Lumbar Spine and Hip Bone Mineral Density in Thai Women Using the Osteosys Dexxum T-Bone Densitometer

Chatlert Pongchaiyakul MD*,
Praew Kotruchin MD**

** Division of Endocrinology and Metabolism, Department of Medicine, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand*
*** Department of Emergency Medicine, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand*

Objective: *To measure lumbar spine and hip bone mineral density (BMD) and to define the Thai normal reference for classifying BMD results and diagnosis of osteoporosis in Thai women using a new mobile central dual energy X-ray absorptiometry (DXA).*
Material and Method: *This cross-sectional investigation recruited 779 Thai women between 20 and 85 years. Lumbar spine and hip BMD was measured by DXA (Osteosys Dexxum-T). The BMD results were classified by T-score as per WHO criteria.*
Results: *Advancing age was negatively correlated with BMD at both sites, whereas body weight was positively correlated to BMD at both. The correlation between BMDs at the lumbar spine and hip was 0.67 to 0.69. The peak BMD was observed in women between 20 and 24 years at both sites, with a respective mean and standard deviation of 1.082±0.153, 1.115±0.161, 0.878±0.150, and 0.946±0.125 at L1-4, L2-4, the femoral neck and total hip. Using the Thai references derived from peak BMD, the prevalence of osteoporosis was 5.1 to 5.5 and 3.1 to 6.3% at the lumbar spine and hip, respectively, which was lower than the Asian reference as provided by DXA.*
Conclusion: *The present study suggested that using the T-score provided by the Osteosys Dexxum-T over-diagnosed osteoporosis in Thai women. The authors recommend using Thai normal reference from the present study to define the BMD result in Thai women.*

Keywords: *Bone mineral density, Dual energy x-ray absorptiometry, Osteoporosis, Reference, Thailand*

J Med Assoc Thai 2013; 96 (8): 898-904
Full text. e-Journal: *http://jmat.mat.or.th*

The cornerstone for the diagnosis and treatment of osteoporosis is the accurate assessment and optimal reporting of bone mineral density (BMD) results. It is generally accepted that BMD, measured by dual energy x-ray absorptiometry (DXA), is the strongest predictor of osteoporotic fracture(s)[1]. At present, central or axial BMD measured at the hip and lumbar spine is recognized as the gold standard and recommended by most organizations for osteoporosis[2-4] including the Thai Osteoporosis Foundation (TOPF)[5]. In some developing countries (including Thailand), DXA is not widely available. There are only about 100 machines in all of Thailand with a population of 60 million. Moreover, most of the machines are at a university or at a private or provincial hospital. Therefore, finding a new method for early identification and facilitating timely intervention for subjects with a high-risk for developing osteoporosis and preventing fracture is very important.

In 2009, the Osteosys Dexxum-T[6], a central DXA from Korea, was launched in Thailand. It has some advantages over standard DXA such as shorter scanning time, lighter weight, micro-emissions of X-rays obviating the need for a shielding room, a small bed size, and an auto-tube current setting for individual patients. Therefore, it can serve as a mobile DXA. The reference data for classifying the BMD measurements is based on both Korean and Asian populations. The present study was designed to measure BMD in Thai women and to establish the normal reference for classification of BMD among Thais facilitating diagnosis of osteoporosis in Thai women.

Correspondence to:
Pongchaiyakul C, Division of Endocrinology and Metabolism, Faculty of Medicine, Khon Kaen University, Khon Kaen 40002, Thailand.
Phone: 043-363-664, Fax: 043-202-491
E-mail: pchatl@kku.ac.th

Material and Method

Subject and setting

The authors designed a cross-sectional study, using multistage, stratified sampling of the Thai population. The first stage was a random sample of

four provinces from each of Thailand's four regions. In the second stage, three to five districts were selected from each of the same provinces. Next, the advertisement was posted at the provincial hospitals and in the health sector in each of the same provinces. In the final stage, at least 45 women were selected in 11 age sub-groups (20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, and 70+ years, respectively). The targeted final sample size was 495 participants, and the final sample collected was 779 participants. The Khon Kaen University Ethics Committees examined and approved our study protocols. Informed written consent was obtained from each participant. The present study was conducted in accordance with the 1975 Helsinki Declaration (revised 1983).

