Prevalence and Risk Factors Associated with Osteoporosis in Women Attending Menopause Clinic at Hat Yai Regional Hospital

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Objective: *To determine the prevalence and risk factors of osteoporosis with different perimenopause status.*
Design: *Descriptive study.*
Setting: *Menopause clinic, Hat Yai Regional Hospital.*
Material and Method: *From April 1997 to September 2006, 1,796 women who underwent bone mineral density (BMD) measurement at Hat Yai Regional Hospital were recruited for the analysis.*
Main Outcome Measures: *BMD was measured at the lumbar spine and the femoral neck using dual-energy x-ray absorptiometer (DXA), Lunar Expert-XL. The value of BMD bone between -1 and -2.5 standard deviation is considered osteopenia, and more than -2.5 standard deviation reflected osteoporosis.*
Results: *It was found that the prevalence of osteoporosis of lumbar spines and femoral neck was significantly higher in the late group of menopause (> 5 years since menopause) than in the early group of menopause (≤ 5 years since menopause) and than in the premenopause group. Osteoporosis at the lumbar spine was present in 1% of premenopause, 5.7% in the early group of menopause, and 10% in the late group of menopause. While osteoporosis at the femoral neck was present in 0.1% of premenopause, 0% in the early group of menopause, and 0.6% in the late group of menopause; both were statistically significant, ($p < 0.001$). Osteoporosis in the present study was not correlated with a history of osteoporosis among members of the family, insufficient calcium food, alcohol intake, caffeine intake, smoking, or non-exercise. Non-hormone intake, low body mass index, early and late group of menopause were highly significant correlated with osteoporosis.*
Conclusion: *During the perimenopause, the quantity and quality of BMD declines gradually or even rapidly. Many factors are known to be associated with osteoporosis. For general public health concern, the risk assessment for all perimenopausal women should be evaluated, probably followed by BMD.*

Keywords: *Prevalence, Osteoporosis, Menopause, Bone mineral density (BMD)*

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Osteoporosis is defined as a metabolic bone disease, characterized by low bone mass and micro-architectural deterioration of bony tissue leading to enhanced bone fragility and a consequent increase in fracture risk[1]. Osteoporotic fractures are a major cause of excess mortality, morbidity, and expenditure worldwide. There is a strong inverse relation between bone mineral density (BMD) and the risk of fracture, with a doubling in fracture incidence for each standard deviation reduction in BMD[2]. In 1994, the World Health Organization (WHO) Working Group established some guidelines by BMD testing called the T-score, or the number of standard deviations that the BMD is above or below the average for the young reference population database in the BMD machines. The classification is: T-scores of 0 to -1 are normal; -1 to -2.5, osteopenia; and -2.5 or lower, osteoporosis[3]. The WHO definition has been used increasingly for the diagnosis of osteoporosis in individuals, based on the measurement of BMD at the hip and spine using dual-energy x-ray absorptiometry (DXA), as well as the dual photon absorptiometry (DPA). The only fundamental difference

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of DXA from DHA is that the radionuclide source is replaced by an x-ray tube [4].

Using the Thai BMD reference[5], the age-specific prevalence of osteoporosis among Thai women rose progressively with increasing age to more than 50% after the age of 70[6]. The lifestyle risk factors of lack of exercise, smoking, alcohol intake, and caffeine consumption are reviewed for physiological effects that place women at risk for osteoporosis[7]. The author aims to determine the prevalence of the degree of BMD in perimenopausal women, and risk factors as well.

Material and Method

The present study was approved by the Institutional Review Board of Hat Yai Regional Hospital. Perimenopausal who attended the menopausal clinic from April 1997 to September 2006, there were 1,796 women who underwent the BMD measure, using DXA (Lunar Expert-XL, Japanese software). BMD was measured at lumbar spines (LS) at L1-L4, and femoral neck at the non-dominant side.

BMD as measured was expressed as absolute BMD (g/cm^2) and designated by either the number of standard deviations (SD) from the mean of age-matched controls (known as Z-score) or the number of SD from the young normal mean (as T-score). The women were allocated into three categories: premenopause group, early group of menopause, and late group of menopause.

