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RISK FACTORS FOR THE DEVELOPMENT OF ARTERIAL HYPERTENSION AND OBESITY IN CHILDREN IN ACCORDANCE WITH PERINATAL METABOLISM PROGRAMMING

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ANNOTATION

Data from a survey of 55 children and adolescents with obesity and arterial hypertension are presented. Along with clinical studies, studies have been conducted to identify risk factors in accordance with the theories of early metabolic programming. A high frequency of risk factors in children with obesity and arterial hypertension was revealed in accordance with perinatal programming.

Key words: perinatal programming; obesity; abdominal obesity; arterial hypertension; risk factors; children and teenagers.

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PERINATAL METABOLIZMNI DASTURLASHGA MUVOFIQ BOLALARDA ARTERIAL GIPERTENSIYA VA SEMIZLIK RIVOJLANIShINING XAVF FATORLARI.

ANNOTATSIYA

Semizlik va arterial gipertenziya bilan og'rigan 55 nafar bola va o'smirlar o'rtasida o'tkazilgan so'rov ma'lumotlari keltirilgan. Klinik tadqiqotlar bilan bir qatorda, erta metabolik dasturlash nazariyalariga muvofiq xavf omillarini aniqlash bo'yicha tadqiqotlar o'tkazildi. Semizlik va arterial gipertenziya bilan og'rigan bolalarda perinatal dasturga muvofiq xavf omillarining yuqori chastotasi aniqlandi.

Kalit so'zlar: perinatal dasturlash; semizlik; qorin bo'shlig'idagi semirish; arterial gipertenziya; xavf omillari; bolalar va o'smirlar.

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ФАКТОРЫ РИСКА РАЗВИТИЯ АРТЕРИАЛЬНОЙ ГИПЕРТОНИИ И ОЖИРЕНИЯ У ДЕТЕЙ В СООТВЕТСТВИИ С ПРОГРАММОЙ ПЕРИНАТАЛЬНОГО МЕТАБОЛИЗМА

АННОТАЦИЯ

Представлены данные обследования 55 детей и подростков с ожирением и артериальной гипертензией. Наряду с клиническими исследованиями проводились исследования по выявлению факторов риска в соответствии с теориями раннего метаболического программирования. Выявлена высокая частота факторов риска у детей с ожирением и артериальной гипертензией в соответствии с перинатальным программированием.

Ключевые слова: перинатальное программирование; ожирение; абдоминальное ожирение; артериальная гипертензия; факторы риска; дети и подростки.

INTRODUCTION. Recent studies show that the risk of non-communicable diseases, such as obesity, diabetes, hypertension, cardiovascular disease and cerebrovascular disease, is determined not only by genetic risk factors and lifestyle in adulthood, but also to a large extent by perinatal metabolic programming [1, 2]. The first 1000 days from conception, until about the age of 2 years, is the period of the most active growth, accompanied by the most important processes of differentiation and development of cells, tissues and organs. During this pre- and postnatal stage of development, the human body remains flexible and adaptable, but at the same time fragile [1, 6, 7]. In connection with the above, it is of interest to study risk factors in sick children with obesity and arterial hypertension (AH) according to the theories of early programming.

MATERIAL AND METHODS. We examined 55 children with exogenous constitutional obesity and arterial hypertension, who were identified during dispensary examinations in family clinics in Samarkand, colleges in Samarkand and Samarkand region. The selection criterion for patients was the determination of BMI and waist circumference in children and adolescents with identified overweight and/or obesity, which was above the 97th percentile for a certain age and gender (WHO, 2006). The study included 25 (45%) girls and 30 (55%) boys, whose mean age was 14.35 ± 0.21 years (from 10 to 18 years). Children with exogenous constitutional obesity are divided by the presence of abdominal (visceral) obesity and the presence of hypertension. Group 1 included 17 people (16.83%) with a uniform type of obesity, with WC 80.11±1.36, WC/OB 0.87±0.01 cm. Group 2 included 38 children with AO, while OT was 99.82±1.3 cm; RT/OB 0.92±0.009. 20 of them had normal blood pressure (group IIA) and 18 children had a confirmed diagnosis of hypertension (group IIB). Differences in the ratio of OT / OB in the 1st and 2nd groups were significant (P<0.05). At the same time, the BMI value exceeded the 97th percentile and averaged 31.27±0.51 kg/m2, with a range of indicators from 23.5 to 47.2 kg/m2. BMI in the 1st group of patients reached 28.85±0.52 kg/m2; in the 2nd group it was significantly higher — 35.37±0.63 kg/m2 (P<0.01). The comparison group consisted of 20 non-obese children aged 14.31±0.63 years, with WC 64±1.51 cm, WC/OB 0.81±0.02 cm, while the difference in the WC/OB ratio was significant with the 1st group (P<0.01) and the 2nd (P<0.001).

