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OBESITY AS A DISTURBING FACTOR IN GROWTH AND DEVELOPMENT OF YOUNGER SCHOOL AGE STUDENTS

(Preliminary communication)

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Abstract

Transversal study has examined the nutritional status of younger school age students. For the assessment of the nutritional status of younger school age students three parameters have been used: body height (HT), body weight (WT) and body mass index (BMI). To measure body weight, medical scales with the accuracy of 0.1kg have been used, and to measure body height, an anthropometer with the accuracy of 0.5cm has been used. The measurements have been carried out by the International Biological Program (Weiner & Lourie, 1969; Taken from Djurašković, 2001).Based on these two parameters body mass index (BMI) has been calculated according to the formula: BMI= WT (kg) / HT² (m²).Possible differences in observed characteristics of the morphological status among the students of the first, second and third grade have been determined by means of multivariate analysis (MANOVA) and the univariate analysis (ANOVA).It can be concluded that at multivariate level there is a statistically significant difference among the students of the first, second and third grade in the examined characteristics of the morphological status .The results of the univariate analysis (ANOVA) have shown that there is a statistically significant difference among the students for the HT and WT, whereas for BMI there is not a statistically significant difference (p = .135). We can conclude that in the study of the nourishment status of students the majority of the examinees from the first (N=82), second (N=74) and third (N=100) grade belong to the category of normal weight, although based on minimal and maximal values of BMI we can state that there are children who are underweight, and also children who are overweight, which requires a special attention of physical education teachers and health care workers.

Keywords: *physical education, teaching curriculum, methodology of physical education, younger school age period, students, physical activity, BMI, morphological characteristics, functional abilities, motor abilities*

INTRODUCTION

When children start school, their carefree life is over, they have less free time for socializing with peers, entertainment and playing games. Attending classes, doing their homework, studying, obligations and the sense of responsibility have a negative effect on their overall physical growth and development, and certain mental disorders can often appear as well.

Some studies published in recent years have indicated a major problem of obesity and occurrence of diabetes and heart diseases in children in the younger school age period. When we talk about children's health, we often mention the environment as an important factor of children's health. In the past, life in the countryside enabled various activities and made us be physically active, as opposed to today's children who are lost among the skyscrapers and darkened rooms with a computer.

Can a class teacher today respond to all the tasks of physical education teaching curriculum? Although class teachers have passed the Methodology of physical education teaching in the process of their education and training, to be honest, they cannot implement a very complex and demanding physical education teaching curriculum with the same quality as mathematics and Serbian language teaching.

Today's generations, compared to the previous ones, are characterized with the significantly greater height and increased body weight with a growing tendency. However, the greater height and the weight gain do not go along with the strengthening of muscles whose task is to support the spine and enable the proper growth and development.

On the basis of anthropometric measurement of the body weight and height, body mass index (BMI) values were calculated.

Increased body weight or obesity has recently assumed epidemic proportions. Intellectual activities require multiple hours of sitting at a computer, while physical activity is reduced to a minimum, which has resulted in an increase in the number of people with obesity problems, both adults and children. Numerous studies have indicated that a modern man lives and works in limited space and time, and that this way of working and living even threatens his biological survival.

Studies conducted in the European Union have shown that 10-30% of children aged 7-11 years, and 8-25% of adolescents aged 14-17 years are obese. (Obradović & Srdić, 2007).

The prevention of obesity involves care in the earliest age when parents bring their child to a counseling center to have their body weight and height measured. The first physical activities of a child start at the end of the first year when a child starts to walk, when it is possible to diagnose changes in the growth and development of the musculoskeletal system. In pediatrics obesity is defined as an increase of total mass of adipose tissue compared to other tissues. It is estimated that there are more than 22 million obese children in the world who are younger than five years old. Due to the increasing number of people at risk, obesity becomes a world health problem number one, and more and more experts talk about real epidemics in developed countries around the world.

To assess the nutritional status, body mass index (BMI) is usually used, and it has been applied to the child population in recent years, because it is considered to be a simple parameter for determining obesity. However, it is still unknown whether this parameter can reliably determine obesity when it comes to the child population.

What causes obesity?

The most common reason for obesity is when more food is taken for a longer period of time without its adequate expenditure; the excess calories are stored in the body creating energy reserves. Obesity will not occur if there is a proper balance between food intake and energy expenditure.

"Obesity is an increase of share of fat mass in body composition, to the extent which may endanger health and cause complications." (Stokić, 2004).