Each woman was interview through a structured questionnaire, concerning risk factors of osteoporosis. Subjects were asked to respond 'yes,' 'no,' or 'not sure' to the questions: history of osteoporosis among members of the family, hormonal intake, alcohol intake and smoking, in addition with quantitative information regarding sufficient calcium food (regular milk or soy bean milk intake), caffeine consumption (> 2 cups per day) and exercise (duration of 30 minutes or more and at least 3 days per week).

Descriptive statistics [number (%), mean $\pm$ standard deviation (SD)] were used where it was appropriate. To compare categorical variables (%) or prevalence, Chi-square or Fishers' exact test were used where appropriated. The p-value of less than 0.05 was considered statistically significant.

Results

One thousand seven hundred and ninety-six women were enrolled into the present study, and determined for BMD at lumbar spine and femoral neck. The subjects were subdivided into three groups: 1,076 cases in the premenopause group, 369 cases in the early group of menopause, and 351 cases in the late group of menopause.

The mean age of the women was 48.97 years with SD = 5.0 and range of 34-60. The mean of body mass index (BMI) was 24.09 (SD = 3.37), and the mean of parity was 2.12 (SD = 1.41). About half (62.6%) had educational background of Bachelor degree or above. About two-third (68.7%) were government officers, and most of them (82.1%) had an income of at least 100,000 Baht annually.

The prevalence of osteoporosis at the lumbar spine and/or femoral neck in three different groups is demonstrated in Table 1. Osteoporosis at the lumbar spine had a higher significant prevalence than at the femoral neck. The early group and late group of menopause had highly statistical significance of both osteoporoses at the lumbar spine and at femoral neck, compared with the premenopause group (both $p < 0.001$).

Table 2 distributes the factors associated with the three categories of BMD: normal, osteopenia, and osteoporosis. History of osteoporosis among members of the family, insufficient calcium food, alcohol intake, caffeine intake, smoking, and non-exercise did not significantly relate with any degree of bone loss. Non-hormone intake was significantly correlated with osteoporosis ($p < 0.05$), while low BMI, early group of menopause, and late group of menopause had a high significance, related with osteoporosis ($p < 0.001$).

Discussion

Osteoporosis is most commonly associated with menopause (postmenopausal osteoporosis), as changes in estrogen levels accelerate bone resorption, and alter the balance between bone removal and bone replacement toward bone removal. The lifestyle risk factors are lack of exercise, smoking, alcohol intake, and caffeine. They should identify the clients at-risk. Beside the other risks should be evaluated; low body weight, > 3 months of oral corticosteroid, as well as the additional risk of estrogen deficiency, and dementia[8]. However, a number of other conditions and medications can cause osteoporosis, and secondary osteoporosis. The common conditions of secondary osteoporosis include anorexia nervosa, chronic liver disease, coeliac disease and inflammatory bowel disease, diabetic (type 1), hyperadrenocorticism, hyperparathyroidism, hyperpro- lactinemia, hypogonadism, renal disease, rheumatoid arthritis, and thyrotoxicosis, whereas the medication includes thyroid hormone,

Table 1. Prevalence of BMD classification at lumbar spines and femoral neck in three different groups

Site of measurement	Prevalence of BMD classification No. (%) n of Pre/Early/Late = 1,076/369/351								
	Normal			Osteopenia			Osteoporosis		
	Pre	Early	Late	Pre	Early	Late	Pre	Early	Late
Lumbar spines (LS)	Normal (n = 1,323)			Osteopenia (n = 399)			Osteoporosis (n = 74)		
(n = 1,796)	900	234	189	165	114	120	11*	21*	42*
	(83.6)	(63.4)	(53.8)	(15.3)	(30.9)	(34.2)	(1)	(5.7)	(10.0)
Femoral neck (FN)	Normal (n = 1,671)			Osteopenia (n = 122)			Osteoporosis (n = 3)		
(n = 1,796)	1,034	335	302	41	34	47	1*	0*	2*
	(96.1)	(90.8)	(86.0)	(3.8)	(9.2)	(13.4)	(0.1)	(0)	(0.6)
Both LS and FN	Normal (n = 1,295)			Osteopenia (n = 59)			Osteoporosis (n = 2)		
(n = 1,356)	884	230	181	19	20	20	0	0	2

