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Assessment of nutritional status in school-age children

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Abstract. *Excess body weight in the period of younger school age is a predictor of obesity in later life, and therefore it is necessary to act as early as possible in order to neutralize this negative phenomenon. The study was conducted on a population of students of both sexes, 11 ± 6 . The research included 50 children, more precisely 21 boys and 29 girls. The aim of the research was to determine the level of nutrition of children. The statistical significance of the differences of the applied variables was determined by the Student's t-test for independent samples. Statistically significant differences were found in height at the level (.000), there were no significant differences in weight (.776) although the numerical values were on the side of the girls. In the degree of nutrition between the sexes, statistically significant differences were found at the level (.013). In conclusion, By determining body weight and height, it is possible to monitor normal growth and development, and in this way, by assessing the nutritional status, we obtain important information about the health profile of children. Given that proper nutrition is a very important segment for the normal nutrition of children and should take into account a healthy diet in the school system.*

Key words: *BMI, percentiles, diet, growth curve, weight, height*



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Introduction

The current way of life caused by the scientific and technological revolution has led to the fact that the number of children who have increased body weight is in constant progression. Excess body weight in the period of younger school age is a predictor of obesity in later life, and therefore it is necessary to act as early as possible in order to neutralize this negative phenomenon^{1,7,9,10}. The child forms his habits under the influence of the social environment as well as the available possibilities. Quantitative and quality of poor eating habits can lead to many nutritional deviations, which in conjunction with hypokinesia leads to catastrophic consequences for the child's body^{8,12}. Determining the nutritional status of children is a very useful activity because it refers to monitoring the process of growth and development of children and helps to assess their current condition¹⁵. Previous research, according to the World Health Organization, has shown that obesity and overweight among children and adolescents between the ages of five and twelve have increased from 4%²⁷ to more than 18%²⁸ and are considered overweight today. There are more than 340 million children in the world. Also, the data show that more than 1/3 of children do not engage in any physical activity, while as many as 56.1% of them spend more than three hours a day using electronic devices or watching TV. Preadolescent children are girls 6-10 years old, and boys 6-12 years^{3,13}. It is a period of latent growth with an annual weight gain of 3-3.5 kg. During this period, ie until entering puberty, the increase in height is 8-10 cm. Increasing independence marks this period, their view of the world is special and at that time they begin to shape their eating habits^{3,16,18}. Inadequate energy intake can result in overweight and, on the other hand, malnutrition of the child^{5,12,19}. Adequate intake of energy and nutrients is needed to maintain the physiological needs of children because with proper nutrition the body receives basic food ingredients such as proteins, fats, carbohydrates, essential amino acids, vitamins and minerals¹⁴. Carbohydrates form the basis of energy needs where complex with medium or low glycemic index (cereals, legumes, vegetables), and sugars or simple carbohydrates (sweets, biscuits, juices) should be consumed in as small quantities as possible. Fats are essential for normal growth, but they depend on their type. Unsaturated fats, which are an integral part of whole milk products, cream and red meat, should make up no more than one third of the diet, while trans-saturated fats found in industrial bakery products and margarine should be avoided^{20,23}. Furthermore, vitamins can be found in fruits and vegetables, in milk and dairy products (calcium), while meat is a source of iron and vitamins from the B12 group. Of the behavioral factors that affect the control of food intake, a special place is occupied by the content of macronutrients, energy density, food form and taste, availability, food choice, price and others. Behavioral factors that affect the control of energy consumption are sedentary lifestyle, physical activities related to work, planned activity, arrangement of parks, playgrounds and others²⁶. A healthy child who eats a normal diet gets enough vitamins and minerals and does not need to be added¹¹.

The aim of the research is to determine the level of nutrition of children.

Research method

Sample of respondents

The study was conducted on a population of students of both sexes, 11 ± 6 . The research included 50 children, more precisely 21 boys and 29 girls. The research was realized in the elementary school "Sveti Sava" in East Sarajevo. Preadolescence is a time of great changes in an individual's nutritional needs. Adopting proper eating habits in preadolescence is important because it is a period of proper growth and development. The fullness of preadolescent health and life will be achieved with good inherited genetic material, nutrition and health with appropriate education.

Sample variables

The set of morphological variables used in this study was formed in accordance with the objectives of the study. It consists of 2 morphological measures. Based on morphological measures, the body mass index was calculated, and presented as a percentile index for the isolated population.

Variables for assessing student morphological characteristics:

- body height (AVIS),
- body weight (ATTE),
- body mass index (BMI).

Experimental procedure

Given the current epidemiological situation caused by the global COVID-19 virus pandemic, the research was adjustments in accordance with public health regulations. During anthropometric measurements, all children wore protective masks, spaced at an appropriate distance.

Statistical data processing

The tables showing the group part of the statistics give the names of the variables (Var.), The number of respondents (N) and their gender, the mean value of the results (Mean), the standard deviation (Std. Deviation) and the standard error (Std. Error Mean).

