

Assessment of the physical development of school-age children (10-17 years old boys)

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Target. To study the features of physical development, the prevalence of overweight and obesity in school-age children-teenage boys.

Materials and methods. During the study, height and body weight were measured, and the body mass index (BMI) of children was calculated. The physical development of children was assessed according to the data of the Research Institute of the SGPE of the Ministry of Health of the Republic of Uzbekistan (2018). The Z-score values of body weight for age, height for age, and BMI for age were calculated.

Results. 1793 boys aged 10-17 years old were examined, including 904 (50.4%) main groups and 889 (49.6%) control groups. According to the WAZ (body weight/age) index, 445/904 (49.3%) and 420/889 (47.3%) boys had it, according to the HAZ (height/age) — 481/904 (53.2%) and 463 /889 (52.2%), according to BAZ (body mass index/age) - 495/904 (54.9%) and 491/889 (55.2%) children. Overweight was detected in 138 (15.2%) of 904 children examined and 142 (16.0%) of 889 children in the control group ($p = 0.001$), obesity was found in 154 (16.9%) and 224 (25.1%) of children, respectively ($p = 0.001$).

Conclusion. The results of the assessment of the physical development of boys aged 10–17 years old showed that the average values of the weight and height indicators of boys were higher compared to the standards of the Scientific Research Institute of the State Health Protection Institute of the Ministry of Health of the Republic of Uzbekistan. Deviations in physical development in the studied group of boys were more related to body weight, while obesity in children in the control group was significant compared to the control group of children.

Keywords: physical development, adolescent boys, school-age children, energy, weight, height, obesity, short stature.

One of the global problems in the health of children and adolescents at present is a decrease in the proportion of children with normal physical development along with an increase in the number of children with both deficiency and excess body weight [1]. The main factor in the formation of obesity in adolescent children is the imbalance of energy expenditure and consumption. In recent years, much data has emerged on obesity in children aged 10-17 years. According to the World Health Organization (WHO) in 2007, almost one in three people on the planet, including 45 million children and adolescents, were overweight or obese [2]. In 2009, the same indicators for children aged 5 to 19 years old were 340 million [3]. WHO found that in 2011, about 40 million children under 5 years of age were overweight [4]. In Western Europe and the USA, according to 2009 data, 25% of adolescents are

overweight, and 15% are obese [5]. In recent years, the prevalence of overweight among children aged 6–11 years has increased from 7 to 13%, and among children aged 12–19 years – from 5 to 14% [6].

According to the Federal State Budgetary Institution "Federal Research Center for Nutrition and Biotechnology", in the Russian Federation, the maximum prevalence of overweight in boys and girls is observed at the age of 10 years, which occurs during primary school [7]. In Russia, according to the Research Institute of Nutrition, the prevalence of overweight among children aged 2-4 years is 4-7%, at the age of 5-7 years - 13%, among students aged 11-14 years - 14-19% [8]. A survey of children living in Astrakhan, Yekaterinburg, Krasnoyarsk, St. Petersburg, and Samara showed that every fifth child was overweight, and 6% were obese. The maximum prevalence of overweight in boys and girls was observed at the age of 10 years (29 and 18% of children, respectively), the minimum - at 15 years (17 and 12%, respectively) [9]. Similar results were obtained when examining students aged 12–18 years living in Moscow: overweight in 12%, obesity in 5%, while obesity was more often observed in boys [10].

Purpose of the study: To study the characteristics of physical development, the prevalence of overweight and obesity in school-age children and adolescent boys.

Materials and methods

Anthropometric parameters (body weight, height) of the boys were assessed during examinations. Children's body weight was measured using impedance meters with an accuracy of 0.05 g. Height was measured using a medical stadiometer with an accuracy of 0.1 cm.

The values of the following indicators were calculated: body weight for age for boys under 17 years of age (Weight-for-Age Z-score, WAZ), height for age (Height-for-Age Z-score, HAZ), body mass index (BMI) to age (BMI-for-Age Z-score, BAZ). According to methodological recommendations, the interpretation of the obtained values was carried out according to the following criteria:

- WAZ: underweight - at < -2 SD, reduced body weight - from -1 to -2 , normal - from -1 to $+1$ SD, overweight - from $+1$ to $+2$ SD, obesity - at $> +2$ SD;
- HAZ: short stature - at < -2 SD, body length below average - from -1 to -2 , normal - from -1 to $+1$ SD, body length above average - from $+1$ to $+2$ SD, tallness - at $> +2$ SD;
- BAZ: insufficient nutrition - at < -2 SD, reduced nutrition - from -1 to -2 , normal - from -1 to $+1$ SD, increased nutrition - from $+1$ to $+2$ SD, excess nutrition - at $> +2$ SD.