Each individual who agreed to participate was given a questionnaire (by trained study staff), which included questions on age, menstrual status and underlying diseases. We excluded individuals with previous bone disorders, chronic diseases, or history of taking medications affecting calcium and bone metabolism except calcium and vitamin D (i.e., steroids, thyroid hormone, fluoride, bisphosphonates, selective estrogen receptor modulators, strontium ranelate, anti-epileptics, thiazides, calcitonin, and alcohol abuse).

Measurements

Body weight was measured on an electronic scale with indoor clothing without shoes. Height was determined without shoes on a portable stadiometer. Body mass index (BMI) was calculated as the ratio of weight (kg) over height squared (m^2).

BMD (g/cm^2) at the lumbar spine and hip, was measured by dual-energy X-ray absorptiometry using an Osteosys Dexxum-T densitometer (OsteoSys Co. Ltd., Seoul, Korea). Five densitometers of the same model and using the same software were calibrated with a standardized phantom before each measurement. Five well-trained technicians validated the results. The coefficient of variation of BMD for normal subjects was 1.2 to 1.5 and 1.4 to 1.8 at the hip and lumbar spine, respectively. The densitometer provided the BMD and T-score for each site measured. We used the WHO criteria to categorize the T-score into three groups, osteoporosis if the T-score was $\leq$-2.5, osteopenia if T-score was between -1 and -2.5, and normal if T-score was $\geq$-1[1,7].

Statistical analysis

Statistical analyses were performed using SPSS for Window version 17, (SPSS Inc., Chicago). Descriptive statistics were calculated for each age group and the results expressed as the mean and standard deviation (SD). BMD values were analyzed in 5-year intervals by calculating the mean and SD. The correlation between BMD, age, body weight and height was obtained using the Pearson correlation coefficient (r). The statistical significance was defined at p-value <0.05.

In the analysis, we used the functional relationship between age and BMD to construct a reference range. A series of polynomial regression models were fitted to the lumbar spine (L1-4 and L2-4), femoral neck and total hip BMD as a function of $BMD = y_0 + a\,(age) + b\,(age)^2 + c\,(age)^3$, where y_0 is the intercept; a, b and c are the regression parameters which were estimated from the observed data. Reduced models (i.e., quadratic and linear) were considered, and the final model selected. Based on the results for BMD, peak BMD and standard deviation (SD) for the lumbar spine (L1-4 and L2-4) and hip (femoral neck and total hip) were used. We then calculated the T-score for each participant and used the WHO criteria to classify the T-score into three groups, osteoporosis, osteopenia, and normal[1,7].

Results

Seven hundred seventy nine women participated in the study. The regional distribution of participants was similar. Age averaged 49.6±13.5 years (range, 20-85). Some 264 women (33.9%) were menopausal and the average number of years since menopause was 11.8.

Advancing age was negatively correlated with BMD at the lumbar spine ($r = -0.34$, $p<0.001$ and -0.33 at L1-4 and L2-4, respectively) and hip ($r = -0.44$, $p<0.001$ and -0.33, $p<0.001$ at the femoral neck and total hip, respectively), whereas body weight was positively correlated with BMD at the lumbar spine ($r = 0.24$, $p<0.001$ and 0.23 at L1-4 and L2-4, respectively) and hip ($r = 0.32$, $p<0.001$ and 0.33, $p<0.001$ at the femoral neck and total hip, respectively). Height was positively associated with the lumbar spine ($r = 0.22$, $p<0.001$ at both L1-4 and L2-4) and hip ($r = 0.32$, $p<0.001$ at both the femoral neck and total hip). The correlation of the BMDs between the femoral neck and lumbar spine was 0.67 ($p<0.001$) and between total hip and lumbar spine was 0.69 ($p<0.001$).

The relationship between BMD at both sites was best described by a third-degree polynomial regression model (Table 1, Fig. 1). The relationship was characterized by three phases, (1) BMD increased between 20 and 25 years of age, (2) followed by a

Table 1. Estimates of parameters of the polynomial regression model

Bone mineral density	Parameters				R^2	SSE
	y_0	a (age)	b $(age)^2$	c $(age)^3$		
Lumbar spine 1-4	0.5777 (0.1849)	0.0311 (0.0117)	-0.0006 (0.0002)	0.000003 (0.000001)	0.13	0.16
Lumbar spine 2-4	0.6226 (0.1936)	0.0301 (0.0122)	-0.0006 (0.0002)	0.000003 (0.000001)	0.12	0.17
Femoral neck	0.5073 (0.1484)	0.0230 (0.0094)	-0.0005 (0.0002)	0.000002 (0.000001)	0.22	0.13
Total hip	0.6845 (0.1574)	0.0129 (0.0100)	-0.0002 (0.0002)	0.0000004 (0.000001)	0.15	0.14

