

VITAMIN D LEVEL AND BONE MINERAL DENSITY STATUS IN OBESE AND OVERWEIGHT CHILDREN

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Abstract: thirty children with overweight and obesity were examined, found evidence of violations of bone mineral density, more pronounced in obesity, and noted a low supply of vitamin D among children and adolescents of school age, regardless of body weight. Thus, in obese children, there were established facts of impaired lipid metabolism more pronounced in abdominal obesity, as well as bone mineral density more pronounced in obesity, while low vitamin D availability was established among children and adolescents of school age, regardless of body weight.

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

УРОВЕНЬ ВИТАМИНА D И МИНЕРАЛЬНАЯ ПЛОТНОСТЬ КОСТИ У ДЕТЕЙ С ОЖИРЕНИЕМ И ИЗБЫТОЧНЫМ ВЕСОМ

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Аннотация: обследовано 30 детей с избыточной массой тела и ожирением, которые обнаружили признаки нарушения минеральной плотности костей, более выраженные при ожирении, и отметили низкое снабжение витамином D среди детей и подростков школьного возраста, независимо от массы тела. Таким образом, у детей с ожирением были установлены факты нарушения липидного обмена, более выраженного при абдоминальном ожирении, а также минеральной плотности костей, более выраженной при ожирении, в то время как низкая доступность витамина D была установлена среди детей и подростков школьного возраста независимо от массы тела.

Ключевые слова: ожирение; дети; минеральная плотность кости; денситометрии; Витамин D.

UDC: 616-056.52(616-053.5)

The actuality 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 wealthy European countries. Recent data indicate the relationship of vitamin D deficiency with obesity, 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, 7].

Literature data indicate that the incidence of reduced MOD (maximum oxygen demand) in the child population is 16-38% [3, 4, 5, 6]. Research studies in recent years shows a violation of peak mass accumulation by the time of completion of skeletal formation in adolescents, against the background of deterioration of children's health parameters in general, this fact is especially relevant for children with obesity, in which this condition is often associated with a violation of vitamin D metabolism [1, 2, 8]. due to the urgency of this problem, we set the following goal: determine the level of vitamin D and the frequency of osteopenia according to ultrasound densitometry in overweight and obese children.

Research material and methods: Survey was conducted with 30 overweight and obese children. The criterion for selecting patients was the determination of BMI in children and adolescents with detected overweight and / or obesity, which was compared with percentile charts developed by WHO for children from 5 to 19 years (WHO Growth Reference, 2007). It also determined the waist size (WS), which was compared with percentile tables for a certain age and gender according to the recommendations of the RSC (2009), and the ratio of waist to hip size (WS/HS). All children were divided into 2 groups based on their body mass index (BMI, kg/m²) according to gender and age. I group 15 overweight children (SDS + 1,0 to +2,0), the average age of children 13,05±0,28 years. II group 15 children with grade I-II obesity (SDS from +2,0 to ≥+3) and abdominal type of obesity, average age 13,59±0,21 years. The comparison group consisted of 20 children who were comparable in age and gender with a normal BMI (SDS -1,0 to +1,0).

The concentration of glucose in the blood serum was determined by the glucose oxidase method. High-density blood cholesterol was determined using an enzymatic method. Low-density and very low-density lipoprotein cholesterol was determined using Friedwald formulas. The level of immunoreactive insulin was determined by enzyme immunoassay (ELISA) with the calculation of $HOMA_R$ insulin resistance indices using formulas. The level of vitamin D was determined by the chemiluminescent method.

Determination of bone mineral density (BMD) of the distal part of the forearm bones was carried out on an ultrasound densitometer with a pediatric base (Omnisense 7000, Israel) with an assessment of the SOS sound velocity (m/s) - during an ultrasound study of bone density. We studied the Z-criterion for this research method.

The results of the research: The BMI in group I was within the range of $28,12 \pm 0,42$ kg/m²; in group II, $33,09 \pm 0,23$ kg/m², and in the comparison group, $18,14 \pm 0,41$ kg/m². The average cholesterol value depended on BMI and waist size (WS), thus, higher cholesterol levels ($5,52 \pm 0,41$ mmol/l) were observed in the group of obese children ($4,06 \pm 0,18$ mmol/l in group I and $3,51 \pm 0,32$ mmol/l in the control group; $P < 0,05$). The analysis of total cholesterol indicators showed the presence of the desired level of cholesterol in the comparison group in 90% of the surveyed, and in groups I and II only in 58,3% and 25%, respectively. In obese children, a positive reliable correlation of BMI and HS with the level of triglycerides was revealed. At the same time, the level of triglycerides $> 1,7$ mmol/l, which is a risk factor for metabolic syndrome, was found in the group with obesity in half of children (50%), and in the group I with uniform type of obesity in 3 children (25%). In the obese group, only 20% of adolescents had low-density lipoprotein levels within the desired categories of values, 40% within the borderline high category, and 20% within the high category. In the control group, all children had normal levels of low-density lipoproteins. The lowest values of low-density lipoproteins were found in obese children- $1,21 \pm 0,14$ mmol/l ($1,34 \pm 0,11$ mmol/l in group I). Among the comparison group, there was no decrease in the level of high-density lipoproteins. Correlation analysis showed that in the group of obese children, an increase in WS is accompanied by an increase in levels of insulin resistance and $HOMA_R$. It was found that with an increase in insulin resistance, lipid disorders also worsened, and the level of β -lipoproteins and triglycerides increased. These studies confirm a pronounced relationship between obesity and insulin resistance, and disorders of the lipid spectrum in children of different ages.

