

Comparison of Osteoporosis Self Assessment Tool for Asian (OSTA) and Standard Assessment in Menopause Clinic, Chiang Mai

Somsak Chaovitsaree MD*,
Siri A-nong Namwongprom MD**, Nuntana Morakote BSc, MPH*,
Nuchanart Suntornlimsiri BSc*, Wirawit Piyamongkol MD, PhD*

* Department of Obstetrics and Gynecology, Faculty of Medicine, Chiang Mai University, Chiang Mai

** Department of Radiology, Faculty of Medicine, Chiang Mai University, Chiang Mai

Objective: To compare osteoporosis self assessment tool for Asian (OSTA) with the standard measurement of bone mineral density (BMD) by dual energy x-rays absorptiometry (DXA) in identifying the prevalence of osteopenia and osteoporosis in Thai menopausal women who attended the Menopause Clinic, Faculty of Medicine, Chiang Mai University.

Material and Method: The data was retrospectively collected from the medical records of women who had lumbar, femoral neck and radius BMD t-score measurement by DXA (Hologic®, QDR-4500C) between January 2004 and December 2005. The body weight and age of patients were calculated for the OSTA index score. The women with OSTA score < -1 and ≥ -1 were classified as “moderate to high risk” and “low risk” for fracture, respectively. The BMD T-scores of < -1 and ≥ -1 were classified as “osteopenia to osteoporosis” and “normal” respectively.

Results: Three hundred and fifteen menopausal women of the age of 45-87 years were included. The BMD T-scores assessment revealed that more than half of the subjects had osteopenia to osteoporosis (T-score ≤ -1), 196 women (62%) at lumbar spine, 133 women (42.2%) at femur and a third, 114 women (36.2%) at radius respectively. The OSTA index at the standard cut-point of < -1 had a sensitivity and specificity of 36.2% and 71.4% respectively for the lumbar spine and 40.6% and 72.0% respectively for the neck of the femur in predicting osteopenia to osteoporosis status.

Conclusion: The OSTA index score had a low sensitivity (36-48%) but a high specificity (71-75%) for identifying osteopenic to osteoporotic women among population of menopausal period. Nevertheless, it is a useful screening tool in old age women (> 65 years).

Keywords: Menopause, OSTA screening, BMD osteoporosis

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Osteoporosis is the most common metabolic bone disease in humans and the consequence of fracture represents one of the major public health problems not only in Western countries but also in Asian countries⁽¹⁾. Osteopenia is the state proceeding osteoporosis status. It is also important to identify

post menopausal women with osteopenia and osteoporosis, so that the prevention program can be started early. Although effective treatments can reduce fracture risk by about half, it is sometimes not possible to restore bone quality fully when the patients have already developed osteoporosis, because the micro-architecture of the loss bone has become irreversible⁽²⁾. Therefore, appropriate treatment for preventing bone loss should ideally be started when the bone mineral density (BMD) is in the range of osteopenia, before it falls into the range of osteoporosis.

Correspondence to : Chaovitsaree S, Department of Obstetrics and Gynaecology, Faculty of Medicine, Chiang Mai University, Chiang Mai 50200, Thailand. Phone 053-945-552-4, Fax: 053-946-112, E-mail: schaovis@mail.med.cmu.ac.th

Bone mineral density (BMD) measurement by dual energy X-rays absorptiometry (DXA) is the gold standard predictor of osteoporosis fractures and a surrogate measurement of osteoporosis⁽³⁾. However, the BMD measurement is not widely available in most communities, and the cost is still high. The osteoporosis self-assessment tools for Asian (OSTA) instrument, largely derived from age and body weight, has been found to be a good and simple tool for the identification of women with osteoporosis risk⁽⁴⁾.

The present study was designed to determine the sensitivity and specificity of the OSTA score in identifying osteopenia to osteoporosis in early and middle periods of Thai postmenopausal women.

Material and Method

The present study was designed as retrospective and diagnostic analytical study, the data were collected from medication record forms at the menopause unit, Chiang Mai University, Thailand, between January 2004 and December 2005. The women were excluded from the study if they were under 45 years or had a history or evidence of metabolic bone disorders, history of taking medications affecting calcium and bone turnover, including steroids, thyroid hormone, bisphosphonates, fluorides or calcitonin, history of lumbar spine, femoral neck and radius fractures. The present study was approved by the ethic committee of Faculty of Medicine, Chiang Mai University. Participants' characteristics including age (years) and the period of menopause (years) were obtained in frequency and percent. Diagnostic test, sensitivity, specificity, false negative, and false positive with 95% confidence interval was presented for comparison of OSTA index and the standard by dual energy X-rays BMD *T*-score.