Besides many other factors, the quality of nutrition and physical activity are considered to be the main factors of nutritional status. Thus, the low-fat diet and high physical activity, because of their importance and impact on the nutritional status, are called "the big two" (According to Šabanović, Beganlić, Mulavdić & Đaković, 2012).

Health problems that can occur in obese children and adolescents in the latter age are: cardiovascular problems, primarily hypertension, a disorder of the endocrine system, the emergence of diabetes type 2, irregular menstruation in female population, depression, respiratory system problems, orthopedic problems and many other complications.

Besides living conditions, genetic predispositions also play a very important role. According to some data, if both parents are obese, the chances are that about 80% of children will be obese, and if one parent is obese, 50% of children will be obese.

Preventing obesity is also possible if people are educated about proper nutrition and if they adopt healthy habits. It is widely known that improper, insufficient and irrational nutrition leads to nutritional disorders and acute or chronic health problems. Poor nutrition during childhood may later have consequences in the form of reduced growth, body weight, capacity for work and the risk of many diseases.

It is especially important to take care of proper nutrition in the childhood, when the so-called food pyramid can be of great help. The emphasis in the food pyramid for children over six years old is on the six main food groups, each of which is important for maintaining good health. A child should be offered a variety of food from all food groups. The base of the pyramid consists of cereal and flour products, which should provide 40% of the total energy value of food. The preference should be given to brown bread and products made of whole-wheat flour in order to increase fiber intake. Slightly narrower part of the pyramid consists of vegetables and fruits which should provide about 35% of the total energy value. Fruit should provide 17% of energy and vegetables 18%.

Fig. 1. The pyramid of proper nutrition (Kragujević & Rakić (Крагујевић & Ракић), 2004)

When selecting food, it should be taken into account that juicy fruit and vegetables are much more present than hazelnuts, almonds, walnuts and potatoes, which are present in smaller quantities. Meat and meat products, milk and milk products occupy the narrower part of the pyramid. Preference should always be given to white poultry meat, veal, fish and beef. Milk and milk products with lower fat content should preferably be used. Fats, oils and sugars form the narrowest part of the pyramid, which means that they should be eaten in the smallest quantities, will provide 5% of the total energy

intake. (Kragujević & Rakić (Крагујевић & Ракић), 2004, Fig.1).

When we talk about the health of children, environment is often mentioned as an important factor of children's health. Life in the countryside used to provide different activities and made us be physically active, unlike today's children who are lost between skyscrapers and a darkened room with a computer.

In addition to the proper nutrition, physical activity is the best prevention of obesity in children. The existence of sports courts in school environment is crucial for the development of psycho-physical abilities of children, although it is becoming increasingly common that near schools, instead of sports courts there are cafes, betting shops, internet cafes, fast food kiosks, where cigarettes and alcohol are also sold. These facilities have a negative effect on children, because they develop propensity for gambling, consuming unhealthy food, tobacco and alcohol. Parents feel that the school environment is not adequate and that it has a negative effect on the development of children and formation of their habits. (J. Zrnzević, N. Zrnzević, 2011).

The family, mostly the parents, has a big role in stimulating the children to engage in physical activities, by spending some time actively playing with them, by transporting their children to and from physical activities and sports, by engaging in realization of sports events in the school their children attend, by providing the financial support for the physical activities, such as purchasing equipment, paying membership fees, paying for a coach (Maksimović, Matić, 2009).

The problem of obesity in Serbia is most dominant in school children population

The problem of obesity of schoolchildren in Serbia was presented in Vienna in 2013 by the State Secretary of the Ministry of Health at the time, Vladimir Djukić, who participated in the ministerial conference of the World Health Organization (WHO) about nutrition and noninfectious diseases. What is most worrying is the fact that 15 per cent of our school children are extremely obese. Due to the set of circumstances, fast food is slowly becoming a dominant diet in the teenage population. Physical activity classes or training have become an extracurricular activity left to wishes and financial capabilities of parents.

Unless they change their lifestyle (especially their nutrition), hundreds of thousands of today's children will soon become patients on various wards of hospitals in Serbia.

At the same conference, the well-known facts were stated - poor eating habits and little interest of the school system for the physical health of children are the major causes of obesity. In schools, physical education is often replaced by other classes, which further contributes to the diseases of certain age. How much children lack physical activity is best reflected in the statement of an eight-year-old boy, "The worst part of school is sitting all the time. That kills me. My brain hurts when I have to sit and listen for hours. I can sit, but I often want to jump and run up the hallways" (Livajn, 2005: 104).

