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DIFFERENCES IN THE NUTRITIONAL STATUS AND LEVEL OF PHYSICAL ACTIVITY AMONG ADOLESCENTS FROM URBAN AND RURAL AREAS OF MONTENEGRO

RAZLIKE V STANJU PREHRANJENOSTI IN STOPNJI TELESNE DEJAVNOSTI MED MLADOSTNIKI, KI ŽIVIJO V URBANIH IN PODEŽELSKIH OBMOČJIH OBČINE NIKŠIĆ

ABSTRACT

The nutritional status and the level of physical activity are very important components in the period of adolescence, and they can vary by type of settlement. Consequently, the aim of this research is to assess the differences in nutritional status and the level of physical activity among adolescents by type of settlement. This research includes 241 adolescents of both sexes in the territory of the municipality of Niksic, with a mean age of 15.7±0.5. The variables BMI, WHtR, and BF% were used to assess the nutritional status, while the PAQ-C questionnaire was used to assess the level of physical activity. Differences in the nutritional status by type of settlement were assessed using the Chi-square test with a statistical significance p≤0.05, while the differences in the level of physical activity were assessed using the T-test with a statistical significance p≤0.05. Statistical analysis was accomplished by SPSS 23.0 software. Results show, that for WHtR values, 11.1% of male and 18% of female adolescents were obese. Differences in nutritional status were not found by type of settlement. For values of physical activity, male adolescents had a score of 2.6±0.6, and female adolescents 2±0.6. Male adolescents didn't show differences in the level of physical activity by type of settlement, while female adolescents who lived in rural areas showed a lower level of physical activity during physical education lessons (p=0.031), short breaks (p=0.034), and lunchtime (p=0.013). It is necessary to raise awareness about the importance of nutritional status and level of physical activity in both urban and rural areas.

Keywords: adolescents, nutritional status, physical activity, urban, rural

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IZVLEČEK

Stanje prehranjenosti in raven telesne dejavnosti sta zelo pomembna elementa v obdobju mladostništva, ki se lahko razlikujeta glede na območje naselitve. Zato je cilj te raziskave oceniti razlike v stanju prehranjenosti in ravni telesne dejavnosti med mladostniki, ki živijo v urbanih in na podeželskih območjih. V raziskavo je bilo vključenih 241 mladostnikov obeh spolov na območju občine Nikšić, katerih povprečna starost je bila 15.7 ± 0.5 leta. Za oceno stanja prehranjenosti so bile uporabljene spremenljivke ITM, WHtR in BF%, za oceno ravni telesne dejavnosti pa vprašalnik PAQ-C. Razlike v stanju prehranjenosti glede na območje naselitve so bile ocenjene s testom Chi-kvadrat s statistično pomembnostjo p≤0.05, razlike v ravni telesne dejavnosti pa s T-testom s statistično pomembnostjo p≤0.05. Statistična analiza je bila opravljena s programsko opremo SPSS 23.0. Rezultati kažejo, da je bilo pri vrednostih WHtR prekomerno težkih 11.1 % mladostnikov in 18 % mladostnic. Razlik v stanju prehranjenosti glede na območje poselitve ni bilo ugotovljenih. Pri vrednostih telesne dejavnosti so imeli moški rezultat 2.6 ± 0.6, ženske pa 2 ± 0.6. Pri mladostnikih ni bilo razlik v stopnji telesne dejavnosti glede na območje naselitve, pri mladostnicah, ki so živele na podeželju, pa je bila stopnja telesne dejavnosti med urami telesne vzgoje (p=0.031), kratkimi odmori (p=0.034) in v času kosila (p=0.013) nižja. Rezultati raziskave kažejo, da je potrebno mladostnike ozaveščati o pomenu stanja prehranjenosti in ravni telesne dejavnosti tako v urbanih kot podeželskih območjih.

Ključne besede: mladostniki, stanje prehranjenosti, telesna dejavnost, urbano območje, podeželsko območje

INTRODUCTION

Adolescence is a very sensitive and at the same time formative part of life, so poor health in adolescence can have negative consequences during the whole life (Choudhary et al., 2016). Therefore, in this period, care should be taken of all the components that can affect their health, among which the nutritional status and the level of physical activity have a significant role.

