Vitamin D Status of Thai Premenopausal Women

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Vitamin D insufficiency of Thai elderly women in urban area were higher than in rural area because of the difference in life style. Until now there are no any evidences about vitamin D status in Thai premenopausal women.

This study was the multicenters study from 5 provinces of Thailand which cover all region of Thailand except southern area.

The mean (SE) of calcidiol level of Thai premenopausal women was 29.09(0.42) ng/ml, and with the cut point of ≤ 35 ng/ml; the prevalence of vitamin D insufficiency was 77.81%. Chiang Mai had lowest calcidiol level (25.09 ng/ml) and had highest PTH, and bone resorption markers. The prevalence of vitamin D insufficiency was highest in Khon Kaen (88.78%) and Chiang Mai (84.62%) province respectively.

Life style modification to expose more sunlight should be advised for increasing the serum vitamin D and lowering the risk of osteoporosis.

Keywords: *Calcidiol, Premenopausal women, Vitamin D insufficiency*

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Vitamin D insufficiency of Thai elderly women in urban area were higher than in rural area (65.38% vs. 17.4% respectively)[1] because of the difference in life style. It also found that the urban life style which the people usually stay in the shelter and usually avoid sun exposure with the fear of the hot from sunlight, skin cancer and darkness of skin.

The prevalence of vitamin D insufficiency were also high in postmenopausal women (60%)[2], until now there are no any evidences about vitamin D status in Thai premenopausal women.

Objective

To find the calcidiol level and the prevalence of vitamin D insufficiency in Thai premenopausal women by using cut point of calcidiol ≤ 35 ng/ml.

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Material and Method

This study was a part of the study of "Level of Undercarboxylated Osteocalcin in Reproductive Thai Females[3]" which included 357 healthy female volunteers, aged between 20-50 years old. Subjects were recruited from 5 provinces (Bangkok, Khon Kaen, Chiang Mai, Ubon ratchathani, Phitsanulok) of Thailand which cover all region of Thailand except southern area. All volunteers did not take any kind of medicine affecting bone metabolism within one month before screening and their menstruation was regular. At the screening visit, an overnight fasting blood sample was collected, and examined for liver and renal function, sugar, bone biochemical markers, and cholesterol. Subjects who had an abnormal level of chemistry in the laboratory test were excluded.

The serum parathyroid hormone samples were measured using the electrochemiluminescence (ECLIA) technique on an Elecsys 1010. The serum calcidiol (25(OH)D) samples were measured using the radioimmunoassay (RIA) technique by a DiaSorin, USA. The interassay coefficients of variation were 7.1 percent for the measurements of the parathyroid hormone and between 9.4 and 11.0 percent for the calcidiol.

Statistical analysis

Baseline demographic and clinical characteristics including age, weight, height, BMI, calcidiol, PTH, bone biochemical markers, and alkaline phosphatase level was described as mean (SE), median (SE), minimum and maximum.

By using the cut point of calcidiol $\leq$ 35 ng/ml as vitamin D insufficiency[4,5], the prevalence of vitamin D insufficiency in all premenopausal women and in each region of Thailand were calculated and described as number and percent

To compare the differences of the mean of continuous variables such as calcidiol, alkaline phosphatase, bone biochemical markers, and PTH level between the subjects in difference region of Thailand by ANOVA and post-hoc test by Bonferroni for equal variances or by Tamhane's T2 for unequal variances. For testing hypothesis, p-value < 0.05 was considered statistical significance.

Results

Baseline clinical characteristics of all participants were showed in Table 1. The mean (SE) and p-value of the parameters of participants in each region of Thailand were showed in Table 2. All parameters of the participants in each region had statistical significant difference by ANOVA, and post hoc test with Tamhane's T2 (unequal variances; $p \leq 0.003$), the participants in Chiang Mai province had significantly lower age, and lower alkaline phosphatase level than other regions ($p < 0.001$), and had significantly higher PTH, NMID, and CTX level than other regions ($p < 0.03$), Chiang Mai province had significantly lower calcidiol level than other regions ($p < 0.05$) except Khon Kaen province ($p = 0.075$).

Table 1. The baseline characteristics of the participants (n = 357 cases)

	Mean (SE)	Median (SE)	Minimum	Maximum
Age (n = 353)	35.20 (0.47)	37.00 (0.47)	20.00	50.00
Weight (n = 303)	54.65 (0.59)	52.00 (0.59)	33.00	94.00
Height (n = 303)	156.73 (0.33)	156.00 (0.33)	140.00	179.00
BMI (n = 303)	22.25 (0.23)	21.17 (0.23)	14.84	37.65
PTH (n = 356)	34.97 (0.93)	31.79 (0.93)	5.16	112.00
Calcidiol (n = 356)	29.09 (0.42)	29.39 (0.42)	5.36	54.98
Alk. phos. (n = 356)	52.56 (1.20)	53.00 (1.20)	10.00	165.00
NMID (n = 356)	20.30 (0.43)	18.80 (0.43)	0.50	56.95
cTx (n = 356)	0.31 (0.01)	0.27 (0.01)	0.04	0.89

Table 2. The mean (SE) and p-value of the parameters of participants in each region of Thailand