Pre = Premenopause group
Early = Early group of menopause (≤ 5 years since menopause)
Late = Late group of menopause (> 5 years since menopause)
* $p < 0.001$

Table 2. Distribution of risk factors associated to bone mineral density

Risk-factors No. (%) n = 1,796	Normal n = 1,295 n (%)	Osteopenia n = 462 n (%)	Osteoporosis n = 75 n (%)	Subtotal n (%)
Osteoporosis in family	40 (71.4)	14 (25.0)	2 (3.6)	56 (3.1)
Insufficient calcium food	1,118 (72.0)	366 (23.6)	69 (14.4)	1,553 (86.4)
Alcohol intake	16 (76.2)	4 (19.0)	1 (4.8)	21 (1.1)
Caffeine intake	520 (73.9)	159 (20.5)	25 (3.6)	704 (39.1)
Smoking	11 (68.8)	4 (25.0)	1 (6.2)	16 (0.8)
Non exercise	238 (75.6)	61 (19.4)	16 (5.1)	315 (17.5)
Non hormone intake	1,189 (73.8)	371 (22.8)	65 (4.0)*	1,625 (90.4)
Low BMI	36 (53.7)	22 (32.8)	9 (13.4)**	67 (3.7)
Menopausal status				
- Premenopause group	885 (82.3)	179 (16.6)	12 (1.1)**	1,076 (59.9)
- Early group of menopause	231 (62.6)	117 (31.7)	21 (5.7)**	369 (20.5)
- Late group of menopause	181 (51.6)	128 (36.5)	42 (12)**	351 (19.5)

Early group of menopause means ≤ 5 years since menopause)
Late group of menopause means > 5 years since menopause)
* $p < 0.05$
** $p < 0.001$

gonadotrophin releasing hormone agonists, phenobarbital, and excessive vitamin D intake[9-11].

The clients at-risk of either postmenopausal or secondary osteoporosis need appropriate tools to alleviate client risk, and to diagnose the degree of bone loss. A study comparing the T-score classification of a prospective cohort of clients referred for their first DXA scan, analyzing data for women in 10-year age groups. Total hip and neck of femur DXA identified significantly fewer osteoporotic clients than spine DXA, and this reduced sensitivity could not be improved by adjusting the T-score threshold without an unacceptable

increase in non-osteoporotic cases[12]. So, both proximal femur and lumbar spine should be assessed jointly.

In the present study, the prevalence of osteoporosis at lumbar spine was up to ten times or more, higher than at the femoral neck: lumbar spine/femoral neck 1.0%/0.1% in premenopause group, 5.7%/0% in the early group of menopause, and 10.0%/0.6% in the late group of menopause, respectively. Thus, it is usual that the discordance in diagnosis of osteoporosis using spine and proximal femur bone densitometry can occur. In addition, the prevalence of osteoporosis in the late group of menopause was statistically significant, compared with the early group of menopause: late/early group were 10.0%/5.7% at lumbar spines, and 0.6%/0% at the femoral neck.

Some lifestyle risk behaviors are quite low among Thai women such as cigarette smoking (0.8%) and alcohol intake (1.1%). The present study confirms that non-hormone intake and low BMI were significantly correlated with osteopenia and osteoporosis.

The lifestyle change is an individual health strategy. While positive encouragement is helpful, various kinds of education such as mass, group, and individual education is required. The health behavior change continuum can be achieved step by step from unawareness to awareness and concern through actual information, attitudes, stable behavior, and eventually health consciousness in positive lifestyle[13]. For general public health concern, the risk assessment for all perimenopausal women should be evaluated, the client, at-risk probably might be followed by BMD. Recently, Thai health economic analysis reported that screening by risk index and DXA with treatment strategies was the most cost-effective strategy[14].