Assessment of nutritional status is one of the most important components of the clinical examination of children (Cross et al., 1995). Overweight and obesity represent one of the biggest problems today. During their youth, children with overweight and obesity are more likely to suffer from cardiovascular diseases, high blood pressure, high cholesterol, and diabetes mellitus type 2, than other children (Kocova, Sukarova-Angelovska, Tanaskoska, Palcevska-Kocevska, & Krstevska, 2014). Today, as much as 65% of the world's population lives in countries where overweight and obesity are a bigger problem than hunger (Despotovic, Aleksopulos, Despotovic, & Ilic, 2013; Corluka, Bjelica, & Gardasevic, 2018). According to data from the World Health Organization (WHO, 2021), in 2016, there were more than 1.9 billion (39%) overweight and over 650 million (13%) obese people in the world, when it comes to people over 18 age. In addition to adults, worldwide obesity in children and adolescents has increased exponentially in recent decades from 0.8% in 1975 to 6.8% in 2016 (Dong et al., 2019; Sbaraini et al., 2020). If it is taken into account that children and adolescents who have a problem with overweight and obesity in this period, may have the same problem during the whole life (WHO, 2000), it is clear that solving this problem should be started on time.

Physical activity (PA) is certainly the best prevention when it comes to overweight and obesity (Tishukaj et al., 2017), while it has been proven that children who practice 55 minutes of moderate to vigorous PA per day have no risk of overweight and obesity (Katzmarzyk et al., 2019). In addition, the benefits of PA are reflected in the preservation of physical and mental health, psychosocial development (Bjelica, 2007) as well as continuous growth and development and effects on the prevention and correction of body deformities (Jovovic, 2008).

The type of settlement can be a significant predictor of growth and development, as well as the lifestyles of a society (Gurzkowka et al., 2014), and as such can significantly influence the nutritional status, the level of PA, and numerous other components. A large number of studies have shown that the nutritional status and the level of PA can differ in children and adolescents by the type of settlement in which they live (Matsushita, Yoshiike, Kaneda, Yoshita, & Takimoto, 2004; Davis, Bennett, Befort, & Nollen, 2011; Erdei et al., 2018; de Bont et al.,

2020). According to Monstat (2011), 620 029 people live in Montenegro, of which 392 020 (63%) live in urban areas and 228 009 (37%) in rural areas. Also, according to the data of Monstat (2011), rural areas of the territory of Montenegro are considered areas characterized by lower population density, relatively few or no presence of administrative centers and state services, and weaker infrastructure, while life activities are mainly reduced to agricultural production), but also settlements with less than 10 000 inhabitants. Therefore, the aim of this research is to assess the differences in the nutritional status and the level of PA among adolescents living in urban and rural areas of Montenegro.

METHODS

Procedure

Measurements in this study were performed in accordance with the standards of the ISAK manual (Marfell-Jones, Olds, Stew, & Carter, 2006). The data collected in this research was conducted in September 2022. Before the beginning of the data collection, permission to access the experimental procedure was obtained from the director of the high school, whose students will be the subject of the measurement. The testing was carried out in the morning hours by experienced measurers - teaching assistants at the Faculty of Sports and Physical Education in Niksic, which resulted in a higher probability of more relevant and accurate data. The measures were familiarized before the measurement with the testing procedure and the method of entering data into the measurement lists provided for each individual. The type of settlement was defined by adolescents entering the name of the place where they live in a modified questionnaire. On the basis of the place of residence, and with the help of the spatial urban planning solution of the municipality of Niksic, the students are divided into urban and rural areas. The spatial urban planning solution was taken over in the Niksic municipality building from the secretariat for spatial planning.

Participants

The sample of respondents in this survey consisted of 241 students of the first and second grades of secondary schools of both sexes in the territory of the municipality of Niksic, with a mean age of 15.7±0.5. Of these, 108 adolescents were male and 133 were female, where 190 (78.84%) of the total sample belonged to urban and 51 (21.16%) to rural areas of the municipality Table 1. Three secondary schools were included in this research: Secondary Vocational School,

Economic School and Gymnasium. The sample of respondents was selected by random sampling, and the respondents participated voluntarily. Adolescents with chronic diseases, physical or mental deficiency, and those who did not want to access the measurement or survey were excluded from this research.

Table 1. Sample of respondents.