Statistical significance of differences of applied variables was determined by Student's **t-test for independent samples** and shows data of F (F) ratio, significance level (Sig. (2-tailed)), t test result (t), degrees of freedom (df), differences of central values (Mean Difference) and

standard error (Std. Error Mean). The level of significance was reduced to Sig. = 0.05. Graphical data processing was performed using MS Office Excel software tool (2007, Microsoft Corp., USA).

Research results with discussion

Assessment of nutritional status

In Table 1. shows the results of height and weight for both sexes, ie. for boys and girls of school age, aged 11 ± 6 months. Looking at the mean values of numerical indicators, we can conclude that their anthropological characteristics are consistent with the research conducted by other authors.

Table 1. Group Statistics, height and weight of boys and girls

Var.	pol	N	Mean	Std. Deviation	Std. Error Mean
AVIS	B	21	146.2143	4.54030	.99077
	G	29	140.1207	3.31300	.61521
ATTE	B	21	37.5905	4.35889	.95119
	G	29	38.0310	5.99614	1.11345

Boys are on average 6.1 cm taller, however, in terms of body weight, girls are less than 0.5 kg heavier than boys, which supports the fact that girls enter the stage of maturation and preadolescent accelerated growth earlier than males^{6, 22}.

In Table 2. shows the differences in height and weight between boys and girls, in fact their statistical significance. Following the column of statistical significance in field 2, we can conclude that there are statistically significant differences in height between boys and girls (.000), while in body weight there is no statistical significance at the level of Sig. .05 and amounts (.776). Numerical values for the body weight variable are higher in girls, but not sufficient for significance alone.

Table 2. Differences between weight and height in boys and girls

Var.	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
AVIS	4,515	.039	5,492	48	.000	6.09360	1.10944
			5,225	34,710	.000	6.09360	1.16624
ATTE	.439	.511	-.286	48	.776	-.44056	1.54009
			-.301	47,995	.765	-.44056	1.46442

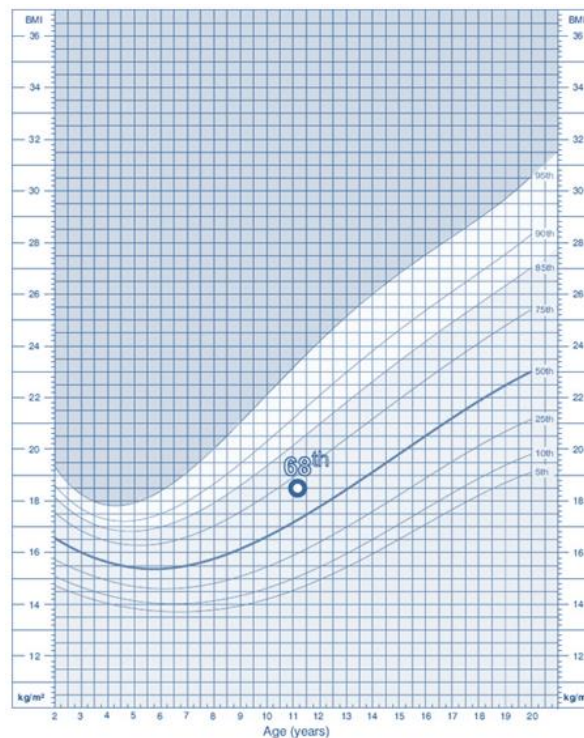
The value of the body mass index in children is interpreted differently from the interpretation in adults. Body mass index in children is dependent on gender and age, so absolute BMI in children and adolescents is not a good parameter for the classification of overweight and obesity²⁴.

Table 3. Group Statistics, BMI boys and girls

Var.	pol	N	Mean	Std. Deviation	Std. Error Mean
BMI	B	21	17.5994	1.96194	.42813
BMI	G	29	19.3326	2.58276	.47961

In table 3. we can state that by the product of height and weight I get the BMI nutritional indicator, however we have previously emphasized that it is not a valid indicator for persons under 18 years of age and that it is shown by a percentile ratio (curve). It can certainly be concluded that girls are more nourished than boys, and this is due to higher body weight and lower height compared to the male population.

Figure 1. Percentile display of nutrition at the group level



Based on the presentation, a complete sample of 50 students (boys and girls) is on the 68th division (*Figure 1*) of the percentile scale and indicates that children are normally fed, which is a very important fact for both the place of residence and the population of healthy population²⁶. It would be more important if the research was conducted on a larger sample of respondents and classified according to age categories and gender.