In European regions covered by WHO, 50% of the population are overweight, whereas 20% are obese. In Austria, the host country of the conference, 24% of children aged up to 14 and 40% of the population between 18 and 64 are obese.

Djukić especially emphasized that almost two thirds of people in Serbia die due to indirect consequences of obesity, mostly manifested as advanced cardiovascular disease. All this is primarily the result of bad eating habits, which involve the use of large amounts of refined foods, sweets, sodas, food of animal origin, alcohol, coffee, tobacco, and snacks. Also, the lack of physical activity of schoolchildren, who first spend a few hours sitting at a desk at schools, and then continue sitting at home in front of their television or computer screens additionally contributes to the occurrence of cardiovascular disease.

It is not true that a modern working man does not eat 5 times a day because he does not have enough time, but because he does not have a habit of doing so. It is very important that parents help their children form healthy eating habits. It is better to prepare breakfast for children than to give them money to buy something themselves at a baker's or at a kiosk. It also often happens that children do not buy anything, saving money for betting shops or some other needless things.

The change of eating habits and physical activities can be made on a personal and family level, not waiting for someone else to do it for us. The possibilities are numerous; it is up to us to take an initiative.

Hippocrates, the famous ancient physician said *food is your medicine,* and a doctor Georg Herber, "Whoever is a father of a disease, proper nutrition is its mother" (Mitrović, 2012).

METHODS

Transversal study has examined the nutritional status of younger school age students. For the assessment of the nutritional status of younger school age students three parameters have been used: body height (HT), body weight (WT) and body mass index (BMI).

To measure body weight, medical scales with the accuracy of 0.1kg have been used, and to measure body height, an anthropometer with the accuracy of 0.5cm has been used. The measurements have been carried out by the International Biological Program (Weiner & Lourie, 1969, according to Djurašković, 2001).

Based on these two parameters body mass index (BMI) has been calculated according to the formula: $BMI = WT\ (kg) / HT^2\ (m^2)$.

In the international classification of diseases, obesity is described as body weight that is far above constitutionally standards, as the result of the excessive accumulation of fats in the body. BMI less than 18.5 is considered malnutrition, whereas the BMI range from

18.5 to 24.99 is defined as normal body weight. People with body mass index above 25 are considered overweight, while people with BMI over 30 are considered obese. In the case of more detailed classification of obesity, for BMI above 40 terms extreme obesity, or morbid obesity are used (Ogden, et al., 2006).

The main disadvantage of this method of assessment of malnutrition or obesity is the fact that when assessing, it does not show the percentage of adipose tissue compared to the muscle mass or bone mass, which leads to great variation in adults and children engaged in some physical activities (according to Mitrović, Pelemiš, M., & Pelemiš, V. (2014).

"Body height is one of the most stable indicators of physical development that reflects the complex internal processes in the human body. It integrally reflects the processes of longitudinal growth. During the life, a person's growth is uneven" (Berar, 2005, 16) (accordin to Mitrović, Pelemiš, M., & Pelemiš, V. (2014).

"Body weight is less genetically determined compared to body height and is more dependent on socio-economic living conditions. The coefficient of variation of body weight 3 to 4 times exceeds the coefficient of variation of body height" (Ivanić, 1988).

Possible differences in observed characteristics of the morphological status among the students of the first, second and third grade have been determined by means of multivariate analysis (MANOVA) and the univariate analysis (ANOVA).

RESULTS AND DISCUSSION

Body height and weight together are basic and the most important indicator of growth, development, health status and living conditions of each individual.

Table 1. Easy interpretation of BMI (Ogden et al., 2006).