Values are the coefficient (standard error) of the model; BMD = y_0 + a (age) + b $(age)^2$ + c $(age)^3$; R^2 = coefficient of determination indicates the proportion of variance in BMD; SSE = standard error of estimates

steady state (between 25 and 45 years), then (3) a gradual decline after the 45 years of age. The peak BMD was observed in women between 20 and 24 years of age at both the lumbar spine and hip (femoral neck and total hip). Bone mineral density at both sites decreased with increasing age; however, the decrease in BMD was more pronounced at the hip particularly after 50 years of age (Table 2).

The respective peak BMD (mean and SD) derived from young adults (aged 20-24 years) in the current study was 1.082±0.153, 1.115±0.161, 0.878±0.150 and 0.946±0.125 at the L1-4, L2-4, femoral neck and total hip. Based on the peak BMD, we calculated the cut-offs for osteopenia and osteoporosis at the lumbar spine and hip (Table 3). Using these cut-offs, the prevalence of osteoporosis was 5.1 to 5.5 and 3.1 to 6.3% at the lumbar spine and hip, respectively. While the age-adjusted prevalence of osteoporosis was 3.4 to 3.6 and 2.0 to 4.1% at the lumbar spine and hip, respectively. The prevalence increased with advancing age; for instance, in women over 50, 60, and 70+, the prevalence of osteoporosis at the lumbar spine (L1-4) was 4.2 (9/216), 11.9 (16/134), and 30.4% (17/56), respectively, while the prevalence of osteoporosis of the total hip was 5.6 (12/216), 13.4 (18/134), and 28.6% (16/56), respectively.

In the current study, the prevalence of osteoporosis using an Asian-based reference in the machine was higher than when using a Thai reference- as derived from the Thai normal reference created in the present study. The age-adjusted prevalence of osteoporosis for all of the subjects was 13.6, 11.0, 9.3, and 4.1% at the L1-4, L2-4, femoral neck, and total hip, respectively. The prevalence was increased with advancing age; for instance, among women 50 and over, the age-adjusted prevalence of osteoporosis was 33.0, 25.6, 26.6, and 13.0% at the L1-4, L2-4, femoral neck, and total hip, respectively.

Discussion

Currently, osteoporosis is operationally defined in terms of BMD, which is compared to a

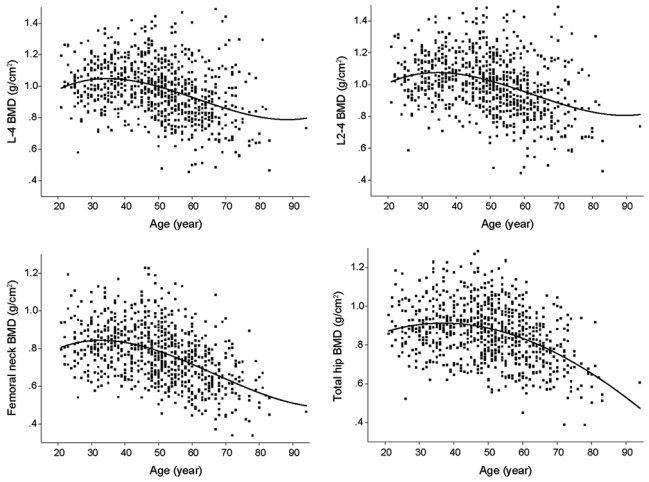

Fig. 1 Relationship between age and bone mineral density at the lumbar spine, femoral neck and total hip (lines were developed from equations).

