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ASSESSMENT OF PHYSICAL DEVELOPMENT OF CHILDREN AND ADOLESCENTS WITH OVERWEIGHT AND OBESITY IN DIFFERENT AGE GROUPS

Nizom J. Ermatov [1], Aygerim J. Jumanazarova [2]

1 DSc, professor, head of the Department of hygiene children and adolescents and hygiene food, Tashkent Medical Academy, Uzbekistan
E-mail: nizom.ermatov1970@gmail.com

2 Doctoral student Department of hygiene children and adolescents and hygiene food, Tashkent Medical Academy, Uzbekistan
E-mail: aygerimd94@mail.ru

ABSTRACT

Purpose of the study. A comprehensive assessment of the physical development of children and adolescents with overweight and obesity in various age groups, identifying the characteristics of their anthropometric indicators, as well as an analysis of factors contributing to the development of these conditions

Materials and methods of research: 208 children and adolescents of the Republic of Karakalpakstan were examined in comprehensive schools in the city of Nukus and the Kungrad district.

In this article, the study was conducted in the format of a cross-sectional comparative analysis method. All children and adolescents were divided into 2 groups based on the definition of the body mass index (BMI, kg / m2) in the tables according to gender and age. The individual value of BMI percentiles taking into account the age and gender of children was calculated using reference BMI percentile tables. The average body mass index of children and adolescents was BMI — 29.9±0.826. All children underwent anamnestic data study based on an original questionnaire developed by the schoolchildren, which was filled out in the presence of a doctor.

Conclusion. The obtained results showed high values of anthropometric indicators in comparison with schoolchildren (11–17 years old) and their peers in the Republic of Karakalpakstan. The obtained results demonstrated high values of anthropometric indicators in comparison with schoolchildren with their peers in the Republic of Karakalpakstan, and obesity in boys was detected 2 times more often than in girls. It is necessary to provide for rationalization of children's nutrition in the family and school environment, optimization of the daily routine and physical activity of children, and the formation of a healthy lifestyle for children.

Key words: Physical development, children and adolescents, overweight, obesity, body mass index.

INTRODUCTION

Physical development of children and adolescents is one of the most important characteristics of their health and behavior. Physical development of children and adolescents largely depends on the nature of nutrition, level of physical activity, lifestyle, and educational technologies. [4]

According to WHO, more than 155 million children in the world are overweight, more than 40 million are clinically obese, and 20 million children are diagnosed with obesity at the age of under 5 years. According to modern concepts, excess body weight in children during the period of active growth plays a key role in the development of obesity in adulthood. There is evidence that obesity in early childhood correlates with risk factors for the development of chronic diseases in adults, including diabetes, cardiovascular diseases, etc. [2] Anthropometric indicators constitute the absolute “popular majority” among all the methods for assessing physical development available in the world today. First of all, this is due to the fact that changes in the length and weight of a growing organism are one of the main indicators of a child’s health and nutritional status. In most cases, deviations from normal values of height and weight gain are the first signs of illness, requiring the doctor to conduct an in-depth examination of the child. Secondly, the popularity of anthropometric methods is explained by their availability, low cost and ease of use. [4]

The purpose of the study is to comprehensively assess the physical development of overweight and obese children and adolescents in various age groups, identify the characteristics of their anthropometric indicators, and analyze the factors contributing to the development of these conditions.

Materials and methods. As part of this work, 208 children and adolescents of the Republic of Karakalpakstan were examined in secondary schools in Nukus and Kungrad district. The present study was conducted in the format of a cross-sectional comparative analysis method, which corresponds to the logical principles described in Table [3]. All children and adolescents were divided into 2 groups based on the determination of body mass index (BMI, kg/m^2) in the tables according to gender and age. The first group included 208 overweight and obese children and adolescents (76 girls and 132 boys). The individual value of BMI percentiles, taking into account the age and gender of children, was calculated using reference BMI percentile tables. The average body mass index of children and adolescents was BMI — 29.9±0.826. The second comparison group also included 208 children of healthy peers of schoolchildren, comparable in age and gender with children of the studied groups, with a normal BMI of 18.4±0.489. [1,5]

All children underwent anamnestic data study based on an original questionnaire developed by the students in the presence of a doctor. The questionnaire for students included a study of children's nutrition during a certain period: 1) information about nutritional features; 2) determination of the structure of the daily time budget of children of middle and senior school age; 3) anthropometric indicators of the student. The questionnaire for assessing the eating behavior of children and adolescents contained questions that allowed us to characterize the nutritional features of children, the teenager's ideas about proper nutrition; to identify the qualitative and quantitative composition of the usual diet, the patient's diet and frequency of meals, and his or her food preferences. The assessment of the characteristics of children's physical development was carried out retrospectively based on a study of children's outpatient records (Form 112/u) at different age periods. Both parametric and nonparametric methods of variation statistics used in statistics were used to compare descriptive characteristics between groups. In this study, the arithmetic mean (M), standard error (m), standard deviation (σ), and other relative measurements were calculated. The statistical significance of differences for normally distributed data was assessed using the Student's t-test for dependent samples. The results were assessed as statistically significant at a probability level of $p<0.05$. The data obtained as a result of the study were calculated by statistics using a Lenovo V15-IGL personal computer using Microsoft Office Excel 16.