The WAZ indicator better reflects the degree of deficiency, rather than excess, of body weight; its value does not depend on ethnic characteristics and characterizes the harmony of physical development [11].

Research results and discussion

The study examined students from children's and youth sports schools (mainly; youth sports school - children's and youth sports school) and secondary schools (control; secondary school - secondary school) in Tashkent. A total of 1,793 boys aged 10–17 years were examined, of which 904 (50.4%) were in the main group and 889 (49.6%) in the control group.

An assessment of anthropometric indicators showed that in the age range from 10 to 17 years inclusive, there is a gradual and relatively uniform increase in weight [53.6 kg; (22.1; 75.7)] and body length [88 cm; (103; 191)], as well as BMI values (Figure 1,2,3).

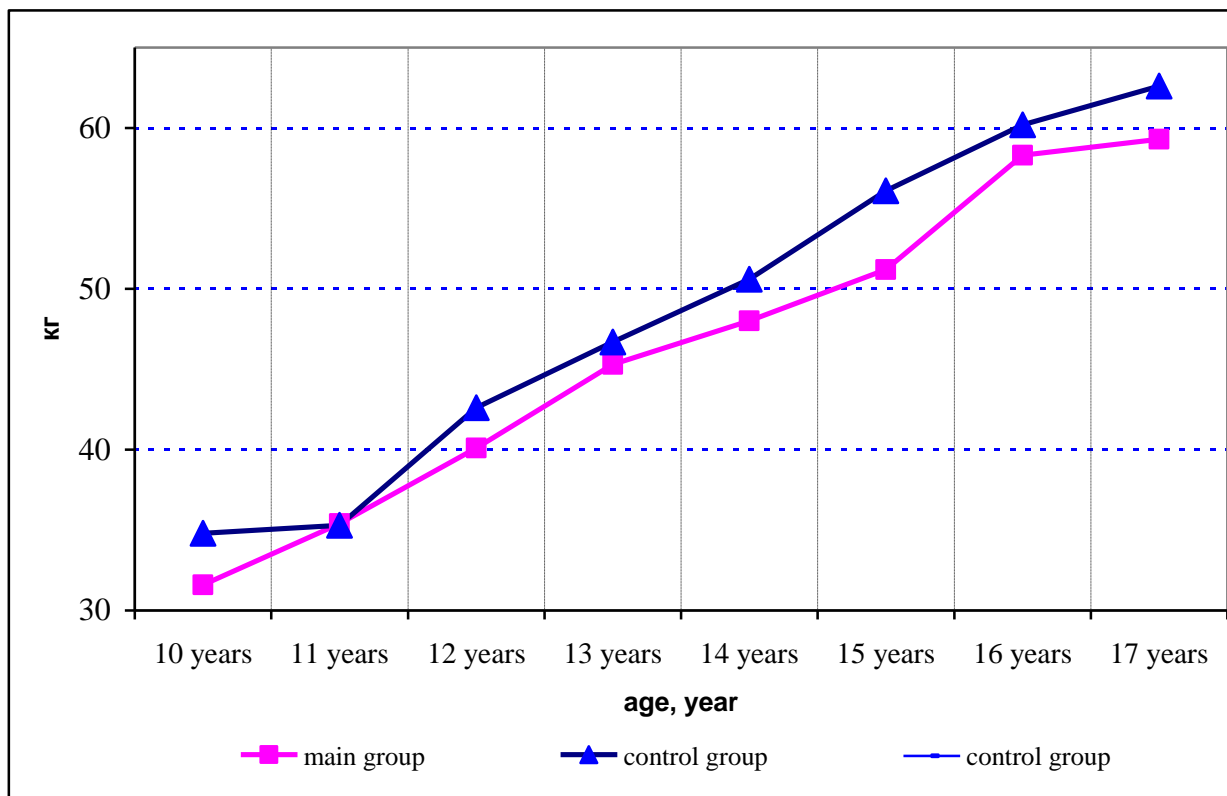


Figure 1. Body weight (kg) of boys depending on age

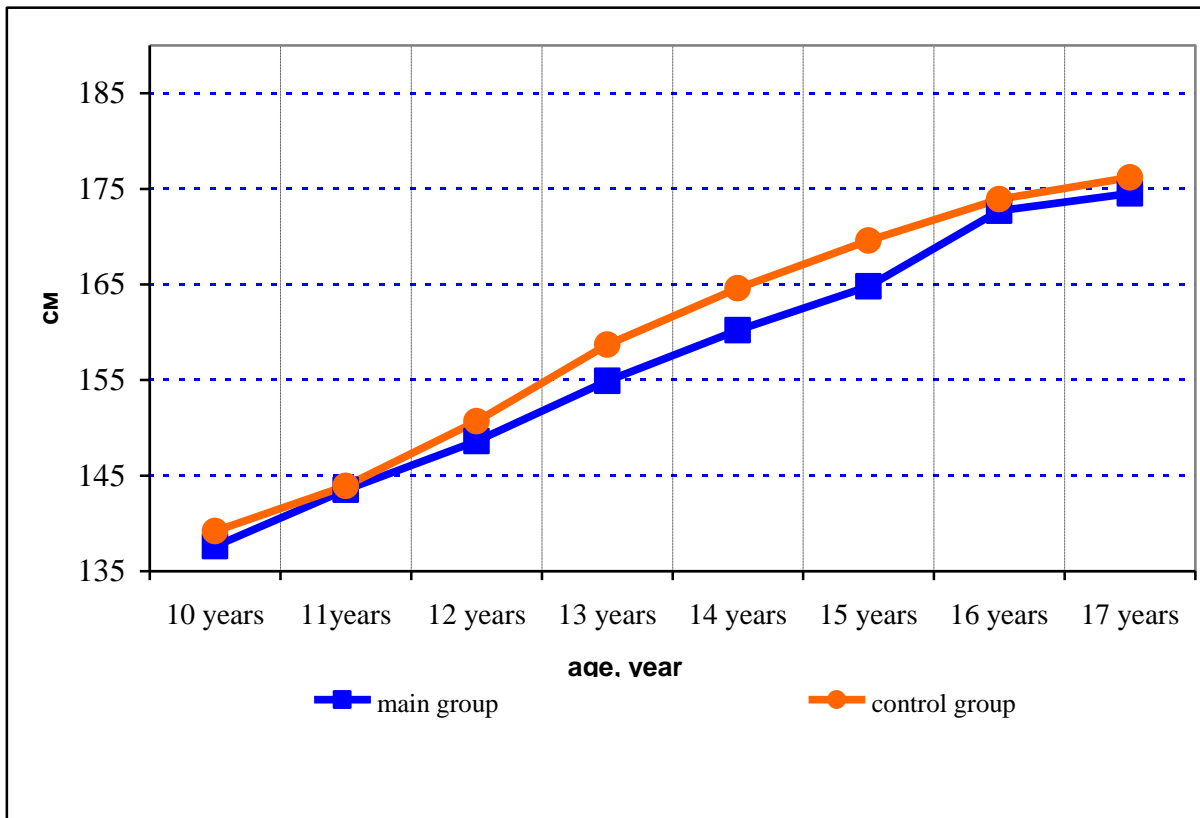


Figure 2. Body length (cm) of boys depending on age

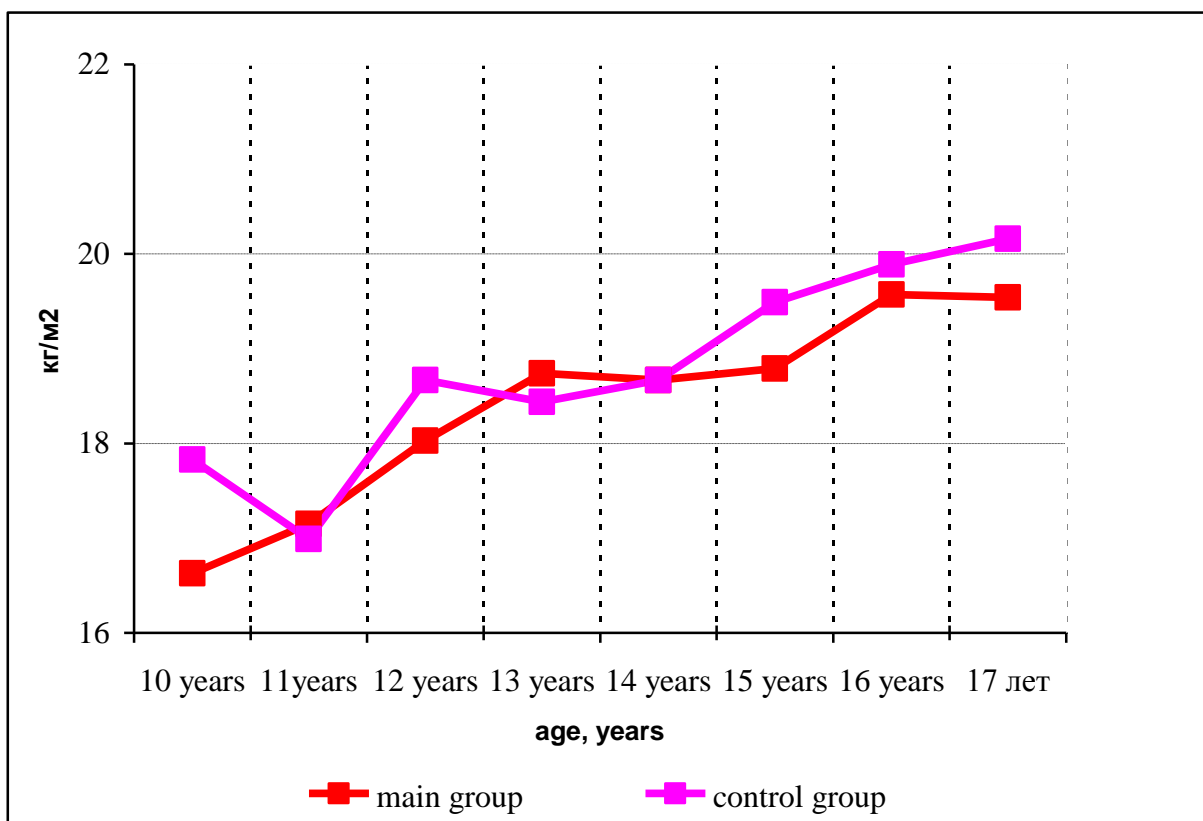


Figure 3. BMI indicators (kg/m2) for boys depending on age

