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5-year changes and effects of bone mineral density in 6-year-old children

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Objective To explore the development and developmental characteristics of forearm bone mineral density in childhood, to understand the effects of body composition and developmental type on bone mineral density, and to provide a basis for studying the changes of human forearm bone mineral density.
Methods Bone development follow-up study of Huilongguan primary school affiliated to Capital Normal University in 2013 enrolled in primary school for five years (2013, 2014, 2015, 2016 and 2017), tracking test indicators: height, weight, body fat composition, forearm bone density. Bone age testing was conducted in 2013 and 2017. Data were analyzed for students who were 6 years old at the end of the first year of the test date. The effective data was 297 (age 6.6 ± 0.2 years), including 147 boys and 150 girls.
Results 1. Forearm bone mineral density(g/cm^2)for the boys and girls were 0.237±0.061 and 0.221±0.059 for children aged 6, 0.220±0.042 and 0.201±0.032 for 7 years old children, 0.219±0.040 and 0.198±0.038 for 8 years old children, 0.236±0.051 and 0.208±0.043 for 9 years old children ,while 0.237±0.044 and 0.213±0.047 when children were 10 years old. An independent sample t-test was performed on bone mineral density in boys and girls. At 7 years, 8 years, 9 years, and 10 years, the bone mineral density of boys was greater than that of girls, and the difference was statistically significant ($p<0.05$). 2. The same batch of child follow-up studies found that girls and boys aged 6 to 8 had a decreasing trend, and the decline of girls was greater than that of boys; girls and boys aged 8 to 10 have risen again, and the increase in girls is less than that of boys; body weight and BMI are factors influencing the forearm bone density of children aged 6-10 years. Height changes and weight changes have a certain effect on changes in forearm bone density. 3. There was no statistically significant difference between bone mineral density and height. The partial correlation with body weight was statistically significant between 6 and 10 years old, $r=0.200$ ($p<0.01$), $r=0.124$ ($p<0.05$), $r=0.176$ ($p<0.01$), $r=0.110$ ($p<0.05$), $r=0.162$ ($p<0.05$); the partial correlation with BMI was statistically significant, $r=0.223$ ($p<0.01$), $r=0.134$ ($p<0.01$), $r=0.183$ ($p<0.01$), $r=0.150$ ($p<0.05$)$r=0.208$ ($p<0.01$); As for the relationships between body fat ratio、FFM ratio and bone mineral density, there are no partial correlations($p>0.05$). 4. The partial correlation between bone mineral density change and height change (6-8 years old) and body weight change (8-10 years old) was statistically significant, $r=-0.138$ ($p<0.05$), $r=0.178$($p<0.01$), the change in bone mineral density of the children with highest 25% and the lowest 25% with different indicators, only the height of the independent sample t-test results was statistically significant. 5. After multiple stepwise linear regression model. At the age of 7, the adjustment of R^2 is the highest. The gender and body mass index entered the model. 6. The overweight and obesity rate of 6-10 years old is more than 40% for boys and over 30% for girls. The obesity rate for boys aged 6 to 10 is reduced from 21.9% to 23.8%; the obesity rate for girls is from 20.3% to 17.3%.
Conclusions The same batch of child follow-up studies found that girls and boys aged 6 to 8 had a decreasing trend, with the decline of girls greater than that of boys; girls and boys between the ages of 8 and 10 were rising again, and the increase in girls was less than that of boys; Weight and BMI are factors influencing the forearm bone mineral density of children aged 6-10 years. Height changes and weight changes have a certain effect on changes in forearm bone density.