Measurements

Three points of bone density were measured including the neck of the femur on the non-dominant side, the lumbar spine at L1 to L4 and the radius on the non-dominant side. All measurements were made using dual energy X-rays absorptiometry (DXA) measurement; the *T*-score of bone mineral density standardized against the peak preference range for young healthy women was calculated.

OSTA score was then calculated for each woman using her age and weight as follows: $0.2X$ (weight – age). Individuals with OSTA score being less than -1 were classified as high risk, and otherwise, a “low risk”. The concordance between the OSTA

classification and the actual BMD-based classification (> -1 , or ≤ -1) can be summarized in a 2 x 2 table, from which the indices of concordance sensitivity and specificity were obtained.

Results

Three hundred and fifteen Thai post-menopausal women, mean age was 54.83 years (SD 5.78, range 45-87 years) were included. Most of them were in the middle age group (45 - 55 years old). Only 8.9% and 4.8% were in the 61-65 and ≥ 65 years age groups respectively. The weight of patients was 51-60 kgs (mean \pm SD 54.43 ± 7.81 , range 34-81 kgs). The duration of menopause period of the patients in the present study is shown in Table 1, of which almost 80% were shorter than 10 years.

Using DXA evaluation, the prevalence of osteopenia (*T*-score ≤ -1) was 47% for lumbar spine, 39.7% for the neck of femur and 29.8% for radius as demonstrated in Table 2. Of all subjects, 210 (66.7%) women had OSTA index of > -1 (low risk category). The remaining 105 (33.3%) belonged to the high-risk category with OSTA value below ≤ -1 (Table 3) and among this group 71/105 (67.6%), 54/105 (51.4%), 55/105 (52.4%) had DXA *T*-score ≤ -1 (osteopenia

Table 1. Characteristics of the 315 menopausal women

Characteristic	Frequency (%)
Age (years)	
45-50	70 (22.2)
51-55	126 (40.0)
56-60	76 (4.1)
61-65	28 (8.9)
> 65	15 (4.8)
Range 45-87 years	
Mean age \pm SD: 54.83 \pm 5.78 years	
Weight (kilograms)	
≤ 40	8 (2.5)
41-50	95 (30.2)
51-60	152 (48.3)
61-65	35 (11.1)
> 65	25 (7.9)
Range 34-81 kgs	
Mean weight \pm SD: 54.43 \pm 7.81 kgs	
Duration post menopause (year)	
≤ 3	118 (37.5)
4-10	133 (42.2)
11-15	44 (14.0)
> 15	20 (6.3)
Total	315 (100)

Table 2. The *T*-score of bone mineral density on lumbar spine, neck of femur and radius of 315 menopausal women in this study

<i>T</i> -score	Lumbar L1-L4 frequency (%)	Femoral neck frequency (%)	Radius frequency (%)
> -1	119 (37.8)	182 (57.8)	201 (63.8)
-1 to > -2.5	148 (47.0)	125 (39.7)	94 (29.8)
≤ -2.5	48 (15.2)	8 (2.5)	20 (6.3)

Table 3. OSTA index classification for assessment of risk fracture from osteoporosis in 315 post menopausal women

OSTA index	Frequency (%)
low risk (> -1)	210 (66.7)
high risk (< or = -1)	105 (33.3)

category) for lumbar spine, femoral neck and radius respectively. The present study also compared OSTA to BMD assessment by DXA in identifying participants with osteopenia (*T*-score ≤ -1) in this population. The cut-off value of -1 was used for the OSTA index. Otherwise, BMD identifying were classification of osteoporosis using BMD when the high risk and low risk of osteoporosis at *T*-score ≤ -2.5 and > -2.5 respectively.

The data were statistically analyzed using McNemar's test. Table 4 shows that the sensitivity and specificity of the OSTA index ≤ -1 in identifying osteopenia and osteoporosis risk compared with BMD (*T*-score ≤ -1) of lumbar spine were 36% and 71%

respectively. The sensitivity and specificity of OSTA index in identifying osteopenia to osteoporosis risk of femoral neck were 41% and 72% respectively, and those of radius were 48% and 75% respectively. On the other hand, the DXA assessment osteoporosis at the *T*-score ≤ -2.5, the sensitivity of OSTA index were upper at all sites, highest (75%) at the neck of femur and 46%, 60% at the lumbar spine and radius respectively (Table 5).

