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Background

•We investigate the relationship between birth weight (BW) and bone mineral content (BMC) in Korean adolescents.

Methods

•Data were obtained from the Korean National Health and Nutrition Examination Survey conducted during 2010.

•Baseline characteristics including anthropometric data were compared according to age and sex specific BMC quartiles of total body less head (TBLH), lumbar spine (LS) and femur neck (FN) in 10-18-year-old adolescents (male=474, female=394).

Results

•BW showed positive correlations with TBLH-BMC ($P = 0.025$) and FN-BMC ($P = 0.019$) in male and TBLH-BMC ($P = 0.044$) in female adolescents.

•BW according to TBLH-BMC quartile groups (P for trend < 0.003 in male and < 0.0001 in female), the LS-BMC quartile groups (P for trend = 0.034 in male) and the FN-BMC quartile groups (P for trend = 0.008 in male and = 0.020 in female) significantly increased.

•The odds ratio of being highest quartile BMC per 1 kg increase in BW was significantly increased in TBLH-BMC (OR = 2.157 in male and OR = 1.985 in female) and FN-BMC (OR = 2.467 in male) after adjusting for age, BMI, smoking, drinking, exercise, gestational weeks.

Table 1. Baseline characteristics and bone mineral contents according to gender in 10-18-year-old male and female adolescents

	Male (n=474)	Female (n=394)	P-value
Birth weight (kg)	3.30±0.03	3.14±0.05	0.018
Current height (cm)	164.3±0.7	157.3±0.5	<0.0001
Current weight (kg)	56.8±0.8	50.0±0.8	<0.0001
Current BMI (kg/cm ²)	20.8±0.2	20.1±0.3	0.037
Maternal age (years)	28.8±0.3	28.0±0.3	0.061
Gestational weeks (weeks)	39.6±0.1	39.7±0.1	0.140
Smoke (yes)	14.5(2.2)	10.3(2.4)	0.263
Drink (yes)	23.1(2.7)	19.5(3.5)	0.429
Physical activity (calory/day)			0.001
0-600	35.0(2.5)	44.2(3.1)	
600-3000	39.9(2.8)	43.6(3.1)	
3000-	25.1(2.5)	12.1(2.1)	
TBLH BMC (g)	1465.3±25.9	1237.2±20.8	<0.0001
LS BMC (g)	46.65±0.92	44.56±1.02	0.104
FN BMC (g)	4.08±0.06	3.37±0.06	<0.0001

Data are presented as the means ± standard error (SE) or % (SE).

Abbreviations: BMI, body mass index, TBLH, total body less head; LS, lumbar spine; FN, femur neck; BMC, bone mineral content; BMI, body mass index

Table 2. Correlations between birth weight and bone mineral contents in 10-18 year-old male and female adolescents.

Variables	Male (n=474), birth weight		Female (n=394), birth weight	
	R	P	R	P
TBLH BMC (g)	0.132	0.025	0.168	0.044
LS BMC (g)	0.089	0.200	0.041	0.498
FN BMC (g)	0.137	0.019	0.077	0.252

Abbreviations: TBLH, total body less head; LS, lumbar spine; FN, femur neck; BMC, bone mineral content

Table 3. Perinatal and current anthropometric data according to quartiles of age and sex specific total body less head, lumbar spine and femur neck bone mineral contents