BMI	Nutritional status	Risk of developing a disease based on BMI	Risk of developing a disease based on BMI
< 18.5	Underweight	Minimal	Low
> 18.5 - 25	Normal weight	Low	Moderate
> 25 - 30	Overweight	Moderate	High
> 30 - 35	Moderately obese	High	Very high
> 35 - 40	Severely obese	Very high	Extremely high
> 40	Very severely obese	Extremely high	Extremely high

Table 2. Central and dispersion parameters of morphological characteristics of the first grade students

N = 82	X	SD	Min	Max	KV	p
TVIS	1.304,48	56,58	1.205,00	1.473,00	4,34	.92
TMAS	279,29	53,39	215,00	460,00	19,12	.18
BMI	16,31	2,09	13,41	24,89	12,80	.14

Table 3. Central and dispersion parameters of morphological characteristics of the second grade students

N = 74	X	SD	Min	Max	KV	p
TVIS	1.349,51	59,39	1.205,00	1.490,00	4,40	1.00
TMAS	307,73	58,80	210,00	525,00	19,11	.82
BMI	16,77	2,15	14,05	24,63	12,81	.34

Table 4. Central and dispersion parameters of morphological characteristics of the third grade students

N=100	X	SD	Min	Max	KV	p
TVIS	1.426,87	65,67	1.245,00	1.570,00	4,60	0,99
TMAS	347,10	64,55	215,00	625,00	18,60	1,00
BMI	16,93	2,19	13,31	25,45	12,91	0,63

Based on the results and mean values (table 2) it can be seen that the first grade students differ in body height, weight and body mass index. The minimal recorded value of body mass index (BMI) among the first grade students is 13.41, and maximal 24.89.

Looking at table 3, which shows the results of the morphological characteristics of the second grade students, we can see that the minimal value of body mass index (BMI) is 14.05 and maximal 24.63.

If we view minimal and maximal level of body mass index (BMI) of the third grade students (table 4) we can see that the minimal value is (13.31), which indicates that there are students who are underweight, and the maximal value is (25.45) which shows that there are the third grade students who are obese.

Low values of body mass index (BMI) recorded for some students are explained by the fact that when children start school, there is a certain stagnation of growth and development. However, these results have been at the lower limit of normal weight, so we cannot generally conclude that students are underweight.

Possible differences in observed characteristics of the morphological status among the students of the first, second and third grade have been determined by means of multivariate analysis (MANOVA) and the univariate analysis (ANOVA).

It can be concluded that at multivariate level there is a statistically significant difference among the students of the first, second and third grade in the examined characteristics of the morphological status (table 5).

Table 5. The significance of the differences among the students of the first, second and third grade in morphological characteristics

	N	F	p
MANOVA	3	29.97	.000

The results of the univariate analysis (ANOVA) have shown that there is a statistically significant difference among the students for the HT and WT, whereas for BMI there is not a statistically significant difference (p = .135) (table 6).

Table 6. The significance of the differences among the groups in morphological characteristics

Varijables	F	p
TVIS	93,94	0,000
TMAS	29,83	0,000
BMI	2,02	0,135

Based on testing morphological characteristics and functional and motor abilities of the students of primary schools in Serbia by "Eurofit" test batteries, conducted by the Republic Institute for Sport, our children are taller than they were on the tests conducted 14 years ago, boys for 3% and girls for 2.5%. However, the bigger problem is that the growth is followed by a far greater increase of body weight, 7.3% in boys and 5.6% in girls. In motor and functional abilities we lag behind the average values of the school population in the countries of the European Union (Pavlović, 2000).

Physical exercise cannot affect the change of body height, but body height can be valuable information for determining the proper body weight. *Body weight tends to change* over the lifespan and it can be changed by physical exercise, but under the supervision of a trainer (Findak, 2003).

CONCLUSION

We can conclude that in the study of the nourishment status of students the majority of the examinees from the first, second and third grade belong to the category of normal weight, although based on minimal and maximal values of BMI we can state that there are children who are underweight, and also children who are overweight, which requires a special attention of physical education teachers and health care workers. Monitoring the growth and development of children should become an obligation of both the society, and schools and teachers, because this is the only way to determine the quality of children's health in the best way and act preventively if necessary.

One should always bear in mind that obesity has negative emotional and social effects on a person, and a body produces significantly less happiness hormones, which affects their psychological state. Children who are overweight are more exposed to bullying of peers than children who have normal weight, they are shier, they have the lack of self-confidence, they are lonely, nervous and prone to risky behavior.

Negative predictions of the past research are unfortunately coming true; the number of obese students is significantly increased, especially in the school age, which can be partly attributed to negative social phenomena and increasingly difficult living and working conditions. Healthy lifestyle and physical activity will have the greatest effect on children's development. Physical activity helps the development and strengthening of the locomotor apparatus, cardiovascular, respiratory and immune system. Physical activity will be most effective if it is suitable for the child's age.

Whenever we have an opportunity, we should enable children to exercise in order to help them acquire sports activities as a part of healthy lifestyle. All of us should participate until it's not too late!

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