Table 2. Bone mineral density at the lumbar spine and hip by age group

Age group	n	Bone mineral density (g/cm^2)						
		L1	L2	L3	L4	L1-4	L2-4	FN	TH
20-24	14	0.967±0.139	1.075±0.161	1.115±0.152	1.149±0.184	1.082±0.153	1.115±0.161	0.878±0.150	0.946±0.125
25-29	44	0.901±0.138	0.984±0.135	1.031±0.142	1.018±0.145	0.990±0.132	1.012±0.137	0.807±0.123	0.871±0.126
30-34	68	0.920±0.140	1.016±0.149	1.094±0.161	1.099±0.161	1.038±0.142	1.072±0.148	0.845±0.134	0.911±0.136
35-39	77	0.926±0.134	1.016±0.139	1.080±0.146	1.108±0.179	1.041±0.139	1.070±0.149	0.829±0.120	0.900±0.131
40-44	65	0.941±0.167	1.021±0.164	1.097±0.179	1.100±0.179	1.045±0.161	1.074±0.167	0.814±0.125	0.899±0.149
45-49	105	0.951±0.151	1.025±0.162	1.093±0.199	1.120±0.186	1.053±0.161	1.082±0.171	0.831±0.150	0.917±0.149
50-54	121	0.883±0.163	0.941±0.155	0.994±0.169	1.037±0.195	0.969±0.157	0.993±0.164	0.777±0.133	0.883±0.146
55-59	95	0.857±0.184	0.923±0.211	0.977±0.199	1.005±0.179	0.945±0.175	0.970±0.182	0.734±0.130	0.856±0.141
60-64	80	0.785±0.169	0.840±0.185	0.916±0.172	0.971±0.187	0.884±0.165	0.912±0.170	0.688±0.134	0.805±0.135
65-69	54	0.778±0.174	0.847±0.191	0.913±0.219	0.964±0.239	0.882±0.193	0.911±0.207	0.653±0.126	0.773±0.143
70+	56	0.772±0.211	0.823±0.226	0.894±0.243	0.948±0.236	0.865±0.219	0.893±0.226	0.624±0.138	0.722±0.153

L = lumbar spine, FN = femoral neck, TH = total hip

normative database[8]. It is well accepted, however, that BMD measurement differs across ethnicities[8-11]; so, the referent database should be ethnicity-specific. A further challenge in Thailand is that most of the available central DXA machines are located in hospitals, particularly at universities, in private and in some provincial hospitals. Hence, the plan to use a mobile central DXA with a Thai reference is appropriate for early identification of individuals in the community at risk for osteoporotic fracture.

We found that the best relationship between age and BMD in the present study followed a third degree polynomial function, which is consistent with a recent study[12]. Thai women achieved their peak BMD between 20 and 24 years of age, which was similar to Caucasians (20-25 years)[13-16]. The peak BMD in this study is earlier than previously reported for Thai women (30-34 years)[17] and some Asian women[12,18]. Although it is not possible to determine the underlying factors for this apparent difference, it is well-known that differences in interactions between endogenous and exogenous factors-including genetics, food intake, menstrual history, lifestyle and physical activity-may affect the results of peak BMD[19-21].

In the current study, we have shown that there is a discrepancy in the diagnosis of osteoporosis when using the Thai referent vs. the Asian reference data provided with the densitometer. When using the Thai normative data, the prevalence of osteoporosis in Thai women 50+ years was 9.1 to 10.3% at the lumbar spine and 5.9 and 11.3% at the femoral neck and total hip, respectively. However, using the DXA-provided Asian reference, it was 24 to 31% at the lumbar spine and 24.1 and 11.3% at the femoral neck and total hip, respectively. Thus, use of the reference data resulted in a higher prevalence of osteoporosis in the Thai population. Differences in the prevalence of osteoporosis might be explained by differences in the peak BMD and SD between the Osteosys Dexxum-T normative data and the present normative data; even though, the SD for BMD is very stable across populations.

In 2001, Limpapayom et al reported the age-adjusted prevalence of osteoporosis was 19.8% and 13.6% for lumbar spine and femoral neck, respectively[22], whereas in two other studies (one hospital-based and the other rural) the respective prevalence of osteoporosis in Thai women was 21.4 to 24.7% and 11.9 to 19.3% at the lumbar spine and femoral neck[23,24]. The discrepancy might be explained by differences in the study populations, peak BMD of

Table 3. BMD cut-offs to define osteopenia (mean -1 SD) and osteoporosis (mean -2.5 SD) at the lumbar spine and hip base on peak BMD from young adult

Regions	Mean	SD	Mean -1 SD	Mean -2.5 SD
Lumbar spine (L1-4)	1.082	0.153	0.929	0.700
Lumbar spine (L2-4)	1.115	0.161	0.954	0.713
Femoral neck	0.878	0.150	0.728	0.503
Total hip	0.946	0.125	0.821	0.634

the populations (i.e., rural women had a higher peak BMD than urban women), nutritional transition[25,26], and health promotion in osteoporosis prevention, physical activity and exercise by the TOPF and Thai Health Promotion Foundation (http://en.thaihealth.or.th/).