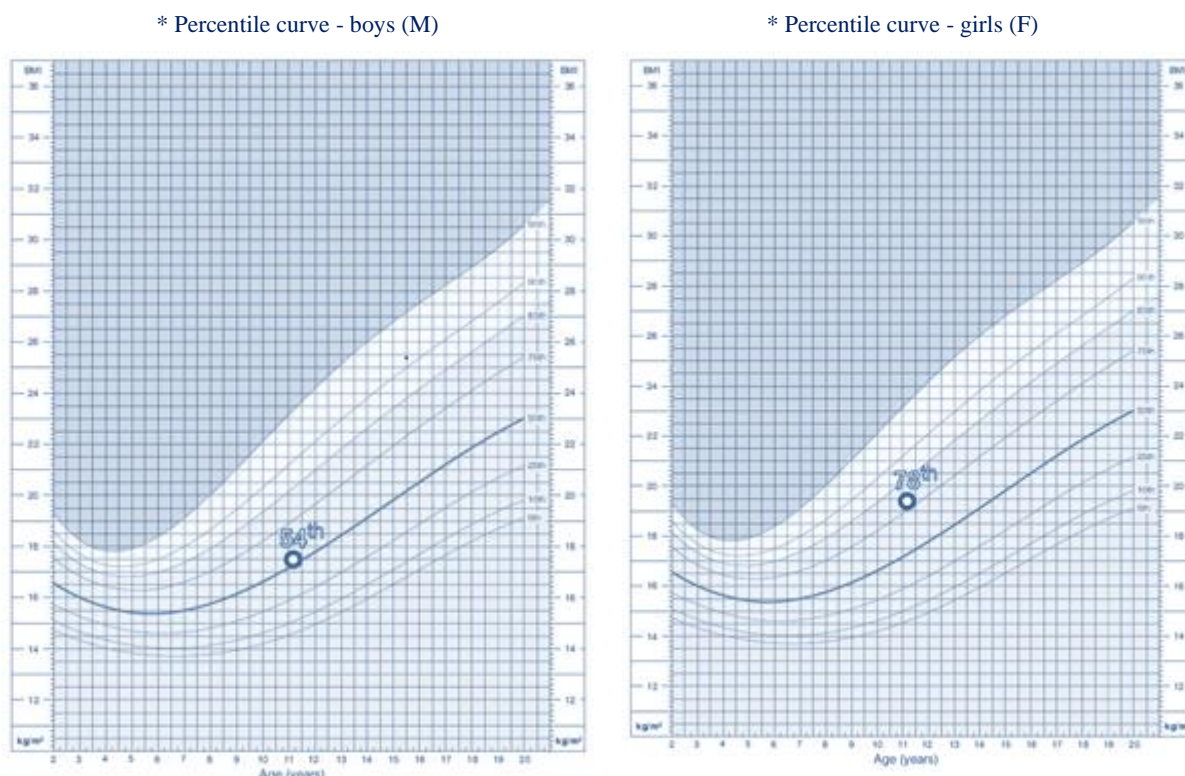
Table 4. Differences between BMI in boys and girls

Var.	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
BMI	.702	.406	-2,580	48	.013	-1.73325	.67168
			-2,696	47,859	.010	-1.73325	.64290

In Table 4. shows the differences in BMI between boys and girls. Based on the statistical significance from section 2, we can conclude that there is a statistically significant difference in body mass index / degree of nutrition between boys and girls at the level (.013). The results were expected given the numerical differences between height and weight between the sexes⁹.

Proper growth and development of children can be monitored by measuring anthropometric characteristics⁶, and measurement results can be used to assess nutritional status^{22,25} to define the suitability of the process of growth and development of children and physical activity programming, but also to predict health status in old age.

Figure 2. Percentile display of nutrition especially for boys and girls



Based on the presented results (*Figure 2*) of the percentile curve according to gender, we can see that boys have an almost ideal BMI, ie. balance between body weight and height, while girls position themselves significantly higher than boys due to the increased number of kilograms. The problem of obesity needs to be addressed in time, so at this age, considering the pre-pubertal period, it is very important to give the right dietary and health guidelines.

The greatest preventive efforts in tackling childhood obesity should be in children in the first days of their lives, including the prenatal period, the postnatal period of sucking, and the transition to a modified adult diet. The most important task of parents in early development is to be carriers of eating habits and their changes in early childhood. The influence of the environment on children's nutrition and the development of obesity has also been proven, especially the way in which parents eat, as well as the influence of parental behavior in the development of children's obesity^{2,4,21}.

Conclusion

The age of adolescents is suitable for shaping proper eating and living habits, and gives hope but also a great responsibility to adults to participate and contribute to their healthy growing up. Parental environment, eating whole meals together significantly contribute to the formation of eating habits of the youngest.

Positive conclusions extracted from the research:

- By determining body weight and height, it is possible to monitor normal growth and development,
- By assessing the state of nutrition, we get important information about the health profile of children,
- Proper nutrition is a very important segment for the normal nutrition of children and should take into account a healthy diet in the school system,
- Physical activity is crucial for proper calorie consumption and maintaining a healthy and positive leisure time.



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