Discussion

In Western countries, postmenopausal women who have a risk of osteoporotic-related fracture during their lives, develop a vertebral deformity or suffer a hip fracture^(5,6). Hip fractures are associated with a high mortality rate and the loss of independence^(7,8). Dual energy x-rays absorptiometry (DXA) is regarded as the standard method for BMD assessment and fracture prediction⁽³⁾. Unfortunately, in developing countries, DXA is not widely available and the cost of the measurement is high, therefore, the service is limited. The quest for a non-BMD or clinical risk index should help in identifying postmenopausal women at risk of osteopenia and osteoporosis and the establishment of

Table 4. Comparison of OSTA index and the standard assessment by dual energy X-rays BMD *T*-score -1.0 of lumbar spine L1-L4, neck of femur and radius

OSTA index	<i>T</i> -score BMD by Dual energy X-rays						Total
	Lumbar spine L1-L4		Neck of Femur		Radius		
	≤ -1	> -1	≤ -1	> -1	≤ -1	> -1	
High risk (index ≤ -1)	71	34 (FP)	54	51 (FP)	55	50 (FP)	105
Low risk (index > -1)	125 (FN)	85	79 (FN)	131	59 (FN)	151	210
Total	196	119	133	182	114	201	315
Sensitivity (95% CI)	36.2% (29.5-43.0)		40.6% (32.3-48.9)		48.3% (39.1-57.4)		
Specificity (95% CI)	71.4% (63.3-79.5)		72.0% (65.5-78.5)		75.1% (69.1-81.1)		
FN = false negative (95% CI)	40.0% (34.3-45.1)		25.0% (20.3-29.9)		19.0% (14.4-23.0)		
FP = false positive (95% CI)	11.0% (7.4-14.2)		16.0% (12.1-20.3)		16.0% (11.8-19.9)		

Table 5. Comparison of OSTA index and the standard assessment by dual energy X-rays BMD T -score ≤ -2.5 of lumbar spine L1-L4, neck of femur and radius

OSTA index	T-score BMD by Dual energy X-rays						Total
	Lumbar spine L1-L4		Neck of Femur		Radius		
	≤ -2.5	> -2.5	≤ -2.5	> -2.5	≤ -2.5	> -2.5	
High risk (index ≤ -1)	22	83 (FP)	6	99 (FP)	12	93 (FP)	105
Low risk (index > -1)	26 (FN)	184	2 (FN)	208	8 (FN)	202	210
Total	48	267	8	307	20	295	315
Sensitivity (95%CI)	45.8% (31.7-59.9)		75.0% (45.0-100.0)		60.0% (38.5-81.5)		
Specificity (95%CI)	68.9% (63.4-74.5)		67.8% (62.5-73.0)		68.5% (63.3-73.8)		
FN = false negative (95%CI)	8.0% (5.2-11.3)		1.0% (0.2-1.5)		3.0% (0.8-4.3)		
FP = false positive (95%CI)	26.0% (21.5-31.2)		31.0% (26.3-36.6)		30.0% (24.5-34.6)		

an early strategy for osteoporosis fracture prevention.

Clinical risk factors are introduced in many instruments in order to estimate the risk of osteoporosis, such as, the simple calculated osteoporosis risk estimation (SCORE), the osteoporosis risk assessment instrument (ORAI), the study of osteoporotic fracture simple useful risk factors (SOF SURF), and osteoporosis self assessment tool for Asians (OSTA). All instruments employ age, body weight as common elements to identify the individual at risk⁽⁹⁾.

The participants in the present study were younger than those in a previous study⁽¹⁾ (mean age 54.8 ± 5.8), prevalence of osteoporosis of lumbar spine, femoral neck and radius were only 15.2%, 2.5%, 6.3% respectively. For the OSTA in the younger age group (45-60 years) at the overall, Pongchaiyakul, et al⁽¹⁾ demonstrated that the sensitivity was 48%, but the specificity was higher (84%), on the other hand, among age 60 years and older, the specificity was 27% compared with the sensitivity of 95%. Similar to the studies from the Philippines⁽¹⁰⁾ and Korea⁽¹¹⁾ indicating that the validation of OSTA, performed in order to identify the risk of osteoporosis among postmenopausal women, gave high sensitivity. In southern Thailand, Geater S et al⁽¹²⁾ used the OSTA index as a screening tool among postmenopausal women and found a high probability of femoral neck and lumbar spine osteoporosis (11.8%, 30.8%) in the older age group (71.3 ± 9.4 years and 68.1 ± 9.0 years). They found that OSTA index at the standard cut point of ≤ -1 provided a sensitivity and specificity of 93% and 61% respectively for neck of femur 80%, and 70% respectively for lumbar spine. They suggested that raising the cut-point to ≤ 0 might be more appropriate to improve the sensitivity of

detection of osteoporosis of the lumbar spine.