Serum parameter	BBK	KK	PL	CM	UB	p-value*
Age	35.83 (0.92)	38.72 (0.75)	38.99 (0.72)	25.13 (0.68)	39.06 (1.13)	<0.001
PTH	38.17 (1.61)	20.97 (1.00)	35.67 (1.50)	50.30 (2.27)	31.61 (2.03)	<0.001
Calcidiol	30.08 (0.94)	28.31 (0.64)	33.10 (0.73)	25.09 (1.00)	30.02 (1.37)	<0.001
Alk. phos	58.29 (2.02)	59.40 (1.70)	63.20 (2.39)	22.97 (0.94)	66.06 (2.61)	<0.001
NMID	21.90 (0.74)	16.20 (0.69)	18.30 (0.73)	26.75 (1.02)	17.90 (1.16)	<0.001
CTX	0.35 (0.02)	0.21 (0.01)	0.30 (0.02)	0.44 (0.02)	0.23 (0.02)	<0.001

* Statistical analysis by ANOVA

BBK = Bangkok, KK = Khon Kaen, PL = Phitsanulok, CM = Chiang Mai, UB = Ubon Ratchathani

Table 3. The prevalence of vitamin D insufficiency of Thai premenopausal women

Center**	Vitamin D insufficiency**		Normal vitamin D		Total cases
	Number	Percent	Number	Percent	
BBK	55	72.37	21	27.63	76
KK	87	88.78	11	11.22	98
CM	66	84.62	12	15.38	78
PL	43	61.43	27	38.57	70
UB	26	76.47	8	23.53	34
Total	277	77.81	79	22.19	356

* Vitamin D insufficiency was defined as serum calcidiol level $\leq$ 35 ng/ml

** BBK = Bangkok, KK = Khon Kaen, PL = Phitsanulok, CM = Chiang Mai, UB = Ubon ratchathani

Table 3 showed the prevalence of vitamin D insufficiency (using calcidiol level $\leq$ 35 ng/ml as vitamin D insufficiency). The prevalence of vitamin D insufficiency of total Thai premenopausal women was 77.81%, Khon Kaen center had highest prevalence of vitamin D insufficiency (88.78%) and Phitsanulok center had lowest prevalence of vitamin D insufficiency (61.43%).

Discussion

The prevalence of vitamin D insufficiency in adolescence and premenopausal women was so high in worldwide[6-10]. In Thailand, according to this study; the calcidiol level was very low (mean = 29.09 ng/ml) and the participant in Chiang Mai center had lowest calcidiol level (mean = 25.09 ng/ml) and highest parathyroid hormone level and bone resorption marker among 5 centers. Chiang Mai province locate at the highest latitude among 5 centers that may result in low sunlight exposure and cause low vitamin D production. The prevalence of vitamin D insufficiency in premenopausal women was very high (77.81%), especially in Khon Kaen (88.78%) and Chiang Mai (84.62%). Vitamin D insufficiency in Thailand had tendency to increase in the near future because of the urbanized life style and the fear of sunlight. Vitamin D insufficiency is one of the risk factors of osteoporosis especially femoral neck[11], Thai women should have life style modification by exposing more sunlight, otherwise, the prevalence of osteoporosis and the risk of osteoporotic fracture will increase in the near future.

Conclusion

The prevalence of vitamin D insufficiency was very high in Thai premenopausal women especially in Khon Kaen and Chiang Mai. Life style modification to expose more sunlight should be advised for increasing the serum vitamin D and lowering the risk of osteoporosis.

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สภาวะของวิตามินดีในสตรีไทยก่อนหมดประจำเดือน

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สตรีสูงอายุในเขตเมืองมีความชุกของการขาดวิตามินดีสูงกว่าเขตชนบทเนื่องจากความแตกต่างของการใช้ชีวิต แต่จนถึงปัจจุบันนี้ยังไม่มีข้อมูลของระดับวิตามินดีของสตรีก่อนหมดประจำเดือน

การศึกษานี้เป็นการศึกษาหลายสถาบัน ของ 5 สถาบันทั่วประเทศยกเว้นเขตภาคใต้

ค่าเฉลี่ย (SE) ของระดับวิตามินดีของสตรีไทยก่อนหมดประจำเดือนเท่ากับ 29.09 (0.42) ng/ml และหากใช้ค่าจุดตัดที่ ≤ 35 ng/ml ถือเป็นระดับของการขาดวิตามินดีพบว่าความชุกของการขาดวิตามินดีของสตรีไทยก่อนหมดประจำเดือนอยู่ที่ร้อยละ 77.81 และพบว่าเขตเชียงใหม่มีระดับของวิตามินดีต่ำสุด (25.09 ng/ml) และมีระดับของ PTH และ bone resorption markers สูงที่สุด และพบว่าความชุกของการขาดวิตามินดีสูงสุดในเขตขอนแก่น (ร้อยละ 88.78) และรองลงมาคือเชียงใหม่ (ร้อยละ 84.62) ตามลำดับ

การปรับเปลี่ยนพฤติกรรมโดยการออกรับแสงแดดเพิ่มขึ้น สามารถเพิ่มระดับของวิตามินดีและลดความเสี่ยงต่อการเกิดโรคกระดูกพรุนได้