EXERCISE AND QUALITY OF LIFE

Volume 7, Issue 1, June 2015

UDC 796.012.1-053.5:613.955

EVALUATION OF THE NUTRITIONAL STATUS OF YOUNGER SCHOOL CHILDREN

Nikola Radulović, Ilona Mihajlović, Milena Mikalački, Nebojša Čokorilo and

Mila Vukadinović[1]

Faculty of Sport and Physical Education, University of Novi Sad, Serbia

Abstract

The aim of this study was to evaluate the nutritional status of younger school children. It included 325 respondents, 196 of which were boys and 129 girls aged 7-11, from the elementary schools in Novi Pazar. Body height and weight were measured in February 2014, based on which the body mass index was calculated. Harrison's categorization was used for the evaluation of the degree of nutritional status of the respondents. Data were analyzed by multivariate analysis of variance. The research results show that there is a statistically significant difference in the nutritional status between boys and girls of younger school age ($p \leq .05$), i.e. 18.61% of girls and only 12.75% of boys were overweight. The category of lean respondents included 35.72% boys and 24.03% girls. Considering the variables of body weight and body mass index, there were statistically significant difference between the boys and girls ($p = .00$). The girls had higher numerical values of body mass (30.10kg) than boys (28.07kg), and at the variable of body fat index, it was also observed that girls (21.63kg/m2) recorded higher values than boys (19.97kg/m2). The conclusion is that girls of younger school age have a higher degree of nutrition, higher body weight and body mass index than boys.

Key words: Body mass index, body waight, Harisson categorization.

Introduction

The nutritional status has a significant impact on the physical and physiological characteristics, functional capacity, biochemical composition, health condition, and represents the contentment of an organism with nutrient and protective substances.

The evaluation of growth and development is not only an indicator of health and nutritional status of children, but also indirectly gives an insight into the quality of life of the entire population of a certain area.

It is well known that children who have the conditions for proper physical growth freely develop their cognitive functions, functional abilities and the immune system. In 1995, it was estimated that in developing countries, mortality was associated with severe malnutrition in 6.3 million, i.e. 54% of children (WHO, 2006).

Anthropometric indicators can be classified by their application, which includes the following: identification of a person or population at risk, then the selection of individuals and populations for intervention, evaluation of the effects of changes in nutritional status, health and socio-economic impacts, including the intervention of the exclusion of persons with high-risk treatments for the estimation of achieving the recommended standards (WHO Expert Committee, 1995).

The choice and selection of anthropometric indicators in the evaluation of the nutritional status of children depends on the aforementioned objectives, as well as their sensitivity and specificity. Numerous tests of nutritional status of children that are implemented in various world countries, unfortunately, are not compatible due to the use of non-standardized criteria, methodology and reference values.

In order to monitor and compare the growth and development, which is the basic objective of the evaluation of these parameters, the populations therefore apply the international reference values of the National Center for Health Statistics / World Health Organization (NCHSIWHO), which were made 70 years ago, based on the data of healthy and normally nourished children in the United States. The World Health Organization adopted these standards for the international application (WHO Working Group, 1986). For the standardized analysis and uniform processing of the data on growth, development and nutritional status of children, the World Health Organization prepared the "ANTRO" software, which was distributed to a number of countries and is used for the comparison of data on a global level. This program would be excellent in the comparison and evaluation of the results of the nutritional status of children from this area with other parts of the world and Europe (WHO Working Group, 1986).

Within the evaluation of data from the global world base of growth and development of children at the population level, typically used threshold values are <-2 SD for the classification of low body weight for certain age, low body height and low body weight for the height as moderate malnutrition, and <-3 SD as severe malnutrition. Treshold value of >+2 SD classifies large body weight for a given height as obesity in children (WHO Expert Committee, 1995).

Previous evaluation of nutritional status of children contributed to the assessment of the importance of determining the prevalence interval in order to assess the severity of malnutrition and the decision to undertake an intervention population program. (Gibney, Vorester & Kok, 2002).

