

# NUTRITIONAL STATUS OF SECOND-GRADE AND THIRD-GRADE STUDENTS OF ELEMENTARY SCHOOLS IN HERCEG NOVI

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## Abstract

Nowadays overweight and obesity are characterized as global issue, from the aspect of health and economy as well, and also it can vary by the age and gender. Regarding above-mentioned the aim of this research is to evaluate general nutritional status and differences by the age and gender of pupils who attend the elementary school from Herceg Novi. This study included 65 pupils of second (N=35) and third grade (N=30) of both gender from elementary school from Herceg Novi, divided into two subsamples. Two variables were used to assess the degree of nutrition, namely BMI and WHtR. Measures of central tendency and dispersion were calculated for all variables. Differences in nutritional status between participants were determined by using a t-test for small and independent samples with statistical significance  $p \leq 0.05$ . Statistical analysis was accomplished by SPSS 23.0 software. On the basis of obtained results it can be said that 12.3% of participants of total sample were overweight, and 27.69% obese for BMI values, while for values of WHtR, 20% participants were classified as obese. On the other side, statistically significant differences at nutritional status by the gender were not founded, while for the age differences existed. Third grade pupils showed a statistically significantly higher level of nutritional status compared to second grade pupils ( $p=0.012$ ) for WHtR values. Herceg Novi as a city has a significant problem with obesity, and it is necessary to act on it very quickly.

**Key words:** obesity, pupils, gender, age, Herceg Novi

## Introduction

In current condition of life, in condition hyper production and hyper consumption in economy, technology, nutrition and other, people enjoy many benefits. Under the influence of development and globalization all of the system, humans forget the basis of everything, himself. Preoccupied of work and obligation, humans bypass all type of healthy life, neglecting physical activity, healthy nutrition, what is prerequisite for many diseases and disorder. One of the consequence sedentary lifestyles, withal one of the biggest problems today it's overweight and obesity. Obesity its chronic disease manifested an increase body mass (10% more than ideal) and excessive fat accumulation in body (Popovic, Petkovic, Bojanic, & Muratovic, 2013). The incidence of obesity has triple at last twenty years, which is why it has been characterized by the World Health Organization (WHO) as an epidemic (Krivokapic, 2015). Data form WHO (WHO, 2020) show that in 2016. it was more than 1.9 billion (39%) overweight and more than 650 million (13%) persons over the eighteen years of age. What

scars more than numbers themselves is the continued expansion of this problem. More than 65% world population living in countries where is obesity bigger problem than hunger (Despotovic, Aleksopoulos, Despotovic, & Ilic, 2013), and the same is increased in Canada from 11% to more than 30%, while in Brazil an increased from 4% to more than 14% (Flynn et al., 2006).

Except adults, whit the problem of overweight and obesity are encountered children and adolescent to. Currently at the world 340 million children and adolescents age five to nineteen have problem with overweight and obesity (WHO, 2020). According to the results of Zatsiorsky and Kreamer (2009), in 2000. 15% of obese children and adolescents aged six to nineteen were recorded, which according to statistical data is more than three times compared to 1980., and more than 10% of children aged two to five compared to 7% from 1994. A very sensitive period that can be affected by these changes is childhood and preadolescence, where obese children and preadolescents are more likely to be obese adults and have a higher risk of many massive non-communicable diseases (World Health Organization,

2000; Safer, Agras, Bryson, & Hammer, 2001; Janssen, Katzmarzyk, & Ross, 2002).

The consequences of this negative trend have not bypassed the state of Montenegro either. According to the data to Milasinovic, Bojanic, Cvorovic and Kucic (2019), every third child in Montenegro, aged nine to thirteen, is overweight or obese. Also, when it comes to adolescents, 19.1% were overweight, and 5.6% were obese (Vasiljevic, 2018). In addition to national studies, smaller studies by the regions and cities showed that Montenegro as a country has a problem with overweight and obesity (Malovic, 2019; Vrevic, 2021, Malovic, & Bjelica, 2021), while data from Bacovic (2020) show that the city of Herceg Novi has 12.7% overweight and 9% of obese children.

Overweight and obesity can vary under the influence of many factors, among which age and gender have a significant role (Matsushita, Yoshiike, Kaneda, Yoshita, & Takimoto, 2004; Wisniewski, & Chernausek, 2009; Salih, Jouda, & Ali, 2016; de Bont et al., 2020). Therefore, based on the above, the aim of this study is to assess the nutritional status of primary school pupils in Herceg Novi and to determine the differences by the gender and age.

## Methods

### Participants

This research included a sample of a total of 65 pupils, from elementary school “Dašo Pavičić” and elementary school “Milan Vuković” from Herceg Novi. All subjects are divided into two subsamples. The first subsample consisted of 35 second-graders aged  $8 \pm 0.6$  years, of which 9 were girls and 26 boys, and the second subsample consisted of 30 third-graders aged  $9 \pm 0.8$  years, of which 15 were girls and 15 boys (Table 1).