The differences between the prevalence of osteoporosis in the current study and previous studies among postmenopausal women in Thailand (+50 years - the common age range for osteoporosis and osteoporosis-related fractures) might be explained by the lower peak BMD in the current study or the higher BMD among the postmenopausal women in the previous studies. However, it is difficult to compare peak BMD between the studies as the densitometers and the software used were different and there is no standardized BMD to correct between the Osteosys Dexxum-T machine and the other densitometers. Further research is therefore needed to standardize between the new machine used in the current research and previous machines (i.e., Lunar, Hologic or Norland); including comparing the peak BMD between studies[27]. Moreover, in the past decade, osteoporosis and osteoporosis-related fractures have been recognized as a health problem in Thailand. Health promotion has included, adequate calcium intake, more physical activity and weight bearing exercise, identification and correction of risk factors. Related to this, the clinical risk indices (i.e., Osteoporosis Self-Assessment Tool (OSTA)[28] and Khon Kaen Osteoporosis Study (KKOS) score[29] - developed from Thai postmenopausal women - were used for screening. It is possible that these policies and strategies could improve the BMD status and further decrease the prevalence of osteoporosis among postmenopausal Thai women.

The present results must be interpreted within the context of strengths and potential limitations. (1) The study represents one of the largest studies on osteoporosis in the Thai population and, as such, it has increased the reliability of estimates for peak BMD, and prevalence of osteoporosis. (2) The study population included all four regions of Thailand as well as both urban and rural areas, making it representative of the general population. (3) The technique used for measurement of BMD is considered the "gold standard".

The study also had a number of potential weaknesses: (a) The participants came in response to an advertisement so the sample may represent a selective bias. (b) Peak BMD should be estimated from a longitudinal study in which a large number of women have been followed from childhood to the age of 35, but such a study is not practicable. (c) The estimate of peak BMD in a cross-sectional study that can be biased by unmeasured confounders. Notwithstanding the limitations, the present findings have important public health and clinical implications: this new, less expensive machine can be used as a mobile central DXA, for defining BMD status and diagnosing osteoporosis at a community level.

In conclusion, these data demonstrate that the prevalence of osteoporosis in postmenopausal Thai women is lower than in previous Thai studies. The data indicate that using the T-score provided by the Osteosys Dexxum-T over-diagnosed osteoporosis in Thai women. The authors propose using the data developed from the study for defining BMD status and for diagnosing osteoporosis in Thai women.

Acknowledgements

This study was supported by Medicia Instrument Service, LTD. The authors thank Mr. Bryan Roderick Hamman and Mrs. Janice Loewen-Hamman for assistance with the English-language presentation of the manuscript.

Potential conflicts of interest

None.