Obesity is a chronic disease, which is manifested by excessive accumulation of body fat and increased body weight (Gibney, Vorester & Kok, 2002). Whether a person is obese or not, can be today determined on site by measuring their actual weight and entering data into a computer. Obesity is one of the leading health problems of people around the world, both in developed countries and countries in transition. The prevalence of obesity has increased significantly in the last 20 years, and the present tendency of further increase reaches global

epidemic proportions. According to the World Health Organization, more than one billion inhabitants of the earth are overweight, 300 million of which are obese (WHO, 2005). Obesity is generally defined as an excessive accumulation of body fat, which is in clinical practice commonly expressed through the body mass index - BMI, or using other methods (Tsigosm et al., 2008). The causes of obesity are manifold. The most important ones are considered to be genetic and metabolic factors. Those are also the unhealthy lifestyle of modern people, with a diet that is inappropriate for the body needs (nutrition with foods of high caloric value, fast food, oversized portions, emotional overeating). The explanation is found in the sociocultural, psychological and neuroendocrine factors (high cortisol levels, lower levels of thyroid hormones, polycystic ovaries, growth hormone deficiency, etc.). However, the main risk factors for obesity are: genetic 5-70%; too high intake of calories and/or bad combination of foods (free carbohydrates combined with concentrated fat or concentrated protein); insufficient physical activity (70%); social factors - flour, sugar and fat are cheep foods, and fruits and vegetables more expensive (and have fewer calories and tend to saturate); cultural factors - the cult of fatty foods, other factors - individual susceptibility, smoking cessation, alcohol, certain medications, pregnancy, menopause, pre-school age, adolescence (Eveleth, & Tanner, 1990).

Obesity is generally becoming an increasingly important public health problem, and resolving the issue of obesity in children needs special attention, because research suggests that most people who were overweight in childhood have problems with obesity in adulthood. Thus, Power, Lake & Cole (1997) estimated for children who were obese at the age of 7 (BMI>95th percentile), 43% of those girls and 63% of boys remain obese in their thirties. In Serbia, excessive body weight is reported in 54% of the population, with the highest prevalence in Vojvodina, where 35.5% of the population is overweight, and 23% of the population is obese (Grujic, Martinov-Cvejin, Ac-Nikolic and Niciforovic-Surkovic, 2005). Given the increasing prevalence of obese children, the study was aimed at determining the nutritional status of young school children from Novi Pazar.

Method

The survey was conducted on a sample of (n=325) of respondents derived from primary school age children, male (n=196) and female (n=129) in the municipality of Novi Pazar. The children attended the primary schools "Bratstvo", "Jovan Jovanović Zmaj", "Rifat Burdzevic Trso", "Vuk Karadzic" and "Stefan Nemanja". They were of different social status, age 7-11.

Anthropometric characteristics that represented the variables in the study were measured for the purposes of this research:

1) *Body height* and

2) *Body weight*, based on which

3) *Body mass index*, was calculated.

The evaluation of anthropometric characteristics included the measurement of:
1) Anthropometer after Martin – Body height (cm)
2) Scale - Body weight (kg) with the standardized, calibrated tools and instruments, in line with the IBP for each measure, and based on these two dimensions
3) Body mass index (kg/m2) was calculated according to the following formula:

The categorization of the degree of nutritional status of respondents was done using Harrison categorization stated by Kristiforovic-Ilic (2004) for a BMI (body mass index). Statistical analysis was performed using SPSS version 20.0 for Windows (SPSS, INC, Chicago, IL). All results were expressed in arithmetic means (AM) ± standard deviation (SD). The multivariate analysis of variance was used to determine the difference between the respondents in the whole system of variables and individually in the variables. Statistical significance was set at $p \leq 0.05$.

Results

The analysis of descriptive statistics (Table 1) indicates the homogeneity of male and female subsamples only in the variable of body height. Other variables (body weight and BMI) observed an increased variability of the results (CV>16%).