Table 1. Information about participants by the classes, gender and general

Participant	Male	Female	General
Second grade	26	9	35
Third grade	15	15	30

### Variables

For the purposes of this study, three morphological characteristics were measured: body weight, body height and waist circumference. Measurement of all morphological characteristics was performed in accordance with - International Standards for Anthropometric Assessment manual” (ISAK, Marfell-Jones, Olds, Stew, & Carter, 2006). BMI and WHtR

values were used to assess the nutritional status, based on the above anthropometric measures. Body Mass Index (BMI) is a simple index defined as the ratio of body mass to the square of body height in meters ( $\text{kg} / \text{m}^2$ ). For children and adolescents, it is calculated according to their age and gender and is very specific due to their growth (Vasiljevic, Bjelica, Popovic, & Gardasevic, 2015). BMI values were calculated individually for each subject and percentile values were determined (World Health Organization expert committee, 1995), and pupils were classified into the following groups: from 0-5 percentiles underweight, from 5-85 percentiles normal weight, from 85-95 percentiles - overweight (risk of obesity) and over 95 percentiles - obese. For values Waist-to-Height Ratio (WHtR) it's calculated by dividing the values of waist circumference by the values of body height. In this relationship, it is assumed that the measure of waist circumference is below half the measure of body height, and the subject whose WHtR is more than 0.5, is considered obese. This index is considered one of the most reliable for assessing the nutritional status, and its importance and validity has been proven in a many of studies (Ashwell, Gunn, & Gibson, 2012).

### Experimental process

Before the start of the experimental treatment, a confirmation for the measurement was obtained from the director of the primary schools. All tests were performed in the gym of primary schools, and the equipment with which the measures were collected is the property of the Faculty of Sports and Physical Education from Niksic. The tests themselves were performed by experienced meters - teaching associates from the mentioned university unit, which achieved a higher probability of more relevant and accurate data. In the beginning, all students were introduced to the measurement procedure and the importance of research. When measuring morphological characteristics, students wore light clothing without sneakers or shoes (Nurton, & Olds, 1996), and each measure was measured twice in a row to minimize the technical error of the measurement (Bjelica i Fratric, 2001). Testing was done in the morning. Students who had physical or mental retardation, or did not voluntarily want to access the measurement process, were not included in this study.

### Statistical analysis

The data obtained in this research were processed by descriptive statistical procedures. Central and dispersion parameters were processed for each variable: Arithmetic mean (Mean); Standard Deviation

(Std. Dev), Minimum Value (Min), Maximum Value (Max). Differences in nutritional status between participants by the gender and age were determined by using a t-test for small and independent samples with statistical significant  $p \leq 0.05$ . Statistical analysis was accomplished by SPSS 23.0 software.

## Results

The values of the general level of nutrition when it comes to the BMI values of all respondents by grades are shown in Table 2. The results show that only 1.55% belong to the group of underweight, 58.46% to the group of normal weight, 12.3% overweight, and even 27.69 % of obese children. When it comes to the general values for the variable WHtR, it can be noticed that 80% of the respondents belong to the normal weight group and 20% to the obese group (Table 3). Based on the data from Table 4 and Table 5, which show the differences in the level of nutrition of second-grade and third-grade pupils in relation to gender, it can be seen that differences between boys and girls did not exist for BMI and WHtR values. On the other hand, differences in relation to age were found for WHtR values (Table 6). Third-grade pupils showed a statistically significantly higher nutritional status compared to second-grade pupils ( $p = 0.012$ ). There were no differences in BMI values for age.

Table 2. Body Mass Index general values, and values for each class

BMI	G2		G3		Total	
Percentile	N	%	N	%	N	%
<5(<13.6kg/m <sup>2</sup> )	0	0	1	1.55	1	1.55
5-85(13.6-17.3kg/m <sup>2</sup> )	24	36.92	14	21.54	38	58.46
85-95(17.3-18.5kg/m <sup>2</sup> )	4	6.15	4	6.15	8	12.3
>95(>18.5kg/m <sup>2</sup> )	7	10.77	11	16.92	17	27.69
Total	35	53.84	30	46.16	65	100

Legend: BMI- Body Mass Index; G2- second grade pupils; G3- third grade pupils; N- number of participants.

Table 3. Waist-to-Height Ratio general values, and values for each class

WHtR	G2		G3		Total	
Values	N	%	N	%	N	%
Normal (<0.5)	31	88.57	21	70	52	80
Obesity (>0.5)	4	11.43	9	30	13	20
Total	35	100	30	100	65	100

Legend: WHtR - Waist-to-Height Ratio.

Table 4. Measures of central tendency and dispersion and values of t-test for assessment differences by the gender for second grade pupils

	Ga	N	Max	Min	Mean	St. Dev.	t-test	Sig.
BMI	M	26	22.20	13.80	17.13	2.019	1.917	.064
	F	9	18.20	14.50	15.76	1.103		
WtHR	M	26	.56	.40	.4466	.0371	-.227	.822
	F	9	.56	.40	.4553	.0530		

Legend: Ga- gender; Max- maximum value; Min- minimum value; St. dev. - standard deviation; Sig.- significant of the difference.

