches are needed to treat the established disease.[2] The strategy of developing countries is to develop widely applicable and appropriate methods for screening, diagnosis, and prevention of bone loss and fracture, to improve the quality of life.

Humans begin to lose bone tissue as they become older. In most cases, this process is slow and gradual. Bone loss starts to occur between the age of 30-40 years and continues throughout life. The new methods for bone density measurement are based on either the energy/methodology used in ultrasound and magnetic resonance imaging (MRI), or x-rays. Some methods are designed for measuring only the forearm, femoral neck, lumbar spine, or heel bone (calcaneus), while others measure several sites in the body simultaneously. Most of the methods demonstrate good precision (i.e. repeated measurements yield the same results).[3] Many studies have shown the high correlation between Lunar and Hologic DXA bone mineral density (BMD) measurements despite differences in absolute calibration.[4] This descriptive hospital-based study examined the association of risk factors with BMD and low bone mass in pre-menopausal and postmenopausal women.

Materials and Methods

From April 2, to December 2, 1997, 430 women underwent bone mass measurement were recruited for the analysis at the menopause clinic, Hat Yai Regional Hospital. BMD was measured using dual photon absorptiometer (Lunar Expert-XL, Japanese software) at lumbar spine (LS: L1-L4) and femoral neck (at the non-dominant side). According to World Health Organization (WHO), osteoporosis is defined as the value of BMD that is more than 2.5 standard deviation below the young adult mean. However, osteopenia in women is defined as the value of BMD that is between 1.0 standard deviation to 2.5 standard deviation below the mean.[5]

In depth interview was conducted about the characteristics of the risk factors. The qualitative data as "yes", "no" or "not sure" were applied to the history of osteoporosis among members of family, hormonal intake, alcohol intake, and smoking. The quantitative data were evaluated for sufficient calcium food (regular milk or soy bean milk intake), caffeine consumption (more than 2 cups per day), and exercise (thirty minutes duration and at least three days per week)

Descriptive statistics were used where it was appropriate. To compare qualitative data, unpaired t-test was used. P-value of less than 0.05 is considered statistically significant.

Results

During eight-month period of the study, 430 women were enrolled to the study. The mean age of the subjects was 48.64 years, (range 34-60 years, SD = 1.01). Of all the subjects, 216 of 430 (50.2%), were pre-menopausal, and 214 of 430 (49.8%) were postmenopausal. Among the post menopausal women (214), 84 (39.3%) were late postmenopausal (more than 5 years since menopause). Nearly two-third (62.6%), 269 of 430 were government officers, the remains were housewives (15.5%), 67 of 430, small businesspersons (9.1%), 39 of 430, blue-collar employees (6.0%), 26 of 430, white collar employees (4.2%), 18 of 430, farmers (2.1%), 9 of 430, and other (0.5%), 2 of 430. Most of them (80.2%), 345 of 430 had family incomes more than 10,000 Bahts per month (higher than average). Nearly two-third (62.4%), 268 of 430 had high education (at least Bachelor degree). Most of them (76.4%), 329 of 430 were married.

Average height was 155.99 centimeters (SD = 23.87), and average weight was 56.49 kilograms (SD = 8.01). Most of them (59.1%, 254 of 430 had normal body mass index (BMI), where as (29.3%), 126 of 430 had high BMI, and (11.6%), 50 of 430 had low BMI. The proportion of low BMD, comparing between lumbar spines and femoral neck among pre-menopausal and post-menopausal women is shown

in Table 1. About three-fourth, 327 of 430 cases (76.0%) had normal BMD, 83 of 430 cases (19.3%) had osteopenia (BMD < 1.0 to 2.5 SD), and 20 of 430 cases (4.7%) had osteoporosis (BMD < 2.5 SD).

Osteopenia at one skeletal site revealed in 76 of 83 cases (91.6%); among these, 70 of 83 cases (84.4%) were osteopenic lumbar spines, 6 of 83 (7.2%) were osteopenic femoral neck. Only 7 of 83 cases (8.4%) were osteopenic lumbar spines and femoral neck. Postmenopausal women had highly statistical significant (P<0.001) to have osteopenic lumbar spine; odds ratio is 6.90 (3.50 <OR< 13.85), and relative risk is 5.08 (2.87<RR< 8.97).

Osteoporosis at one skeletal site occurred in 19 of 20 cases (95.0%); all of them were osteoporotic lumbar spines. Only 1 of 20 cases (5.0%) was osteoporotic lumbar spines and femoral neck. Postmenopausal women had highly statistical significant (P<0.001) to have osteoporotic lumbar spine; odds ratio is 28.35 (3.93 <OR< 576.86), and relative risk is 24.95 (3.37<RR< 184.80).