Comparing the two subsamples (girls and boys of younger school age), it can be noted that, according to BMI, both had an average normal volume of nutritional status (18.5-24.9 kg/m2).According to the multivariate analysis, there were significant differences in the nutritional status of boys and girls of younger school age (p = .00) with the values of the Wilks's F test of 24.50. Individual analysis showed statistically significant differences in the variables of body weight (p = .00) and BMI (p = .00) in favor of the girls.

Table 1. Descriptive statistics of variables and differences between the groups

Variable	Gender	AM	SD	CV (%)	f	p
Body height (mm)	M	1287.21	64.28	4.99	.30	.58
	F	1283.77	66.23	5.16		
Body weight (kg)	M	28.07	5.01	17.85	12.89	**.00**
	F	30.10	4.93	16.38		
Body mass index (kg/m^2)	M	19.97	3.64	18.22	15.03	**.00**
	F	21.63	3.94	18.21		

F = 24.50 P=**.00**

Legend: AS – arithmetic mean; SD – standard deviation; CV - coefficient of variation; f - f univariate f test; p - level of statistical significance of the f test; F - multivariate Wilks's F test; P - statistical significance of multivariate F test

In order to facilitate the transparency of the results in the index of nutrition, we conducted the distribution of body mass index by gender, considering three classifications: underweight, normal weight and overweight.

Table 2. Distribution of BMI by gender, according to Harisson's categorization (Kristiforovic-Ilic, 2004)

Norms	Boys (N=196)		Girls (N=129)		Total	
Percentil	n	%	n	%	n	%
<30 (<18.5 kg/m^2) underweight	70	35.72	31	24.03	101	31.08
30-85 (18.5-24.9 kg/m^2) normal	101	51.53	74	57.36	175	53.84
>85 (>25 kg/m^2) overweight	25	12.75	24	18.61	49	15.08
Total	196	100	129	100	325	100

The results in Table 2 show a high percentage of children with too low body weight, malnutrition (35.72% of boys and 24.03% of girls, which in the aggregate amount to 101 respondents). Normal body weight was present in a total of 175 respondents (101 boys and 74 girls), while 25 boys and 24 girls were overweight which is 15.08% in the total. The review of the results showed a large number of malnourished children.

Discussion

In the total sample of 325 respondents, the differences in the nutritional status of children of young school age were examined. The research revealed that the number of malnourished children was extremely high to the total sample (31.08%), while the number of overweight children was 15.08%. Normal level of nutrition was present in 53.84%. It is obvious that the overall prevalence of obesity among the examined children in this population of 15.08% is still considerably lower than the prevalence of obesity in Western European countries and the United States (Yajnik, 2000).

Greater variability of the results in the variable for assessing obesity is a consequence of the uneven development of children's body. It is well known that body weight is not affected only by genetic factors, but much more by socio-economic ones, lifestyle and level of physical activity. Both analyzed subsamples reported a well-balanced diet which was in line with the energy needs of young school children and adequate level of physical activity of children of different gender.

Overall prevalence of malnutrition in the examined children is 31.08%. In the attempt to compare the observed prevalence of malnutrition in the examined children with the test results of other studies, we found very scarce data in the literature. Those data were almost twice higher than in the research by Markovic, Igrutinovic, Kostic and Vuletic (2008) whose percentage of such children was 17.7% on the territory of Sumadija. It did not surprise us to a great extent, due to the fact that most authors, who studied the issue of the nutritional status of children focusing on the phenomenon of obesity, originated from socio-economically developed countries (Yajnik, 2000).

The use of the appropriate formula for the evaluation of nutritional status quickly and accurately provided the information on the nutritional status of children from the district of Novi Pazar. The results showed varying degrees of nutritional status of respondents of sexually dimorphic groups. In the development of children and the degree of their nutrition biological, psychological and sociological (environmental factors) factors are important, especially cultural factors that can have a profound influence on these results.