A comparison of the nutritional status of boys of both groups of school age showed that boys of the main groups aged 10–17 years have higher body weight, other parameters, as well as the values of WAZ, HAZ and BAZ indicators are higher in the control group (Table 1).

| Index | Main group (n=904) | Control group (n=889) | P |
|------------------------|-----------------------|--------------------------|-------|
| Body weight, kg | 48,61 | 46,14 | 0,05 |
| Height, cm | 157,12 | 159,61 | 0,05 |
| ИМТ, кг/м ² | 18,39 | 18,77 | нд |
| WAZ, SD | 32,10 | 41,10 | 0,001 |
| HAZ, SD | 32,10 | 41,30 | 0,001 |
| BAZ, SD | 14,56 | 19,7 | 0,01 |

Overweight according to the WAZ criterion was determined in 138 (15.2%) children of the main group out of 904 and 142 (16.0%) in the control group out of 889 (p = 0.001), obesity - in 154 (16.9%) and 224 (25.1%) children, respectively (p = 0.001). At the same time, 124 (13.6%) and 156 (17.6%) boys of the 2 groups studied had severe obesity (BAZ > +3) (p = 0.05). A detailed description of the distribution of Z-score values in the studied groups is presented in Table. 2.

| Index | Group | Z-score | | | | |
|------------------|---------|--------------|---------------|---------------|---------------|---------------|
| | | <-2 | -1 - -2 | -1 - +1 | +1 - +2 | >+2 |