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ความชุกและปัจจัยเสี่ยงอันสัมพันธ์กับภาวะกระดูกพรุนในสตรีที่มาตรวจ ณ คลินิกวัยทอง โรงพยาบาลศูนย์หาดใหญ่

เทพณรงค์ จารุพานิช

วัตถุประสงค์*: เพื่อตรวจหาความชุกและปัจจัยเสี่ยงของภาวะกระดูกพรุนของสตรีวัยใกล้และหลังวัยหมดระดูในสถานะต่าง ๆ*

รูปแบบการทำวิจัย*: การศึกษาเชิงพรรณนา*

สถานที่ทำวิจัย*: คลินิกวัยหมดระดู โรงพยาบาลศูนย์หาดใหญ่*

วัสดุและวิธีการ*: สตรีที่ได้รับการตรวจความหนาแน่นของกระดูกในโรงพยาบาลศูนย์หาดใหญ่ ระหว่างเดือนเมษายน พ.ศ. 2540 ถึงเดือนกันยายน พ.ศ. 2549 จำนวน 1,796 ราย*

ตัววัดผลที่ได้รับหลัก*: การตรวจความหนาแน่นของกระดูกสันหลังและคอกระดูกต้นขา ด้วยเครื่อง dual-energy x-ray absorptiometer (DXA) ค่าความหนาแน่นของกระดูกระหว่าง -1 ถึง -2.5 ของค่าเบี่ยงเบนมาตรฐาน เป็นภาวะกระดูกบาง และค่าความหนาแน่นของกระดูกต่ำกว่า -2.5 ของค่าเบี่ยงเบนมาตรฐานเป็นภาวะกระดูกพรุน*

ผลการศึกษา*: ความชุกของภาวะกระดูกพรุนของกระดูกสันหลังและคอกระดูกต้นขา ในกลุ่มล่าของวัยหมดระดู (หมดระดูมากกว่า 5 ปี) สูงกว่ากลุ่มเริ่มของวัยหมดระดู (หมดระดู 5 ปีหรือน้อยกว่า) อย่างมีนัยสำคัญ และสูงกว่ากลุ่มก่อนวัยหมดระดู ภาวะโรคกระดูกพรุนที่กระดูกสันหลังพบร้อยละ 1 ในกลุ่มก่อนวัยหมดระดู ร้อยละ 5.7 ในกลุ่มเริ่มของวัยหมดระดู และร้อยละ 10 ในกลุ่มล่าของวัยหมดระดู ส่วนภาวะโรคกระดูกพรุนที่คอกระดูกต้นขาพบร้อยละ 0.1 ในกลุ่มก่อนวัยหมดระดู ร้อยละ 0 ในกลุ่มเริ่มของวัยหมดระดู และร้อยละ 0.6 ในกลุ่มล่าของวัยหมดระดู (ทั้งสองค่า $p < 0.001$) ภาวะกระดูกพรุนในการศึกษาปัจจุบันไม่สัมพันธ์กับประวัติโรคกระดูกพรุนในครอบครัว การรับประทานอาหาร ที่มีแคลเซียมต่ำ การดื่มแอลกอฮอล์ การดื่มกาแฟ การสูบบุหรี่ หรือการไม่ออกกำลังกาย ทว่าสัมพันธ์กับกลุ่มไม่ได้รับฮอร์โมนทดแทน ดัชนีมวลกายต่ำ รูปร่างผอม กลุ่มเริ่มของวัยหมดระดู และกลุ่มล่าของวัยหมดระดู*

สรุป*: ระหว่างวัยใกล้และหลังวัยหมดระดู ปริมาณและคุณภาพของความหนาแน่นของกระดูกลดลงทีละน้อย หรือรวดเร็วก็ตาม ปัจจัยเสี่ยงจำนวนมากเป็นที่ทราบดีว่าเกี่ยวข้องกับภาวะกระดูกพรุน สำหรับความตระหนักด้านสุขภาพสาธารณะ สตรีวัยใกล้และหลังวัยหมดระดูทุกคนควรได้รับการประเมินความเสี่ยงและน่าจะตามด้วยการตรวจความหนาแน่น ของกระดูก*