In the present study, the overall from DXA measurement, the younger age group possessed a high prevalence of osteopenia (T -score -1 to -2.5), the authors compared the OSTA index with the BMD for those who were identified at risk of osteopenia and osteoporosis in northern, Thailand. The subjects in the present study comprised those who mainly attended the post menopause clinic voluntarily, generally received welfare from the government, and were well-educated about the menopause.

The present finding suggested that the application of the OSTA index for identifying Thai postmenopausal women at an increased risk of osteopenia and osteoporosis in a younger age group has lower sensitivity than that in the older age group. The sensitivity was only 36%, 41%, and 48% for the lumbar spine, the femoral neck, and the radius respectively, however the specificity was high with approximately higher than 70% all sites of measurement. However, comparing the OSTA (≤ -1) and BMD T -score ≤ -2.5 for osteoporosis, it revealed the high sensitivity (75%) at the neck of femur.

It was concluded that OSTA is a simple and effective clinical risk assessment tool for identifying elderly of age > 65 years, Thai menopausal women at risk of osteopenia to osteoporosis. The effectiveness of OSTA index was best in the assessment of femoral neck osteoporosis. However, in the younger age group, other clinical risk assessment and the use of quantitative bone ultrasound measurement should be considered to improve the sensitivity of detection of lumbar spine and femoral neck osteopenia in early menopausal women.

References

1. Pongchaiyakul C, Nguyen ND, Eisman JA, Nguyen TV. Clinical risk indices, prediction of osteoporosis, and prevention of fractures: diagnostic consequences and costs. *Osteoporos Int* 2005; 16: 1444-50.
2. Hochberg M. Preventing fractures in postmenopausal women with osteoporosis. A review of recent controlled trials of antiresorptive agents. *Drugs Aging* 2000; 17: 317-30.
3. Kanis JA. Diagnosis of osteoporosis and assessment of fracture risk. *Lancet* 2002; 359: 1929-36.
4. Koh LK, Sedrine WB, Torralba TP, Kung A, Fujiwara S, Chan SP, et al. A simple tool to identify asian women at increased risk of osteoporosis. *Osteoporos Int* 2001; 12: 699-705.
5. Melton LJ III, Kan SH, Frye MA, Wahner HW, O'Fallon WM, Riggs BL. Epidemiology of vertebral fractures in women. *Am J Epidemiol* 1989; 129: 1000-11.
6. Barrett JA, Baron JA, Karagas MR, Beach ML. Fracture risk in the U.S. Medicare population. *J Clin Epidemiol* 1999; 52: 243-9.
7. White BL, Fisher WD, Laurin CA. Rate of mortality for elderly patients after fracture of the hip in the 1980's. *J Bone Joint Surg Am* 1987; 69: 1335-40.
8. Cauley JA, Thompson DE, Ensrud KC, Scott JC, Black D. Risk of mortality following clinical fractures. *Osteoporos Int* 2000; 11: 556-61.
9. Wehren LE, Siris ES. Beyond bone mineral density: can existing clinical risk assessment instruments identify women at increased risk of osteoporosis? *J Intern Med* 2004; 256: 375-80.
10. Li-Yu JT, Llamado LJ, Torralba TP. Validation of OSTA among Filipinos. *Osteoporos Int* 2005; 16: 1789-93.
11. Park HM, Sedrine WB, Reginster JY, Ross PD. Korean experience with the OSTA risk index for osteoporosis: a validation study. *J Clin Densitom* 2003; 6: 247-50.
12. Geater S, Leelawattana R, Geater A. Validation of the OSTA index for discriminating between high and low probability of femoral neck and lumbar spine osteoporosis among Thai postmenopausal women. *J Med Assoc Thai* 2004; 87: 1286-92.

