

VITAMIN D LEVEL AND CONDITION OF MINERAL BONE DENSITY IN CHILDREN WITH OBESITY AND OVERWEIGHT

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Annotation

Examined 30 children with overweight and obesity, the facts of infringement of the mineral first bone density more expression conjugated with obesity, while marked by low supply of vitamin D in children and adolescents of school age, regardless of body weight

Keywords: obesity; children; bone mineral density; densitometry; vitamin D.

The Relevance of the Problem

According to WHO, more than 1 billion people in the world are deficient in vitamin D, while deficiency of this vitamin is widespread in prosperous European countries. Recent data show that vitamin D deficiency is associated with obesity, a high body mass index, and insulin resistance i.e. biologically active metabolites of vitamin D contribute to the prevention and treatment of obesity and diabetes [1,2].

Literature data indicate that the decrease in BMD in the child population is 16-38% [3,4,5]. Recent studies claim about proves violation accumulation peak weight at the time of completion of the formation of the skeleton in adolescents, against the background of deterioration in child health settings as a whole, especially given the fact topical for obese children who have this condition often linked to the metabolism of vitamin D [1, 2], due to the relevance of this problem, we set the following goal: to determine the level of vitamin D and the frequency of osteopenia according to ultrasound densitometry in children with overweight and obesity.

Material and research methods: 30 children with overweight and obesity were examined. The criterion for the selection of patients was the determination of BMI in children and adolescents with identified overweight and / or obesity, which was compared with percentile charts developed by WHO for children from 5 to 19 years (WHO Growth Reference, 2007). An OT was also determined, which was compared with percentile tables for a specific age and gender according to the recommendations of GFCF (2009), and the ratio of waist to hip volume (OT / V).

All children, based on the determination of body mass index (BMI, kg / m²), were divided into 2 groups according to gender and age. I group of 15 overweight children (SDS + 1.0 to +2.0), average age of children 13.05 ± 0.28 years. Group II 15 children with obesity of the I-II degree

(SDS from +2.0 to $\square\square+3$) and abdominal type of obesity , average age 13.59 ± 0.21 years. The comparison group consisted of 20 children, comparable in age and gender with a normal BMI (SDS - 1.0 to +1.0) .

The concentration of glucose in blood serum was determined by glucose oxidase method. Cholesterol , high-density blood cholesterol were determined using the enzymatic method. Cholesterol of low density and very low density lipoproteins was determined using the Friedwald formula. The level of immunoreactive insulin was determined by enzyme-linked immunosorbent assay (ELISA) with the calculation of the indices of insulin resistance HOMA R according to the formulas . Vitamin D levels were determined by the chemiluminescent method.

The bone mineral density (BMD) of the distal forearm bones was determined using an ultrasound densitometer with a pediatric base (Omnisense 7000, Israel) with an estimate of the SOS sound speed (m / s) —when ultrasonically examining bone density. We investigated the Z-criterion for this research method.

Results of the study: BMI in group I of patients was within 28.12 ± 0.42 kg / m² ; in group II 33.09 ± 0.23 kg / m² , in the comparison group 18.14 ± 0.41 kg / m² . The average value of cholesterol depended on BMI and waist size (OT), so higher cholesterol ($5.52 + 0.41$ mmol / L) was observed in the group of obese children (4.06 ± 0.18 mmol / L in group 1 and 3.51 ± 0.32 mmol / L in the control group; P <0.05). Analysis of total cholesterol showed the presence of the desired level of cholesterol in the comparison group in 90% of the examined, and in groups 1 and 2 only 58.3% and 25%, respectively. In obese children, a positive reliable correlation of ITM and RT with the level of triglycerides was revealed. Moreover, the level of triglycerides > 1.7 mmol / L, which is a risk factor for the metabolic syndrome, was found in the group with obesity in half of the children (50%), and in 1 group with a uniform type of obesity in 3 children (25%). In the obese group, in only 20% of adolescents, the level of low density lipoproteins was within the desirable categories of values, in 40% within the borderline high category, in 20% within the high category. In the control group, all children had normal levels of low density lipoproteins . The lowest levels of LDL have been identified in children with a rail Irene - $1.21 + 0.14$ mmol / l ($1.34 + 0.11$ mmol / l in group 1). Among the comparison group, a decrease in the level of high density lipoproteins was not observed. Correlation analysis showed that in the group of obese children OT increase accompanied by an increase levels of insulin resistance and the HOMA R . It was revealed that with an increase in insulin resistance , lipid disorders were also aggravated, the level of β -lipoproteins and triglycerides increased. These studies confirm the pronounced relationship between obesity and insulin resistance , lipid disorders in children of different ages.

The children of the comparison groups were assessed with vitamin D. It was revealed that the level of vitamin D was not significantly dependent on body weight. The average level of vitamin D was 18.92 ± 0.18 ng / ml and 17.20 ± 0.23 ng / ml, respectively (p > 0.5). Only 3 children (25%) in group 1 and 1 (10%) children in group 2 with obesity and 6 (30%) children in the control group had a normal vitamin D supply, while the majority in both groups corresponded to a deficiency of this vitamin.

In accordance with the above, we performed densitometry with determination of bone mineral density. A decrease in bone mineral density is clinically identified as osteopenia or

osteoporosis. In children, the Z-score is used. The Z-score is considered as the standard deviation of the actual bone density in relation to the corresponding average age indicator. Z-score values up to -1SD are considered normal, from -1SD to -2.5 SD as osteopenia and more than -2.5 SD as osteoporosis. So, when studying the mineral density of blood using ultrasound densitometry in a comparative aspect, it was found that in 26.6% of children ($p > 0.2$ compared with the control) with overweight, the Z-score values were in the range up to -1SD, in 53.3% ($p > 0.5$ compared with the control) of the child, the indicators were within the Z-score from -1SD to -2.5 SD, which characterized their presence of osteopenia and in 20% of the children the Z-score was higher - 2.5 SD, which was regarded as osteoporosis ($p < 0.05$ compared with the control) In the group of obese children, a predominance was observed etey osteoporosis, accounting for 40% ($p > 0.2$) in 53.3% in the group with overweight osteopenia observed ($p > 0.5$ compared with the control), and only 6.6% mineral bone density was within normal limits ($p < 0.01$ compared to control). In the study of a group of conditionally healthy children of a similar age, which made up the control group, it was found that osteopenia (50%) was also observed in the bulk of children, cases of bone mineral density within normal limits (-1SD) were observed in 45% of children, and only 5 % signs of osteoporosis were noted.

An analysis of the gender differences in the data obtained among the overweight group showed that the overall frequency of osteopenia and osteoporosis was 55% of 11 cases in boys, 57.1% of 14 cases in the obese group, and osteoporosis was more pronounced in the group with normal body weight. in girls, 70% of 10 cases ($p > 0.2$). Thus, there was no significant difference between boys and girls regarding the development of osteopenia and osteoporosis in groups with overweight and obesity, while cases of osteopenia prevailed in girls in the control group.

Conclusions

Thus, children with obesity facts established lipid metabolism more pronounced with abdominal obesity, as well as mineral th bone density more pronounced in case of obesity, the set low supply of vitamin D in children and adolescents of school age, regardless of body weight.

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