	Male(n=474)					Female(n=394)				
	Q1	Q2	Q3	Q4	P for trend	Q1	Q2	Q3	Q4	P for trend
Age (years)	14.5±0.3	14.2±0.3	14.0±0.3	13.7±0.3	0.208	13.9±0.3	13.9±0.3	13.9±0.4	13.7±0.3	0.963
BW (kg)	3.2±0.1	3.3±0.0	3.3±0.1	3.4±0.1	0.003	3.0±0.1	3.2±0.1	3.0±0.1	3.3±0.1	<0.0001
Current height	159.7±1.4	163.3±1.3	164.5±1.2	168.4±1.4	0.0002	152.4±1.0	156.2±1.0	157.6±0.6	161.2±0.6	<0.0001
Current weight	47.3±1.4	54.6±1.2	58.2±1.3	67.1±1.5	<0.0001	42.0±0.9	47.3±1.0	52.8±1.4	58.3±1.7	<0.0001
BMI (kg/cm ²)	18.4±0.4	20.2±0.3	21.3±0.4	23.5±0.3	<0.0001	18.0±0.3	19.3±0.3	21.2±0.6	22.4±0.6	<0.0001
LS										
Age (years)	14.2±0.3	14.1±0.3	14.0±0.3	13.7±0.3	0.488	13.9±0.4	13.6±0.3	14.1±0.3	13.8±0.4	0.727
BW (kg)	3.2±0.1	3.3±0.0	3.3±0.1	3.4±0.1	0.034	3.2±0.0	3.2±0.1	3.2±0.1	3.28±0.06	0.478
Current height	159.8±1.6	162.9±1.5	163.7±1.4	168.4±1.3	<0.0001	152.5±1.0	155.7±1.1	159.2±0.8	160.7±0.6	<0.0001
Current weight	49.6±1.8	56.1±1.7	56.6±1.6	63.6±1.7	<0.0001	43.0±1.0	47.1±1.1	53.1±1.7	56.2±1.7	<0.0001
BMI (kg/cm ²)	19.1±0.5	20.9±0.4	21.0±0.5	22.2±0.4	<0.0001	18.4±0.3	19.3±0.3	20.9±0.7	21.7±0.6	<0.0001
FN										
Age (years)	14.3±0.3	14.4±0.3	13.9±0.3	13.6±0.3	0.210	14.1±0.4	13.8±0.3	13.8±0.4	13.9±0.4	0.935
BW (kg)	3.2±0.1	3.2±0.05	3.3±0.1	3.5±0.1	0.008	3.2±0.1	3.1±0.0	3.3±0.1	3.29±0.06	0.020
Current height	161.8±1.7	163.3±1.2	164.8±1.0	166.4±1.5	0.182	153.8±1.2	156.4±0.9	157.4±0.9	160.9±0.6	<0.0001
Current weight	49.8±1.4	55.5±1.5	57.3±1.4	64.2±1.7	<0.0001	43.7±1.0	47.0±1.0	50.1±1.3	59.0±1.7	<0.0001
BMI (kg/cm ²)	18.8±0.4	20.6±0.4	20.8±0.4	23.0±0.5	<0.0001	18.4±0.3	19.1±0.3	20.1±0.5	22.7±0.6	<0.0001

Abbreviations: TBLH, total body less head; LS, lumbar spine; FN, femur neck; BW, birth weight; BMI, body mass index

Table 4. Multivariate logistic analyses of being upper highest quartile of age and sex specific bone mineral contents according to per unit change in birth weight (kg).

Male	MODEL 1	MODEL 2	MODEL 3
TBLH-Qq	2.00 (1.33-3.00)	2.06 (1.33-3.20)	2.16 (1.36-3.42)
LSP-Qq	1.77 (0.89-3.54)	1.69 (0.83-3.43)	1.71 (0.79-3.69)
FN-Qq	2.53 (1.29-4.95)	2.50 (1.23-5.08)	2.47 (1.18-5.14)
Female			
TBLH-Qq	1.82 (1.21-2.73)	1.84 (1.18-2.88)	1.99 (1.13-3.50)
LSP-Qq	1.58 (0.73-3.41)	1.47 (0.60-3.61)	1.50 (0.60-3.74)
FN-Qq	1.73 (0.77-3.85)	1.52 (0.52-4.47)	1.63 (0.53-5.00)

Model 1 adjusted for age.

Model 2 adjusted for age, BMI, smoke, drink, exercise

Model 3 adjusted for age, BMI, smoke, drink, exercise, gestational weeks

Conclusion

BW might be an important determinant of BMC of Korean adolescents.