There were 9 girls and 11 boys. This contingent was selected in the city family polyclinics of Samarkand. All children were assigned to the 1st health group. The average value of BMI in the comparison group was 19.44±0.47 kg/m2, with a range of values from 18.2 to 20.4 kg/m2. The difference in BMI value with the observation group is significant (P<0.001). When examining children, a special questionnaire was used to determine the anamnesis, genealogical history and lifestyle of children with exogenous constitutional obesity and hypertension, as well as to determine the quality of life of children, psychological and social adaptation.

RESULTS AND DISCUSSION One of the important risk factors for the development of obesity and arterial hypertension in children is birth weight. So, according to D. Barker (1995), JG. Eriksson (1999) [3], revealed that in the group of patients born with low body weight, there were more cases of hypertension and insulin-independent diabetes mellitus, the so-called insulin-resistant or metabolic syndrome. Considering these data, we were primarily interested in studying body weight at birth. Thus, in 26 (47.7%) obese children, birth weight was within the normal range (3334.5 ± 378.2 g), one third of the children weighed 2500 g or less - 15 (27.2%), which averaged (2103.6±309.3 g). It should be noted that this contingent of children was born at normal gestational age (37–40 weeks). At the same time, ¼ of obese children (14 children (25.4%)) were overweight at birth (more than 4000 g), which averaged (4323.6±209.4 g). When analyzing body weight at birth, depending on the type of obesity and the presence of hypertension, it was found that in the group of children with a uniform type of obesity, the average body weight at birth was (3266.3 ± 145.4 g), while in children with abdominal obesity and with normal blood pressure, the average body weight fluctuated (2226.7±184.1 g). In the group with AO and AH, there were ambiguous parameters, since there were cases of the birth of children both with a body weight above 4000 g and below 2500 g, normal indicators of body weight at birth were not detected. In this regard, the average birth weight was (3359.2±528.4 g). These facts confirmed that one of the non-modifiable risk factors for the development of obesity is low birth weight, as well as excess weight of more than 4000 g, especially in the group of children with AO and AH. According to the latest theories, the dynamics of weight gain and growth in the first 2 years of a child's life is of great importance in the development of obesity. Thus, when analyzing outpatient records of the main number of obese children, it was found that 50.9% (28) of obese children showed a significant tendency to rapid growth and accumulation of overweight. Thus, their average body weight was 13560.3 ± 125.2 g with a height of 82.4 ± 2.1 cm, while in the control group the average weight of children was in the range of 10430.8 ± 108.2 g. These facts were confirmed by BMI, which was in the range of 20.3 ± 0.5 kg/m2 in children aged 1 year, which characterized body weight as overweight. In children of the control group, BMI was 16.02±0.7 kg/m2, which characterized the body weight within the median. When comparing the indicators for the study groups, it was found that the highest indicators for weight gain were observed in the group of children with AO. Thus, the average body weight in children in group 2B at the age of 1 year was 13980.3 ± 101.5 g with a height of 82.1 ± 0.9 cm and a BMI of 20.2 ± 0.2 kg/m2, which was significantly more in relation to children with a uniform type of obesity. In turn, in children of the 1st group, an excess of body weight and height was also observed compared to children in the control group. The role of early postnatal nutrition, weight gain in the first year of life and subsequent blood pressure was studied by Y. Cheung et al. (2000), who over 30 years observed the growth, development and nature of blood pressure in 122 subjects born weighing less than 2500 g. Researchers have proven that higher weight and height indicators in children aged 6-18 months. were accompanied by higher blood pressure levels at the age of 30 years