Participants	Male	Female	Overall
Urban	92	98	190
Rural	16	35	51
Overall	108	133	241

Variables

To assess the nutritional status, the following anthropometric measures were measured: body height (BH), body mass (BM), waist circumference (WC), subscapular skinfold (SS), and triceps skinfold (TS). Based on the measured anthropometric characteristics, anthropometric indexes were calculated: Body Mass Index (BMI), Waist to Height Ratio (WHtR), and percentage of body fat (BF%). The assessment of the nutritional status was determined by calculating percentile values for BMI values for each respondent, where the respondents were classified into groups of underweight (<5th percentage), normal (5th - 85th), overweight (>85th ≤95th), and obese (>95th) (Growth Reference 5-19 Years - BMI-For-Age (5-19 Years), n.d.). WHtR is also one of the most reliable methods for assessing nutritional status and represents the ratio of waist circumference to body height, and respondent whose WHtR is more than 0.5 is considered to belong to the obese group (Ashwell & Hsieh, 2005; Ashwell, Gunn, & Gibson, 2012). The BF% was calculated using the Slaughter equation, which uses the subscapular skinfold (SS) and the triceps skinfold (TS) for its formula (Slaughter et al., 1988), after which were calculated fat percentages for each subject, which are classified into groups of underweight (<5th percentage), normal (5th - 85th), overweight (>85th ≤95th) and obese (>95th) (McCarthy, Cole, Fry, Jebb, & Prentice, 2006). To assess the level of physical activity (PA), a standardized international questionnaire on PA for children and adolescents, the PAQ-C questionnaire (Kowalski, Crocker, & Kowalski, 1997) was used. This questionnaire assesses the child's self-report of the level of PA that he performs in different environments and parts of the day on a scale with grades from 1 to 5, where the value 1 represents no PA, the values 2, 3,

and 4 mean a medium level and the value 5 high levels of PA. The validity and reliability of this questionnaire have been confirmed in many studies (Wang, Baranowski, Lau, Chen, & Pitkethly, 2016; Voss, Dean, Gardner, Duncobe, & Harris, 2017).

Statistical analysis

The data obtained in this research were processed using descriptive statistical procedures, and the arithmetic means and standard deviation were determined. A Chi-square test, with statistical significance $p \leq 0.05$, was used to assess the differences in the nutritional status among adolescents living in urban and rural areas of the municipality of Niksic. Differences in the level of PA among adolescents by type of settlement were assessed using the t-test for small and independent samples, with statistical significance $p \leq 0.05$. Data processing and application of statistical procedures in this research were carried out in the SPSS software package, version 23.0.

RESULTS

The results of nutritional status for adolescents, and their differences for the variables of BMI, WHtR, and BF% are shown in Table 2. For BMI values, 13.9% of male and 12.8% of female adolescents were overweight, and 7.4% of males and 3.8 of females were obese. For WHtR values, 11.1% of male and 18% of female adolescents were obese. According to the BF%, there were 10.2% overweight and 9.3% of obese male adolescents, and 7.5% overweight and 7.5% of obese female adolescents. When it comes to differences in the nutritional status of adolescents of both sexes by type of settlement, no statistically significant differences were found in any variables.

Table 2. Differences in nutritional status by type of settlement.

	Male							Female						
	Urban		Rural		Overall		Chi	Urban		Rural		Overall		Chi
	n	%	n	%	n	%	p	n	%	n	%	n	%	p
BMI														
Underweight	1	1.1	0	0	1	0.9		3	3.1	2	5.7	5	3.8	
Normal	70	76.1	14	87.5	84	77.8		80	81.6	26	74.3	106	79.7	
Overweight	14	15.2	1	6.3	15	13.9	.747	13	13.3	4	11.4	17	12.8	.302
Obese	7	7.6	1	6.3	8	7.4		2	2.0	3	8.6	5	3.8	
WHtR														
Normal	81	88.0	15	93.8	96	88.9		84	85.7	25	71.4	109	82.0	
Obese	11	12.0	1	6.3	12	11.1	.503	14	14.3	10	28.6	24	18.0	.059
Body Fat %														
Underweight	5	5.4	2	12.5	7	6.5		12	12.2	5	14.3	17	12.8	
Normal	69	75.0	11	68.8	80	74.1		74	75.5	22	62.9	96	72.2	
Overweight	9	9.8	2	12.5	11	10.2	.705	7	7.1	3	8.6	10	7.5	.306
Obese	9	9.8	1	6.3	10	9.3		5	5.1	5	14.3	10	7.5	

Legend: BMI - Body Mass Index; WHtR - Waist to height ratio; Chi - Chi-squared test; p - significant value

The level of PA of male adolescents and the differences in relation by type of settlement is shown in table 3. The mean level of PA for male adolescents was 2.6±0.6. There were no differences in the level of PA by the type of settlement.

