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RELATIONSHIP BETWEEN BODY DEVELOPMENT AND BONE MATURATION
IN HUNGARIAN GIRLS AND BOYS AGED 11-16 YEARS

PhD THESES

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Relationship between body development and bone maturation in Hungarian girls and boys aged 11-16 years

Introduction: Every tenth human suffers from osteoporosis in the world, in Hungary one million people are effected. The prevalence of osteoporosis can be reduced by a diet a sufficient amount of calcium, by a replenishment of vitamin D stores and by increasing habitual physical exercise during childhood and puberty. Osteoporosis at old age can be avoided by screening the bone density of children in the critical phases of development and by observing the recommended changes in life style.

An ultrasonographic osteodensitometric survey was carried out by assessing bone mineral mass in girls and boys aged 11-16 years to investigate the potential factors of primer osteoporosis. Several methods are adequate for assessing bone density, however the CT and MR examinations are expensive, the X-ray examinations threaten with the effects of radiation, so the choice is often the ultrasonic osteodensitometric examination. The ODM-equipment is appropriate for measuring the weight of forearm/antebrachium, spine/columna vertebralis, collum femoris, os calcaneus bones and even the total mass of all bones of the entire body. Bone mineral content (BMC) or bone mineral density (BMD) can be quantified by detecting the beam of rays crossing through the body. Body composition and the actual condition of the bones are determined genetically and among others by nutritional status, physical activity and and by the process of sexual maturation.

Subjects and Methods: An Transdanubian urban sample (n=998; aged between 11-16, 370 boys, 628 girls), measurements were between 1998-2007.

The 25 anthropometric dimensions analysed in this study were the followings: longitudinal dimensions (finger height, shoulder height, stature, sitting height, spinal height), width dimensions on the trunk (biacromial width, iliocrystal breadth) and on the extremities (elbow, wrist, knee and ankle breadths), and dimensions of the foot (foot length and width, and width of the calcaneus), circumferences (on the relaxed and flexed upper arm, chest, calf and ankle), skinfolds (biceps, triceps, subscapular, iliospinale, calf).

The status of sexual maturation was assessed by the secondary sexual characteristics by Tanner's (1962) stages of pubic hair, breast and genitalia.

The ultrasonic osteodensitometric appropriate for measuring the weight of os calcaneus bones and even the total mass of all bones of the entire body. Bone mineral content (BMC) or bone

mineral density (BMD) can be quantified by detecting the beam of rays crossing through the body.

Data for menarche were collected by “status quo” method.

Bone mass was approximated by the Drinkwater-Ross (1980) four-component anthropometric body mass fractionation method. Differences between the subgroups of sex, age and level of self-evaluation were tested by F-tests following one-way ANOVA's.

In case of significant overall F, multiple post-hoc comparisons of the means were tested by Scheffé's formula. The relationships of grade point average with morphological characteristics were analyzed by linear regression.

We used the SPSS 14. for Windows software for statistical evaluation and employed an alpha level of 5% in all tests of significance.

The aims of the study:

was to investigate the relationship between these factors and the ultrasonographic parameters of calcaneus (BUA: **b**roadband **u**ltrasound **a**ttenuation, SOS: speed of sound) in urban children of different statuses of sexual maturation.

The test of the markers of bone structure and antropometric bone according to maturation's age structure on 11-16 aged children.

1. The comparison of children of the same maturation but of different age.

The markers of bone structure and of antropometric bone maturation with the sexual maturation.

2. Bone age estimated on the basis of antropometrical markers of the bone maturation

3. Biological factors influencing the bone structure (milk intake, Ca- intake, fizical activity)

4. The comparison of children with sexual maturation status and environmental factors (in and out of organ) and the bone structural and bone maturation with gender and biological age.

5. With antropological bone maturation markers definition of estimation-regression concerning subgroups of differen age, sexual maturation, nutritional states and life style,needed for bone maturation.

6. To create a new references database of bone structural markers, in which the age, sexual status and nutritional state are differentiated.

Results: Significant correlation was found between body mass fractions, stature and BUA, while the influence of sexual maturational status was also found to be significant on BUA. Changes were found to be more marked in the years preceding menarche than after it. BUA schowed considerable changes in the two years there was no further change.

Bone mineral density is mostly determined by body mass and sexual maturation status and varies with gender and age.

The puberty is a very sensitive and critical period in the process of bone mineralization. This is the last phase in life when developing a healthy dietary regime and introducing sufficiently intense habitual physical activity into one's style of life can yet influence later health bonequality.

The aim of this study was to investigate the relationship between these factors and the ultrasonographic parametres of calcaneus helped to the hungarian healthy children's osteodensitymetric databank.

Bone age estimated on the basis of antropometrical markers of the bone maturation with sexual maturation status and environmental (biological factors influencing the bone structure) factors.

Helped a new references database of bone structural markers, in which the age, sexual status and nutritional state are differentiated

Significant correlation between bone mineral density and BUA was evidenced in adults by other studies of body compoistion. Ultrasonographic body composition examinations can be performed also in children, the osteologic status of children can be assessed by this method without the potential risk of radial exposure.

As a new scientific result making anew references database of bone structural markers, in which the age, sexual status and nutritional state are differentiated

The aim of this study was to investigate the relationship between these factors and the ultrasonographic parametres of calcaneus helped to the hungarian healthy children's osteodensitymetric databank.

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