

## Factors associated with bone mineral content and density in Chinese adolescent girls

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To investigate the factors associated with total body bone mineral in Chinese adolescent girls, a cross-sectional study was carried out in a random sample of 80 healthy Beijing perimenarcheal girls aged  $12.1 \pm 0.3$  years, consuming their usual plant-based diet. Measurements included total body (TB) bone mineral content (BMC), bone area (BA) and bone mineral density (BMD) by dual-energy x-ray absorptiometry, weight, height, BMI, Tanner stage of breast and pubic hair development, calcium intake, physical activity, insulin-like growth factor I (IGF-I), parathyroid hormone (PTH), 25-hydroxyvitamin D [25(OH)D], and three biochemical markers of bone turnover – bone alkaline phosphatase (bone ALP), osteocalcin (OC), and deoxypyridinoline (DPD).

Bivariate correlation analyses showed that height ( $0.42 < r < 0.77$ ), weight ( $0.77 < r < 0.79$ ), BMI ( $0.53 < r < 0.76$ ), Tanner stage of breast development ( $0.49 < r < 0.50$ ) and Tanner stage of pubic hair development ( $0.48 < r < 0.59$ ) were positively correlated with total body BMC and BMD. The three biomarkers of bone turnover – bone ALP ( $-0.42 < r < -0.37$ ), OC ( $-0.55 < r < -0.34$ ) and DPD ( $-0.49 < r < -0.47$ ) were negatively correlated with total body BMC and BMD. Total body BA ( $r = 0.63$ ), age ( $r = 0.32$ ) and IGF-I ( $r = 0.31$ ) were also positively correlated with total body BMC. Mean calcium intake was  $476.4 \pm 212.6$  mg/d. Calcium intake was not correlated with bone variables, but was negatively correlated with OC ( $r = -0.36$ ) and PTH ( $r = -0.28$ ).

Regression models <sup>a</sup>	Regression coefficient	Standard error	Standardized coefficient	P value	Partial R <sup>2</sup>
<b>TBBMC</b>					
Weight	19.361	1.531	0.564	<0.001	0.591
TBBA	0.620	0.055	0.501	<0.001	0.196
OC	-1.367	0.315	-0.211	<0.001	0.067
Bone ALP	-0.556	0.195	-0.133	0.006	0.013
Constant	-326.002	140.805		0.023	
<b>TBBMD</b>					
Weight	0.0072	0.001	0.691	<0.001	0.625
OC	-0.0006	0.000	-0.302	<0.001	0.130
Bone ALP	-0.0002	0.000	-0.166	0.007	0.020
Constant	0.513	0.032		<0.001	

<sup>a</sup>Stepwise method, entry criteria:  $P < 0.05$ .

Multiple regression analysis indicated that body weight accounted for the largest significant proportion of the explained variance (78%–87%) in total body BMC and BMD. OC and bone ALP also entered the regression model as important predictors of total body BMC and BMD. Body weight appears to be the most important determinant of total body bone mineral in Chinese adolescent girls. There was negative association between bone turnover rate and total body bone mineral in Chinese girls during this developmental period. As the rate of low body weight (BMI < 18) was 38.8% in these subjects and calcium intake was negatively correlated with bone turnover rate, improvements in energy and calcium nutrition in Chinese adolescent girls is indicated by these results.

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Key words: bone mineral content, bone mineral density, bone biomarkers