In all segments of the methodics of teaching physical education, evaluation has been recognized as a useful method that allows a unique opportunity to improve the classroom work with children (Koplan, Liverman & Kraak, 2004). With this study, we realized that with the application of evaluation, using a statistical package, we can quickly calculate the parameters of nutritional status.

Based on the above, it can be concluded that the results of this study have indicated the obvious existence of the problem of thinness in male and female children in the detection of school children. The percentage of overweight children is small, but it cannot be expected that such trend would be kept with the development and growth of the body at later age. Preventive measures in the fight against the thinness of children should include the increase of physical activity, increased energy intake, changes of factors influencing too low body weight and obesity, while originating from environmental and educational work with parents. Parents, teachers, head teachers and other professionals are required to provide sufficiently encouraging environment for proper growth and development of each child, for future active and healthy lifestyle, which includes high-quality and adequate intake of healthy and beneficial ingredients. The limitation of the study was that the questionnaire on the occupation of a parent or guardian was not parallelly introduced in order to accurately determine the association between socio-economic status and childhood malnutrition. Given that the results of the treatment of severe forms of the nutrition disorder, especially in obesity and thinness, are generally unsatisfactory, most authors agree that emphasis should be placed on the prevention of eating disorders (Bibbins-Domingo, Coxson, Pletcher, Lightwood, Goldmanetall, 2007).

References

Bibbins-Domingo, K., Coxson, P., Pletcher, M.J., Lightwood, J., Goldman, L., et all. (2004). Adolescent overweight and future adult coronary heart disease. *NEJM*, 357, 2371-2379.

Eveleth, P.B. & Tanner, J.M. (1990). *Worldwide variations in human growth* (pp. 3-90). 2 edition. Cambrige: Cambrige University Press.

Gibney, M. J., Vorester, H. H., Kok, F. J. (2002). *Introduction to human nutrition* (pp. 125-224). Oxford: Blackwell Scinence Ltd.

Grujic, V., Martinov-Cvejin, M., Ac-Nikolic, E., Niciforovic-Surkovic, O. (2005). Epidemiology of obesity in adult population of Vojvodina. *Medical overview*; LVIII (5-6), 292-295.

Koplan, J.P., Liverman, C.T., Kraak, V.A., eds. (2004). Preventing childhood obesity: *Health in the balance*. Committee on Prevention of obesity in children and Youth. Washington DC, Institute of Medicine.

Kristoforovic-Ilic, M. (2004). *Hygiene-handbook with practicum.* Novi Sad: Faculty of Medicine Novi Sad.

Markovic, S., Igrutinovic, Z., Kostic, G. and Vuletic, B. (2008). Nutritional status and possible factors of etiopathogenesis of obesity in school children. *Medical Journal*, 1, 7-14.

Power, C., Lake, J. K., Cole, T. J. (1997). Measurement and long-term health risk of child and adolescent fatness. *Instytuial Journal Obesity*; 21, 507-526.

Tsigos, C., Hainer, V., Basdevant, A., Finer, N., Fried, M., Mathus-Vliegen, E., Micić, D., Maislos, M., Roman, G., Schutz, Y., Toplak, H., Zahorska-Markiewicz, B. (2008). *Management of Obesity in Adults*. European Clinical Practice Guidelines Obesity Facts.

WHO (1983). *Measuring change in nutritional status*. Guidelines for Assesing the Nutritional Impact of Supplementary Feeding Progranunes for Vulnerable Groups. Geneva.

WHO Expert Committee (1995). *Physical status: The use and interpretation of anthropometry*. WHO Technical Report Series 854. Geneva.

WHO Working Group (1986). Use and interpretation of anthropometric indicators of nutritional status. *Bull World Health Organ*, 64 (6), 929-941.

World Health Organization, Europe (2005). *The challenge of obesity in the WHO.*

Yajnik, C. (2000). Interactions of perturbations in intrauterine growth and growth during childhood outhe risk of adult-onset disease. *Proc Nutr Soc*., 59, 257-265.