การเปรียบเทียบแบบประเมินภาวะกระดูกพรุนอย่างง่ายสำหรับสตรีชาวเอเชียเทียบกับวิธีมาตรฐาน ดูอัลเอเอเอจี เอกซเรย์ แอปซอพติโอเมตรี ในสตรีวัยหมดระดู คลินิกวัยทอง เชียงใหม่

สมศักดิ์ เชาววิศิษฐ์เสรี, ศิริอนงค์ นามวงศ์พรหม, นันทนา มรกต, นุชนาต สุนทรลัมศิริ, วีรวิทย์ ปิยะมงคล

วัตถุประสงค์: เพื่อเปรียบเทียบแบบประเมินภาวะกระดูกพรุนอย่างง่ายสำหรับชาวเอเชียเปรียบเทียบกับวิธีมาตรฐานวัดความหนาแน่นกระดูกด้วยเครื่องดูอัล เอเอเอจี เอกซเรย์ แอปซอพติโอเมตรี (DXA) ในการประเมินความชุกของภาวะกระดูกบางและกระดูกพรุนในสตรีวัยหมดระดู ที่มารับบริการที่คลินิกวัยทอง คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่

วัสดุและวิธีการ: เป็นการศึกษาแบบย้อนหลังโดยการเก็บรวบรวมข้อมูลจากเวชระเบียนผู้ป่วย ในสตรีทุกรายที่ได้รับการตรวจวัดความหนาแน่น ด้วยเครื่อง DXA ในช่วงระหว่างเดือน มกราคม พ.ศ. 2547 ถึง เดือน ธันวาคม พ.ศ. 2548 โดยประเมินค่า T-score ของกระดูกส่วนกระดูกสันหลัง กระดูกข้อสะโพก และกระดูกข้อมือ การคำนวณค่าดัชนีประเมินความเสี่ยงต่อโรคกระดูกพรุนอย่างง่ายสำหรับชาวเอเชียโดยใช้น้ำหนักและอายุตามสูตร $0.2 \times (\text{น้ำหนัก} - \text{อายุ})$ ในช่วงที่สตรีได้รับการตรวจวัดความหนาแน่นกระดูกด้วยวิธีมาตรฐาน เปรียบเทียบวิธีการประเมินความเสี่ยงภาวะกระดูกหักของทั้ง 2 วิธี คือค่าดัชนีจากการคำนวณน้ำหนักและอายุ เปรียบเทียบกับค่า T-score โดยใช้เกณฑ์ ≤ -1 เป็นกลุ่มเสี่ยงสูง และ > -1 เป็นกลุ่มเสี่ยงต่ำ

ผลการศึกษา: สตรีวัยหมดระดูจำนวน 315 คน มีอายุระหว่าง 45-87 ปี จากการตรวจวัดความหนาแน่นกระดูกด้วยวิธีมาตรฐานพบว่าสตรี 196 คนหรือมากกว่าครึ่ง (ร้อยละ 62) มีค่า T-score ของกระดูกสันหลังอยู่ในเกณฑ์ภาวะกระดูกบางถึงกระดูกพรุน (T-score ≤ -1) ส่วนกระดูกสะโพก และกระดูกข้อมือพบร้อยละ 42.2 และ 36.1 ตามลำดับจากการประเมินความเสี่ยงโดยวิธีมาตรฐานที่ค่า T-score ≤ -1 เปรียบเทียบกับค่าดัชนีจากแบบประเมินความเสี่ยงกระดูกพรุนอย่างง่ายสำหรับชาวเอเชีย ที่เกณฑ์ ≤ -1 ประเมินความไวและความจำเพาะของแบบประเมินความเสี่ยงอย่างง่ายสำหรับชาวเอเชีย พบว่าความไวและความจำเพาะต่อความเสี่ยงกระดูกบางถึงกระดูกพรุนที่ส่วนกระดูกสันหลัง คิดเป็นร้อยละ 36.2 และ 71.4 ตามลำดับ และ ส่วนกระดูกสะโพก ร้อยละ 40.6 และ 72.0 ตามลำดับ

สรุป: แบบประเมินความเสี่ยงกระดูกพรุนอย่างง่ายสำหรับชาวเอเชียเพื่อนำมาใช้คัดกรองในสตรีวัยหมดระดู ให้ความไวต่ำ ในการที่จะประเมินความเสี่ยงจากภาวะกระดูกบางถึงกระดูกพรุนในกลุ่มสตรีวัยหมดระดู ซึ่งน่าจะเหมาะสมมากกว่าในการใช้คัดกรองกลุ่มสตรีสูงอายุ (มากกว่า 65 ปี)