Table 3. Differences in level of physical activity by type of settlement for male adolescents.

PAQ-C Variables	Urban	Rural	Overall	t-test	p
PA at spare time	1.5±0.3	1.6±0.3	1.5±0.3	-.97	.336
PE class	2.2±1.6	1.6±1.3	2.1±1.6	1.57	.131
Little break	1.9±0.8	2.3±1.4	2±0.9	-.82	.425
Lunchtime	2±0.9	2.1±1.2	2±0.9	-.47	.636
After school	3.2±1.4	3±1.4	3.2±1.4	.51	.610
Evening	3.1±1.4	3.1±1	3.1±1.3	.032	.975
Weekend	3.3±1.1	3.2±1.2	3.3±1.1	.43	.667
Statement that best describes PA	3.2±1.2	2.9±1.1	3.2±1.2	.94	.349
FA by days	3.3±1	3±1	3.2±1.1	.78	.437
Overall PAQ-C	2.6±0.6	2.5±0.8	2.6±0.6	.53	.596

PA -Physical activity; PE class - Physical education class; t-test - values for t-test; p - significant values

The level of PA of female adolescents and the differences by type of settlement is shown in table 4. For female adolescents, the mean level of PA was 2±0.6. There were no differences in the total score of PA by type of settlement, while during physical education lessons (p=0.031), short breaks (p=0.034) and lunchtime (p=0.013), female adolescents living in rural areas showed a lower level of PA.

Table 4. Differences in level of physical activity by type of settlement for female adolescents.

PAQ-C Variables	Urban	Rural	Overall	t-test	p
PA at spare time	1.4±0.3	1.5±0.3	1.4±0.3	-1.92	.058
PE class	1.8±1.3	1.3±0.9	1.6±1.2	2.19	.031
Little break	1.9±0.8	1.6±0.6	1.8±0.8	2.14	.034
Lunchtime	2±0.7	1.6±0.6	1.9±0.7	2.53	.013
After school	2.3±1.2	2.6±1.3	2.4±1.2	-.93	.355
Evening	2.2±1.1	2.3±1.1	2.2±1	-.57	.567
Weekend	2.3±1.1	2.3±0.9	2.3±1	.002	.999
Statement that best describes PA	2.4±1	2.5±1	2.5±1	-.43	.666
FA by days	2.5±0.8	2.5±0.9	2.5±0.9	-.28	.783
Overall PAQ-C	2±0.6	2±0.4	2±0.6	.63	.530

Legend: PA -Physical activity; PE class - Physical education class; t-test - values for t-test; p - significant values

DISCUSSION

The aim of this research was to assess the differences in nutritional status and level of PA among adolescents living in urban and rural areas of Montenegro. When we look at the results of nutritional status by type of settlement, in this study no differences were found for the values of BMI, WHtR, and BF%. Similar results were shown by adolescents from Cyprus (Bathrellou, Lazarou, Panagiotakos, & Sidossis, 2007), Kosovo (Tishukaj et al., 2017), and Hungary (Erdei et al., 2018). On the other hand, if we observe the general condition of nutritional status, for BMI values, 13.9% of male and 12.8% of female adolescents were overweight, and 7.4% of males and 3.8 of females were obese. Also, for WHtR values, 11.1% of male and 18% of female adolescents were obese. For BF% values, 10.2% of male and 7.5% of female adolescents are classified as overweight, while 9.3% of male and 7.5% of female adolescents are classified as obese. According to one of the latest studies (Health at a Glance: Europe 2020, 2020), which included adolescents from 35 European countries, it showed that 19% of adolescents aged 15

years were overweight or obese in 2018., for BMI values, where is 23% were male adolescents and 15% female adolescents. When we compare the data of our study, where according to the BMI values 21.3% of male adolescents were either overweight or obese, and 16.6% of female adolescents were overweight or obese, with the results of the listed global study, it can be noted that male adolescents have lower mean values than their peers, while female adolescents exceed the mean values of their peers. Also, when the data of this research is compared with a national study on a sample of adolescents in Montenegro, conducted by Vasiljevic (2018), where 15.2% of male adolescents and 9.7% of female adolescents were overweight or obese, it can be noticed that the situation in Montenegro has worsened in recent years.

