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ORAWAN THONGDONTHAON : DIETARY CALCIUM INTAKE AND OTHER FACTORS AFFECTING BONE STATUS IN HEALTHY THAI CHILDREN AGED 9-12 YEARS. THESIS ADVISORS : SOMSRI CHAROENKIATKUL, D.Sc. VONGSAVAT KOSULWAT, Ph.D. UMAPORN SUTHUTVORAVUT, M.D. NIPA ROJROONGWASINKUL, M.Sc. 184 p. ISBN 974-663-736-3

Osteoporosis is characterized by low bone mass and micro architectural deterioration of bony tissue, leading to high risk fracture. Maximizing peak bone mass during growth constitutes one of the best preventive strategies. This approach requires better understanding of bone acquisition and its contributing factors. Therefore, this study was conducted to investigate dietary calcium and other factors affecting bone mass in 274 healthy Thai children and adolescents from Samsen and Phayathai schools, aged 9-12 years. Bone mineral content (BMC, g) and areal bone mineral density (BMD, gm.cm^{-2}) were measured by dual energy x-ray absorptiometry (DEXA) at midshaft radius, lumbar spine (L2-4), and femoral neck (FN), including total body BMD, total body BMC and total body calcium (TBC). Calculated volumetric bone mineral density (vBMD, gm.cm^{-3}) was also evaluated. Current dietary intake was assessed by 3-day food record whereas usual calcium intake was estimated by semi-quantitative food frequency questionnaire. Physical activity was measured by self-administered questionnaire.

Dietary assessment revealed that there was no significant difference in calcium intake at any age group, pubertal stage as well as between sex with mean intake of $511 \pm 230 \text{ mg.d}^{-1}$. Mean time spent for weight bearing activity was $6.5 \pm 5.8 \text{ hr.wk}^{-1}$ with significant difference between males and females. The BMD values at all sites tended to increase with advancing age and the values reach statistical significant difference from age 11 to 12 years old in both genders except for FNBM in males. No significant increment of vBMD at L2-4 spine and FN site was observed in both males and females except for the value at lumbar spine in females which observed a significant change starting from age 11 years. A significant gender effect was observed among subjects who had the same age especially on the areal BMD and TBC in the 11-year old group except for FN. Males in younger age group had significant higher BMD at midshaft radius and FN and BMC at FN than females. Significant effect of pubertal status on bone change at a variety of bone sites was observed by exhibiting higher bone values among pubertal children than those in pre-pubertal stage. The number of hours spent for weight bearing activity on a weekly basis also had a significant effect of bone increment especially the BMD value at different bone sites in male subjects. Results from multiple regression analysis confirmed the findings by demonstrating that age, sex, puberty, weight for height were the major determinants of bone mass, accounting for 24-79% of the variability. Usual calcium intake was environmental factor which determined bone mass especially at midshaft radius in both genders. Weight bearing activity appeared to be another independent determinant, describe the variability on total body and at lumbar spine.

In conclusion, physiological factors were the major determinant on bone mass. Calcium intake and weight bearing activity were associated with bone mass at different sites especially in subjects whose usual calcium intake and time spent for weight bearing activity were above their mean. Therefore, maximizing peak bone mass can be achieved in these children with proper weight, adequate calcium intake and moderate physical activity during the optimum time of bone growth.