| WAZ, ађс. (%) | Main | 3,24 (29) | 15,3 (138) | 49,3 (445) | 15,2 (138) | 16,9 (154) |
| | Control | 0,67 (6) | 10,9 (97) | 47,3 (420) | 16 (142) | 25,1 (224) |
| HAZ, ађс. (%) | Main | 2,91 (26) | 11,8 (106) | 53,2 (481) | 18,9 (172) | 13,2 (119) |
| | Control | 0,78 (7) | 5,7 (51) | 52,2 (463) | 24,9 (222) | 16,4 (146) |
| BAZ, ађс. (%) | Main | 3,11 (28) | 16,3 (148) | 54,9 (495) | 12,1 (109) | 13,6 (124) |
| | Control | 1,59 (14) | 14,5 (129) | 55,2 (491) | 11,1 (99) | 17,6 (156) |

A study conducted to study anthropometric indicators with the calculation of the WAZ, HAZ and BAZ indices in school-age boys revealed a significant number of children with overweight and obesity.

More pronounced deviations towards overweight and obesity were found in the BAZ, HAZ, WAZ indicators in the control group compared to the main group.

Conclusion

A study of physical development among children aged 10 to 17 years revealed a large proportion of children with excess body weight. The largest number of overweight children is determined using the BMI-for-age ratio (BAZ index). According to this criterion, up to 30% of school-age children have deviations in physical development.

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