Research Results

The results of our study show statistically significant differences between the groups of children and adolescents suffering from obesity and their healthy peers. A detailed examination of each parameter allows us to identify key trends and deviations, which provides a basis for a deeper understanding of the problem of overweight and obesity in this age group.

Table 1

Body weight values of healthy and overweight and obese schoolchildrens in middle and high school aged 11-17 years, kg

Age, y.o	Healthy			Obese			p
	Mean	SD	SE	Mean	SD	SE	
Male							
11-14	41,01	7,72	0,9	73,71	12,89	1,44	< 0.001
15-17	56,55	7,1	0,93	97,67	14,03	1,95	< 0.001
Female							
11-14	43,83	7,34	1,07	75,67	11,31	1,69	< 0.001
15-17	50,2	5,73	1,05	83,44	8,65	1,53	< 0.001

Body weight: Children with obesity show significantly higher body weight than their healthy peers in all age groups and for both sexes. The differences range from 30 to 40 kg, indicating a pronounced excess accumulation of fat mass in these children. Increased body weight puts stress on the body and increases the risk of developing metabolic syndrome, especially in adolescence (Table 1).

Table 2

Height values in healthy and overweight and obese schoolchildrens in middle and high school aged 11-17 years, m

Age, y.o	Healthy			Obese			p
	Mean	SD	SE	Mean	SD	SE	
Male							
11-14	1,51	0,1	0,01	1,6	0,1	0,01	< 0.001
15-17	1,72	0,08	0,01	1,76	0,08	0,01	< 0.001
Female							
11-14	1,55	0,08	0,01	1,61	0,08	0,01	< 0.001
15-17	1,62	0,05	0,01	1,64	0,06	0,01	< 0.001

Note: the data is presented as an average value ±

Height: children with obesity also have a higher average height than their healthy peers, although the differences are less pronounced than in body weight. For example, girls aged 11-14 with obesity have an average height of 1.61±0.01 m, while healthy girls have a height of 1.55±0.01 m. Boys also have a difference, although it is not as significant. This is probably due to the effect of obesity on the rate of physical development and growth (Table 2).

Table 3

BMI values for healthy and obese schoolchildrens in middle and high school aged 11-17 years, m.

Age, y.o	Healthy			Obese			p
	Mean	SD	SE	Mean	SD	SE	
Male							
11-14	17,81	1,67	0,19	28,72	2,88	0,32	< 0.001
15-17	19,03	1,9	0,25	31,34	3,82	0,53	< 0.001
Female							
11-14	18,06	1,83	0,27	29,22	2,96	0,44	< 0.001
15-17	19,2	1,61	0,29	31,09	3,28	0,58	< 0.001

Note: the data is presented as an average value ±

Body mass index (BMI): BMI is an important indicator used to diagnose obesity. In children and adolescents with obesity, BMI values significantly exceed the norm for their age groups. For example, in girls aged 11-14 with obesity, the average BMI is 29.22±0.44, while in healthy peers this indicator is significantly

lower (18.06±0.27). This indicates the need for regular BMI monitoring for early detection of obesity cases (Table 3).

Statistical significance of differences: All indicators in the 'obese' and 'healthy' groups have significant differences ($p < 0.001$), which confirms the reliability of observations and the significance of the identified trends. These differences emphasize the need for early intervention and preventive measures among children with increased risk.

Thus, the obtained results show that obesity is a serious problem among adolescents, as it is associated with unfavorable changes in various somatometric indicators. Early diagnosis and intervention can significantly reduce the risk of developing metabolic syndrome and related chronic noncommunicable diseases.

Discussion

The results of our study show significant differences between obese adolescents and their healthy peers in key somatometric indicators, including body weight, height, and body mass index (BMI). All the differences identified are statistically significant ($p < 0.001$), which confirms the reliability of the data obtained and indicates a serious impact of excess body weight on the stable development of children and adolescents.

The body weight of obese children significantly increases the indicators of their healthy peers in all age groups. The difference is from 30 to 40 kg, indicating a pronounced accumulation of adipose tissue. This excessive weight gain leads to an increase in the level of the musculoskeletal system, cardiovascular system, and metabolism, which increases the likelihood of metabolic syndrome and other chronic diseases.

Growth rates in obese adolescents are also slightly higher than in their healthy peers, the differences are less pronounced, although in comparison with body weight. Increased growth may be associated with accelerated physical development in children with reserve body mass, which is confirmed by basic research. However, this factor requires further study, since obesity can affect the processes of growth and puberty. The body mass index (BMI) in obese adolescents is significantly higher compared to healthy schoolchildren. This indicates a pronounced excess accumulation of solid mass in this group. High BMI values increase with an increased risk of developing metabolic conditions, including insulin resistance, type 2 diabetes, hypertension and other cardiovascular diseases.

Conclusion

1. The obtained results demonstrated high values of anthropometric indicators in comparison with schoolchildren (11-17 years old) with their peers in the Republic of Karakalpakstan.

2. Higher differences in the body mass index of children with overweight and obesity (BMI - 29.9 ± 0.826) were revealed, and obesity in boys was detected 2 times more often than in girls.

3. The results we obtained dictate the need to introduce a set of preventive measures to form overweight and obesity in schoolchildren. These measures should include rationalization of children's nutrition in the family and school environment, optimization of the daily routine and physical activity of children, psychological support for children with overweight and obesity, the introduction of modern educational and information technologies for the formation of a healthy lifestyle for children.

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