Table 5. Measures of central tendency and dispersion and values of t-test for assessment differences by the gender for third grade pupils

	Ga	N	Max	Min	Mean	St. Dev.	t-test	Sig.
BMI	M	15	20.10	13.20	17.34	1.999	-.417	.680
	F	15	23.60	13.60	17.74	3.130		
WtHR	M	15	.52	.42	.4741	.0290	-.084	.934
	F	15	.58	.36	.4756	.0647		

Table 6. Values of t-test for assessment differences by the age (class)

	Class	N	Mean	t-test	Sig.
BMI	II	35	16.44	-1.358	.179
	III	30	17.00		
WHtR	II	35	.4509	-2.579	.012
	III	30	.4748		

Legend: II- second grade pupils; III- third grade pupils.

## Discussion

Aim of this research it's was to evaluate general nutritional status and differences by the age and gender of pupils who attend the elementary school from Herceg Novi.

Based on the obtained results, it can be noticed that the city of Herceg Novi has a big problem with childhood obesity. Namely, when it comes to BMI values, 12.3% of the total sample was overweight, and as many as 27.7% were obese. These results are even more alarming if we look at the research conducted by Bacovic (2020) where of the total sample of children aged seven, 12.7% were overweight and 9% obese, so it can be seen that obesity in this city has tripled compared to last year. Also, when you look at the WHtR values, you can see an almost identical picture where 20% of the subjects belonged to the group of obese. When we compare these data with the results from other cities in Montenegro, where Malovic (2019) estimated that obesity in children aged seven and eight from Niksic and Kotor was 16.3%, and the results of Obradovic and Srdic (2007) who found that obesity in children aged eight to eleven ranged from 11.6% to 22%, we can see that these data are worrying. What

could have influenced this increase in the nutritional status, may be a consequence of all the measures that were adopted to control the COVID-19 virus, which significantly limited the possibility of physical activity in children. Physical activity is known to be a significant predictor of nutritional status (Janssen, & Leblanc, 2010), and on the other hand, it has been proven that children who practice 55 minutes of moderate to intense physical activity daily do not have a risk of overweight and obesity (Katzmarzik et al., 2019.) As Herceg Novi is an urbanized environment where the majority of the population lives in apartments and households that do not have yards, and due to quarantine, children did not have free space to exercise. Also, the measures affected the stopping of organized physical activities and training of children in their clubs, physical education classes, which had a destructive effect on children's activity. The answer to the reason for increased obesity, can be found in all of the above. When it comes to differences in nutritional status by gender, a statistically significant difference was not found in either second-grade or third-grade pupils. The same results were shown by research in the region where preschool children from Cuprija did not show a statistically significant difference by gender (Desputovic et al., 2013), as well as students from first to eighth grade in Sarajevo (Dinarevic, Brankovic, & Hasanbegovic, 2011). The reason for the non-existence of a difference by gender maybe can be found in the fact that children of this age are not yet in the period of puberty where the first changes occur between boys and girls due to increased secretion of their hormone (Benardot, 2010). A statistically significant difference was found only in relation to age. Third-grade pupils were statistically significantly obese than second-grade pupils ( $p = 0.012$ ). Children in the United Kingdom had similar results (Reilly & Wilson, 2006), while the results of children from Sarajevo showed that older pupils were obese than younger primary school pupils (Dinarevic et al., 2011).

## Conclusion

Based on the results of this research, we can conclude that Herceg Novi as a city has a big problem with the nutritional status of children. This problem should be approached very seriously as it is known that if obesity occurs in childhood and preadolescence, it has a pretending to continue in later life (World Health Organization, 2000). The consequences of obesity are numerous, ranging from high blood pressure, high cholesterol levels, the occurrence of diabetes mellitus type 2 (Kocova, Sukarova-Angelovska, Tanaskoska, Palcevaska-Kocevska i Krstevska, 2014), to poorer levels of insulin and glucose (Srinivasan, Bao,

Wattigney, & Berenson, 1996). Therefore, a quick reaction is necessary, especially for older children who have shown a higher degree of nutrition. The best reaction is certain to raise awareness of the importance of physical activity and to propagate it. The first responsibility should come from parents who are role models for their children and who need through their example representing of physical activity, quality nutrition because they are the main and responsible for their lifestyles. In addition, physical education teachers need to activate pupils in a number of ways and wake up their sensors for physical activity so that children can be more active in and out of physical education classes. Also, the state of Montenegro, but also other neighboring countries should form a better national or regional strategy to stop the problem of obesity. The limitation of this research is the small number of participants, which may limit the validity and reliability of this research. The limited participants is the cause of the bad epidemiological situation in Montenegro caused by the COVID-19 virus, due to which it was not possible to measure a larger number of them. Recommendations for further research on this topic may be to measure a larger number of participants in the territory of Herceg Novi, of different ages, including adolescents, since the sensitivity of this age is known. Also, at the age of these children, a national study can be reported and the situation in the whole of Montenegro can be assessed, but also in the surrounding countries since all the countries of the Western Balkans have a problem with obesity. The significance of such research is unquestionable, and a larger number of it is necessary in order to constantly warn the public about the obesity problem that significantly exhausting a large number of countries from both the world and from the health and economic aspect.

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