References

1. Kanis JA. Diagnosis of osteoporosis and assessment of fracture risk. Lancet 2002; 359: 1929-36.

2. World Health Organization. Assessment of fracture risk and its application to screening for postmenopausal osteoporosis. No. 843 of Technical Reports Series. Geneva: WHO; 1994.
3. Lewiecki EM, Watts NB, McClung MR, Petak SM, Bachrach LK, Shepherd JA, et al. International Society for Clinical Densitometry. Official Positions of the International Society for Clinical Densitometry. J Clin Endocrinol Metab 2004; 89: 3651-5.
4. National Osteoporosis Foundation. Clinician's guide to prevention and treatment of osteoporosis. Washington, DC: NOF; 2008.
5. Royal College of Orthopaedic Surgeons of Thailand and Thai Osteoporosis Foundation. Clinical practice guideline for osteoporosis. Bangkok: Royal College of Orthopaedic Surgeons of Thailand and Thai Osteoporosis Foundation; 2010.
6. QST Group. Dexxum T [Internet]. 2010 [cited 2012 Aug 30]. Available from: http://www.qsttech.com/dexxum-t
7. Kanis JA, Glüer CC. An update on the diagnosis and assessment of osteoporosis with densitometry. Committee of Scientific Advisors, International Osteoporosis Foundation. Osteoporos Int 2000; 11: 192-202.
8. Baim S, Binkley N, Bilezikian JP, Kendler DL, Hans DB, Lewiecki EM, et al. Official Positions of the International Society for Clinical Densitometry and executive summary of the 2007 ISCD Position Development Conference. J Clin Densitom 2008; 11: 75-91.
9. Namwongprom S, Rojnastein S, Mangklabruks A, Soontrapa S, Wongboontan C, Ongphiphadhanakul B. Importance of ethnic base standard references for the diagnosis of osteoporosis in Thai women. J Clin Densitom 2012; 15: 295-301.
10. Hoiberg M, Nielsen TL, Wraae K, Abrahamsen B, Hagen C, Andersen M, et al. Population-based reference values for bone mineral density in young men. Osteoporos Int 2007; 18: 1507-14.
11. Nam HS, Shin MH, Zmuda JM, Leung PC, Barrett-Connor E, Orwoll ES, et al. Race/ethnic differences in bone mineral densities in older men. Osteoporos Int 2010; 21: 2115-23.
12. Nguyen HT, von Schoultz B, Pham DM, Nguyen DB, Le QH, Nguyen DV, et al. Peak bone mineral density in Vietnamese women. Arch Osteoporos 2009; 4: 9-15.
13. Henry MJ, Pasco JA, Pocock NA, Nicholson GC, Kotowicz MA. Reference ranges for bone densitometers adopted Australia-wide: Geelong osteoporosis study. Australas Radiol 2004; 48: 473-5.
14. Nguyen TV, Maynard LM, Towne B, Roche AF, Wisemandle W, Li J, et al. Sex differences in bone mass acquisition during growth: the Fels Longitudinal Study. J Clin Densitom 2001; 4: 147-57.
15. Pedrazzoni M, Girasole G, Bertoldo F, Bianchi G, Cepollaro C, Del Puente A, et al. Definition of a population-specific DXA reference standard in Italian women: the Densitometric Italian Normative Study (DINS). Osteoporos Int 2003; 14: 978-82.
16. Sabatier JP, Guaydier-Souquieres G, Laroche D, Benmalek A, Fournier L, Guillon-Metz F, et al. Bone mineral acquisition during adolescence and early adulthood: a study in 574 healthy females 10-24 years of age. Osteoporos Int 1996; 6: 141-8.
17. Limpaphayom KK, Taechakraichana N, Jaisamrarn U, Bunyavejchevin S, Chaikittisilpa S, Poshyachinda M, et al. Bone mineral density of lumbar spine and proximal femur in normal Thai women. J Med Assoc Thai 2000; 83: 725-31.
18. Shivane VK, Sarathi V, Lila AR, Bandgar T, Joshi SR, Menon PS, et al. Peak bone mineral density and its determinants in an Asian Indian population. J Clin Densitom 2012; 15: 152-8.
19. Matkovic V, Jelic T, Wardlaw GM, Ilich JZ, Goel PK, Wright JK, et al. Timing of peak bone mass in Caucasian females and its implication for the prevention of osteoporosis. Inference from a cross-sectional model. J Clin Invest 1994; 93: 799-808.
20. Matkovic V, Fontana D, Tominac C, Goel P, Chesnut CH III. Factors that influence peak bone mass formation: a study of calcium balance and the inheritance of bone mass in adolescent females. Am J Clin Nutr 1990; 52: 878-88.
21. Berger C, Goltzman D, Langsetmo L, Joseph L, Jackson S, Kreiger N, et al. Peak bone mass from longitudinal data: implications for the prevalence, pathophysiology, and diagnosis of osteoporosis. J Bone Miner Res 2010; 25: 1948-57.
22. Limpaphayom KK, Taechakraichana N, Jaisamrarn U, Bunyavejchevin S, Chaikittisilpa S, Poshyachinda M, et al. Prevalence of osteopenia and osteoporosis in Thai women. Menopause 2001; 8: 65-9.
23. Taechakraichana N, Angkawanich P, Panyakhamlerd K, Limpaphayom K.