[4]. These facts were also confirmed in our studies, where in the group of children with AO and AH, the largest jump in body weight and height was observed in the first year of life. At the same time, the greatest difference in weight at birth and in the 1st year of life was observed in children with AO and AH, which can be regarded as a valuable diagnostic sign of the development of AH against the background of AO in children. Despite the well-known assertion that the main cause of obesity is an imbalance between energy expenditure and energy intake, in recent years there have been many new scientific facts indicating the early origins of obesity (antenatal and early postnatal periods). A number of scientific works link the risk of developing obesity with the nature of the mother's nutrition during pregnancy (both excessive and insufficient), as well as the short duration of breastfeeding. For the first time, such a hypothesis was put forward more than 30 years ago by a German researcher (G. Dorner, 1973), who noted that "the concentration of hormones and metabolites in critical periods of early development programs the risk of developing certain diseases in an adult" [5]. Numerous studies in this direction confirm the hypothesis that nutrition during antenatal development and in infancy programs the risk of developing obesity in subsequent years of life [6]. The period of intrauterine development is characterized by high plasticity of metabolism, the ability to adapt all metabolic systems of the body to environmental factors. Malnutrition of the mother, uteroplacental circulation, as well as hypoxia, stress, anemia lead to a delay in fetal development and, possibly, form a "thrifty phenotype" that contributes to the accumulation of adipose tissue, impaired lipid metabolism and the formation of cardiovascular pathology. There is an opinion that maternal malnutrition during pregnancy, the birth of a child with low body weight or symptoms of intrauterine growth retardation are risk factors that often lead to obesity, arterial hypertension and insulin resistance diabetes [7]. In this regard, the perinatal history was studied. Thus, it was found that the violation of fetoplacental circulation or premature aging of the placenta was present in 10 (18.1%) children of the main group, absent in the control group. It should be noted that in the group of children with uniform fat deposition, 3 (17.6%) cases were observed, in group 2A - 3 (15%) and in group 2B - 4 (22.2%). Such a condition as anemia of pregnancy, which leads to fetal hypoxia, occurred in almost the same percentage of 94.5% in the main and 90% in the control group. But when detecting cases of severe anemia, an absolute predominance was found in the group with AO. Thus, cases of severe anemia in group 1 were observed in 6 (35.2%), in group 2A - in 8 (40%) and in group 2B - in 9 (50%) mothers of obese children, while in the control only 1 mother had a case of severe anemia in pregnancy (5%). Preeclampsia of pregnancy was also observed, including preeclampsia of the 2nd and 3rd trimesters of pregnancy. Severe gestosis of pregnancy, including preeclampsia, occurred in 2 (11.7%) mothers of children with a uniform type of obesity, in 3 (15%) mothers of children with AO and in 3 (16.6%) mothers of children with AO and AG. There were no cases of severe gestosis in the control group. The intranatal period was complicated in 28.8% of the children of the main group, while 28 (50.9%) children were born with an Apgar score of 7–8 and 9 (16.3%) with an Apgar score of 4–6. In 13 (23.6%) cases, the pregnancy was premature, while the distribution by group showed the following prevalence of prematurity: 17.6%, 30.0% and 22.2%, respectively, in groups 1, 2a and 2B, with this showed a predominance of prematurity in the group with abdominal obesity and normal blood pressure. 16 (30.7%) mothers of obese children suffered from extragenital pathology (chronic diseases of the kidneys, cardiovascular system, etc.). At the same time, a uniform distribution was observed among the observation groups: thus, in the 1st group there were 5 (29.4%) cases, in the 2A group - 6 (30%), in the 2B group - 5 (27.7%) cases. In contrast to the previous data, there was a predominance of mothers with grade 1–2 obesity in children with AO and AH — 6 (33.3%) cases, while it was most often accompanied by type 2 diabetes mellitus — in 2 (11 .1%), 2 (11.1%) mothers had impaired glucose tolerance. In other groups, such indicators were absent or were an order of magnitude lower. Also, 19 (34.5%) mothers of obese children noted a significant increase in body weight during pregnancy.

CONCLUSION

Thus, according to the theories of early programming in sick children with obesity, there was a significant incidence of pathology of the perinatal period, which leads to disturbances in their metabolic status. At the same time, in children with AO, the main risk factors were severe anemia of pregnancy, hypoxic conditions of newborns, prematurity, extragenital pathology of the mother, and a significant increase in body weight during pregnancy, while for children with AO and AH, the predominant risk factors were maternal obesity and impaired carbohydrate metabolism.

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