Table 1. The proportion of bone mineral density comparing between lumbar spines and femoral neck among pre-menopausal and postmenopausal women (N=430)

Sites of investigation	BMD					
	Normal (N=327) (N) %		Osteopenia (N=83) (N) %		Osteoporosis (N=20) (N) %	
	Pre	Post	Pre	Post	Pre	Post
Lumbar spine	-	-	13 (15.7)	57** (68.7)	1 (5.0)	18** (90.0)
Femoral neck	-	-	1 (1.2)	5* (6.0)	-	-
Both lumbar spine and femoral neck	200 (62.2)	127 (38.8)	1 (1.2)	6* (7.2)	-	1 (5.0)

Pre = Pre-menopausal women
Post = Post-menopausal women
* P < 0.05
** P < 0.001
Note: 8 cases of osteoporotic lumbar spine coexisted with osteopenic femoral neck

Table 2 compared the factors associated with osteoporosis and osteopenia to normal women. Osteopenia and osteoporosis in this study did not show correlation with history of osteoporosis among members of family, non-hormone intake, insufficient calcium food, alcohol intake, coffee intake, smoking, or non-exercise. Low body mass index (BMI) was highly significant correlated with osteoporosis (P=0.000138), and significant correlated with osteopenia (P=0.0115).

Table 2. Comparison of factors associated to bone mineral density

Risk factors	Normal (N=327) (N) %	Osteopenia (N=83) (N) %	Osteoporosis (N=20) (N) %
Osteoporosis in family	15 (4.6)	7 (8.4)	1 (5.0)
Non-hormone intake	284 (86.9)	66 (79.5)	15 (75.0)
Insufficient calcium food	156 (47.7)	36 (43.4)	10 (50.0)
Alcohol intake	2 (0.6)	1 (1.2)	-
Coffee intake	47 (14.4)	12 (14.5)	3 (15.0)
Smoking	1 (0.3)	1 (1.2)	-
Non-exercise	170 (52.0)	40 (48.2)	7 (35.0)
Low BMI	28 (8.6)	15 (18.1)*	7 (35.0) **
Menopausal status	127 (38.8)	68 (81.9)**	19 (90.0)**

* P < 0.05
** P < 0.001

Discussion

Interest in the determination of the relation between risk factors and bone mineral density is increasing among the researchers but the way ahead is unclear. Recently, a meta-analysis of 29 published cross sectional studies revealed the difference in bone density in 2,156 smokers and 9,705 non-smokers according to age, and of 19 cohort and case-control studies recording 3,889 hip fractures showed increasing risk in smokers compare to non-smokers. In pre-menopausal women bone density was similar in smokers and non-smokers. Postmenopausal bone loss was greater in current smokers than non-smokers, for instance, bone density diminishes more in smokers than non-smokers by 2% for every 10 year increase in age, with a difference of 6% at age 80.[6] In this study, the smoking among women is quite low, 2 of 430 women (0.47%), and was not significantly correlated with osteopenia or osteoporosis.

Dietary caffeine intake has been suggested as a risk factor for bone loss in postmenopausal women in some studies. However, no association between caffeine intake and any low BMD was observed in our study. This study does not support the notion that caffeine is a risk factor for bone loss in healthy postmenopausal women.[7,8]

Serum estrogen deficiency is one of the main causes of osteoporosis in post-menopausal women, and especially in oophorectomized women. Alcohol intake of at least 7 oz per week is associated with high bone density in post-menopausal women, an effect possibly related to the augmentation of endogenous estrogen levels by alcohol.[9] However, this study does not found any correlation between hormone intake and alcohol intake to BMD.

The manifestation of osteoporosis in women is influenced to a greater extent by age and year since the menopause than by the distribution of nutritional factors in a normal mixed diet.[10] However, Scientific Advisory Board, Osteoporosis Society of Canada recommend to have calcium and vitamin D nutritional supplementation; including physical activity, exercise, and fall-avoidance techniques for pre-menopausal and post-menopausal women.[11] The non-exercise and

insufficient calcium intake did not support the occurrence of significant low BMD in this study, nevertheless the physical activity, exercise, and calcium intake should be encouraged for both pre-menopausal and post-menopausal women. In addition, we found that nearly half of the women did not have physical activity, exercise, and insufficient calcium intake.

The result of the study suggests that BMI is an important determinant of bone density in this population, especially in the postmenopausal women. The application of this study to the clinical practice is BMI can be an indicator in bone mineral density screening among postmenopausal women attending the menopausal clinic. The routine screening for preventive measure is not recommended for periodic health examination due to the cost-effectiveness and balance between the high technology consumption and national resources.[12] Further study on improving BMI is encouraged to determine the risk reduction of low bone mineral density, as well as the quantitative of daily food and nutrition intake.

Acknowledgements

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