Children in the comparison groups were assessed for vitamin D supplementation. It was found that the level of vitamin D did not depend significantly on body weight. The average vitamin D level was $18,92 \pm 0,18$ ng/ml and $17,20 \pm 0,23$ ng/ml, respectively ($p > 0,5$). Only 3 children (25%) in group I and 1 (10%) child in group II with obesity and 6 (30%) children in the control group had normal vitamin D availability, while the majority in both groups corresponded to vitamin D deficiency in terms of availability.

In accordance with the above, we performed densitometry to determine the bone mineral density. A decrease in bone mineral density is clinically identified as osteopenia or osteoporosis. In children it was used Z-criterion (Z-score). The Z-score is considered as the value of 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. Thus, the study of blood mineral density using ultrasound densitometry in a comparative aspect revealed that 26,6% of children ($p > 0,2$ compared to the control) with overweight Z-score values were within the range of -1SD, 53,3% ($p > 0,5$ compared to the control) of the child's indicators were within the Z-score from -1SD to -2,5 SD, which characterized their presence of osteopenia and 20% of children Z-score was higher than -2,5 SD, which was regarded as osteoporosis ($p < 0,05$ compared to the control). In the group of obese children, the predominance of children with osteoporosis was observed, which was 40% ($p > 0,2$), in 53,3% of the overweight group, osteopenia was observed ($p > 0,5$ compared to the control), and in just 6.6%, the bone mineral density was within the normal range ($p < 0,01$ compared to the control). In the survey of a group of conditionally healthy children of the same age, which made up the control group, it was found that the bulk of children also had osteopenia (50%), cases of bone mineral density within the normal range (-1SD) were observed in 45% of children, and only 5% had signs of osteoporosis. Analysis of gender differences in the data obtained among the overweight group showed that the overall incidence of osteopenia and osteoporosis was 55% of 11 cases in boys, 57,1% of 14 cases in the obese group, and 70% of 10 cases of osteoporosis were more pronounced in girls ($p > 0,2$). Thus, there was no significant difference between boys and girls in the development of osteopenia and osteoporosis in the overweight and obese groups, while cases of osteopenia prevailed in girls in the control group.

Conclusions: Thus, in obese children, there were established facts of impaired lipid metabolism more pronounced in abdominal obesity, as well as bone mineral density more pronounced in obesity, while low vitamin D availability was established among children and adolescents of school age, regardless of body weight.

References / Список литературы

1. Agababyan I.R., Ismailov J.A., Ruziyeva A.A. Khronicheskaya serdechnaya nedostatochnost' u molodykh patsiyentov s ozhireniyem na fone khronicheskoy obstruktivnoy bolezni legkikh / Dostizheniya nauki i obrazovaniya, 2020. № 3 (57).

2. *Dedov I.I. and others.*, 2007. Obesity in adolescence, Results of the Russian epidemiological study. Therapeutic archive. T. 79. № 10. Pp. 28-32.
3. *Garifulina L.M., Ashurova M.D., Goyibova N.S.* Sovershenstvovaniye terapii metabolicheskogo sindroma u podrostkov pri pomoshchi primeneniya a-lipoyevoy kisloty // Nauka, tekhnika i obrazovaniye, 2018. № 10 (51).
4. *Garifulina L.M., Kudratova G.N., Goyibova N.S.* Stepen' metabolicheskikh narusheniy u detey i podrostkov s ozhireniyem i arterial'noy gipertenziyey // Aktual'nyye voprosy sovremennoy nauki, 2016. № 4. S. 19-24.
5. *Lim V.I. i dr.* Struktura bronkhoobstruktivnogo sindroma u gositalizirovannykh detey // International scientific review of the problems of natural sciences and medicine, 2019. S. 78-85.
6. *Rasulova N.A. i dr.* Otsenka znachimosti urovnya 25 (on) d3 v syvorotke krovi i yego vliyaniye na profilaktiku rakhita u detey 1-go goda zhizni // Dostizheniya nauki i obrazovaniya, 2019. № 11 (52).
7. *Rustamov M.R., Garifulina L.M.* Pokazateli serdechno-sosudistoy sistemy u detey i podrostkov na fone ozhireniya i arterial'noy gipertenzii // Voprosy nauki i obrazovaniya, 2019. № 6 (52).
8. *Shamsiyev A., Kurbaniyazov Z., Davlatov S.* Criteria's of choice method in surgical treatment of patients ventral hernia with concomitant obesity // European science review, 2016. № 3-4. C. 232-234.