Postmenopausal osteoporosis: what is the real magnitude of the problem in the Thai population? J Med Assoc Thai 1998; 81: 397-401.
24. Pongchaiyakul C, Rojroongwasinkul N, Chotmongkol R, Kosulwat V, Charoenkiatkul S, Rajatanavin R. Bone mineral density in rural Thai adults living in Khon Kaen province. J Med Assoc Thai 2002; 85: 235-44.
25. Kosulwat V. The nutrition and health transition in Thailand. Public Health Nutr 2002; 5: 183-9.
26. Prasertwaree R. Menu development of high-calcium Thai diet [Thesis] [Internet]. 2005 [cited 2012 Aug 30]. Available from: http://www.li.mahidol.ac.th/thesis/2548/cd382/4336509.pdf
27. Hui SL, Gao S, Zhou XH, Johnston CC Jr, Lu Y, Gluer CC, et al. Universal standardization of bone density measurements: a method with optimal properties for calibration among several instruments. J Bone Miner Res 1997; 12: 1463-70.
28. 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.
29. Pongchaiyakul C, Nguyen ND, Pongchaiyakul C, Nguyen TV. Development and validation of a new clinical risk index for prediction of osteoporosis in Thai women. J Med Assoc Thai 2004; 87: 910-6.

ความหนาแน่นของกระดูกสันหลังส่วนเอวและกระดูกสะโพกในสตรีไทยจากการวัดด้วยเครื่องตรวจความหนาแน่นของกระดูกยี่ห้อ Osteosys Dexxum-T

ฉัตรเลิศ พงษ์ไชยกุล, แพรว โคตรุฉิน

วัตถุประสงค์: *เพื่อวัดและหาค่าอ้างอิงของความหนาแน่นของกระดูกสันหลังส่วนเอวและกระดูกสะโพกในสตรีไทยในการจำแนกผลตรวจความหนาแน่นของกระดูก และวินิจฉัยโรคกระดูกพรุนโดยใช้เครื่องวัดความหนาแน่นของกระดูกแกนกลางชนิดเคลื่อนย้าย*

วิธีการศึกษา: *เป็นการศึกษาแบบตัดขวางในสตรีไทยจำนวน 779 ราย อายุระหว่าง 20-85 ปี ความหนาแน่นของกระดูกสันหลังส่วนเอวและกระดูกสะโพกวัดโดยเครื่องตรวจความหนาแน่นของกระดูกยี่ห้อ Osteosys รุ่น Dexxum-T ผลตรวจความหนาแน่นของกระดูกจะจำแนกโดยค่า T-score ตามเกณฑ์ขององค์การอนามัยโลก*

ผลการศึกษา: *อายุมีความสัมพันธ์ในเชิงบวกในขณะที่น้ำหนักตัวมีความสัมพันธ์ในเชิงลบกับความหนาแน่นของกระดูกทั้งสองตำแหน่ง ค่าสัมประสิทธิ์สหสัมพันธ์ระหว่างความหนาแน่นของกระดูกสันหลังกับกระดูกสะโพกเท่ากับ 0.67-0.69 พบมวลกระดูกสูงสุดในช่วงอายุระหว่าง 20-24 ปีทั้งสองตำแหน่ง โดยมีค่าเฉลี่ยและค่าเบี่ยงเบนเท่ากับ 1.082±0.153, 1.115±0.161, 0.878±0.150 และ 0.946±0.125 ที่กระดูกสันหลังส่วนเอวปล้องที่ 1-4, กระดูกสันหลังส่วนเอวปล้องที่ 2-4, กระดูกคอสะโพกและกระดูกสะโพกรวมตามลำดับ เมื่อเปรียบเทียบจากมวลกระดูกสูงสุดของการศึกษานี้ พบความชุกของโรคกระดูกพรุนที่ตำแหน่งกระดูกสันหลังส่วนเอว ร้อยละ 5.1-5.5 และที่กระดูกสะโพก ร้อยละ 3.1-6.3 ซึ่งต่ำกว่าความชุกของโรคกระดูกพรุนจากการใช้ค่าอ้างอิงของชาวเอเชียที่ได้จากเครื่อง*

สรุป: *การศึกษานี้แสดงให้เห็นว่าการใช้ค่า T-score จากเครื่องตรวจความหนาแน่นของกระดูกยี่ห้อ Osteosys รุ่น Dexxum-T จะทำให้วินิจฉัยโรคกระดูกพรุนในสตรีไทยมากเกินจริง ผู้นิพนธ์เสนอให้ใช้ค่าอ้างอิงที่ได้จากการศึกษานี้ในการจำแนกผลตรวจความหนาแน่นของกระดูกในสตรีไทย*