When looking at the mean values of the level of PA, it can be applied that male adolescents had a score of 2.6 ± 0.6, and female adolescents 2 ± 0.6, which can't be considered a satisfactory level of PA. The alarming data is that the very low values for PA in physical education classes, which was 2.1 ± 1.6 for male, and only 1.6 ± 1.2 for female adolescents. Unlike research in India (Kaur, Bains, & Kaur, 2018), Bosnia and Herzegovina (Miljanovic-Damjanovic, Obradovic Salcin, Zenic, Foretic, & Liposek, 2019), the USA (Eurel et al., 2019) which showed differences in the level of PA by type of settlement, in this study differences for overall values, at both genders, were not found. What can be observed, from the results, is that female adolescents living in rural areas showed a lower level of PA in physical education classes ($p=0.031$), short breaks ($p=0.034$), and lunchtime ($p=0.013$). First of all, it should be noted that female adolescents living in rural areas had a level of PA in physical education classes of only 1.3 ± 0.9, which means that in rural areas, that physical education classes are not taken into account, what should be one of the elementary ways of promoting the PA for children and adolescents. The reason for less attention to physical education classes can be fewer children, resources, and conditions for maintaining a quality class at elementary schools in rural areas. In this way, children who don't take physical education classes come with the same habits, that they can keep in high school and thus endanger their needs for PA. The reason for the less PA of female adolescents who come from rural areas during small breaks and around lunchtime may be that there are fewer children in rural primary schools, so they don't have enough of their peers with whom they could play informal games during school breaks, which require PA. Based on that, those same girls can come to high school with already acquired habits and during school breaks be more withdrawn, shyer to join groups of other teenagers, and thus less physically active. These results can be explained by the data of a global study (NCD Risk Factor Collaboration, 2019), which evaluated the differences in the nutritional status in adults by type of settlement, and

which states that adults in rural areas can have less physical activity for a number of reasons. And if there was a difference in adolescents living in urban and rural areas of the municipality of Niksic in the mentioned parts of the day, there was no statistically significant difference when it came to the overall score of the level of PA. The same results were shown by adolescents from Cyprus (Bathrellou et al., 2007), Kosovo (Tishukaj et al., 2017), and Scotland (McCrorie et al., 2020).

One of the limitations of this research may be the small sample included in this research, and the fact that only first and second-grade high school students were included. Based on this sample, since these adolescents have just started their education in secondary schools, the influence of primary school on the observed components can be assessed. Therefore, it is good to recommend that the same research be carried out with adolescents in their final years of high school in order to assess the impact of the school environment on the mentioned problems. Also one of the limitations is that the assessment of the level of PA of adolescents is carried out with a questionnaire, which can reduce the objectivity of the data obtained in this research, taking into account that adolescents can be biased and subjective when giving answers.

CONCLUSION

Based on the results of this research, it can be concluded that there were no differences in the nutritional status by type of settlement. If we look at the fact that the percentage of overweight and obese adolescents is not negligible, it is necessary to equally influence the reduction of this problem in both urban and rural areas. Also, since the results of the level of PA are not satisfactory, and when it comes to the activity in physical education classes it is alarming, it is necessary to raise the awareness of adolescents about the importance of PA. This research can be an excellent starting point for future research on this topic since such research on a sample of adolescents in Montenegro has not been found.

A recommendation for further research may be to conduct the same or similar research on a larger sample of respondents in the territory of the municipality of Niksic, but also on other age categories. The same research could be carried out on the territory of the whole of Montenegro since the review of the research could not see a global study on the mentioned topic on a sample of adolescents. On the basis of a national study, more precise data could be obtained, and based on them, influence the creation of a more precise policy to solve the problem of overweight and

obesity, but also less level of PA in the period of adolescence, which is very sensitive and essential for creating healthy, and socially responsible persons.

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Declaration of Competing Interest

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