

Body mass index and physical activity of students of University of Novi Sad

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ABSTRACT

Aim To determine nutritional status and physical activity among students in Novi Sad. **Method** This research was conducted among students of the University of Novi Sad in the period from October 2010 to February 2011. The study involved 800 students, the first and final year students (aged 20 to 24). As for sex structure, both genders were equally represented. A questionnaire was designed for this study. Statistical analysis was performed in SPSS15.

Results Older male students had significantly higher body mass index (BMI) (\bar{X} = 24.49) in contrast to younger ones (\bar{X} = 23.36), and younger female students had a slightly higher BMI (\bar{X} = 20.49) in contrast to older female students (\bar{X} = 20.37). There were 116 (29%) overweight and obese male students, while 62 (15.5%) female students proved to be underweight. 451 (56.4%) students were physically active. Older students ($p < 0.01$) were more physically active than younger ones, 481 (60.1%) and 399 (49.9%), respectively. Physically active students had a higher BMI. Students have a sedentary lifestyle, as 417 (52.1%) students spend more than 2 hours a day in front of the TV and computer.

Conclusion Male students were more inclined to obesity and female students to malnutrition. Sedentary lifestyle was also present, in a higher percentage in senior students. These results point out the necessity of an integrated approach to prevention and control of risk factors, particularly among youth.

Key words: obesity, malnutrition, young/adults, questionnaire

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INTRODUCTION

Metabolic diseases are extremely common. They can be caused by disturbance in nutrient input, their absorption in the digestive tract, or disorders at the level of cellular metabolism (1). Pathological nutritional status involves two opposite conditions, malnutrition and obesity (1).

Malnutrition, in view of the etiology may be primary and secondary (2). Obesity is defined as the excess of body fat that threatens health (3). Obesity also can be primary and secondary (3).

Etiopathogenetic factors of obesity are genetic factors, disturbed mechanisms of hunger and satiety, energy balance, and psychological factors, socio-economic situation and state of endocrine-metabolic system (1). Obesity is one of the most common risk factors for the development of mass non-contagious diseases and the main reason for the occurrence of cardiovascular diseases (3).

The population of developing countries is facing a global lack of food and massive health problems, related to malnutrition and starvation (1). Developed countries, but also increasingly developing countries are, on the other hand, affected by mass non-contagious diseases related to the over nutrition and generally low quality of food with reduced physical activity (4).

The National College Health Risk Behavior Survey from 1995 in a sample of 4609 students, showed that 35% of students were obese (5). Two studies from Boston and Philadelphia have shown a tendency to reduce obesity to 25% of students (6,7).

Several recent studies in the European region have pointed out increased percentage of overweight students, 15.2% of overweight students in Italy (8) and 18% in Spain (9). The situation is similar in neighboring Bulgaria (10). Sedentary lifestyle is extremely widespread in life of young people (3). Physically inactive people suffer from cardiovascular diseases twice more than physically active (4). Lack of physical activity is associated with a number of disorders, including coronary heart disease, stroke, high blood pressure, diabetes and osteoporosis (11).

According to the Youth Risk Behavior Surveillance System (YRBS) study in the United States, the percentage of adolescents who were physically active was significantly decreased in the

period 1991-2003 (from 42.5% to 33.0%), and then increased slightly in the period 2003-2005 (from 33% to 35.9%) (12). Sedentary way of life occurs in mostly young population, since more than 3 hours a day of physical activity is carried out only by 39.2% of adolescents (12).

In Serbia, obesity is a significant problem, particularly in the population of Vojvodina, which is characterized by unhealthy diet and sedentary lifestyle. This encouraged us to determine the nutritional status and physical activity among students in Novi Sad.

The importance of this work is in the detection of high-risk groups among students, in obesity and in the modern eating disorders like anorexia and bulimia, as well as in the planning of measures of health-educational work in accordance with research results.

EXAMINEES AND METHODS

The research was planned as a cross-sectional study, and was conducted in the period from October 2010 until April 2011.

The sample was randomly selected, and the study included 800 students, from which 400 in the first year (born in 1991), and 400 students from the last year at the University (born in 1988 and 1987). The sample represents 5% of all student population at the University of Novi Sad, mostly students at the Faculty of Medicine, Mathematics, Agriculture, Economics, Engineering and Sport and Physical Education. In both age groups there were 200 male and 200 female subjects.

The original questionnaire was used for collecting the research data. The research was approved by the Ethical Committee of the University of Medicine in Novi Sad. All participants were read and signed informed consent about the purpose of the study (participation was voluntary and anonymous).

Each survey respondent was approached with a possibility of voluntary withdrawal at any time. Improperly or insufficiently filled polls were not taken into account. Each survey was attributed a personal number, from 1 to 800.

The survey contained the following questions: year of birth, gender, body weight, body height and questions about physical activity. The survey was conducted by using personal contact with respondents and thus avoided occurrence of logic errors.

For the assessment of nutritional status Body Mass Index (BMI) ($BMI = \text{body mass (kg)} / \text{body height}^2(\text{m})$) was used (4) (Table 1).

For statistical analysis, absolute numbers and percentages, measures of central tendency (arithmetic mean, median, standard deviation and minimum and maximum distance values), test of statistical significance and correlation tests were used ($p < 0.05$ was statistically significant).

RESULTS

The mean body mass for male students was 80.3 kg, and body height 183.1 cm, for female students, 58.5 kg and 169.0 cm, respectively (Table 2).

Malnutrition occurred more frequently in female students, in 62 (15.5%), while overweight and obesity in male students, in 116 (29%) cases (Table 3). Among underweight students 62 (93.94%) were females.

In the group of students with normal weight, two marginal groups at risk of being underweight or overweight can be singled out. Tendency to malnutrition (students with BMI from 18.5 to 19.5) had 72 (9%) of all students, or 72 (11.88%) within the normal weight group. Female students were also dominant here, 62 (86.11%). Tendency to obesity (students with BMI from 24 to 25) have shown 81 (10.12%) of all students, or 81 (13.37%) within the normal weight group. Males were dominant, 73 (90.12%).

The prevalence of obesity was higher in males since 102 (89.47%) were underweight, and all 14 (100%) students were obese at Level 1 (Table 3). Observed by age, older male students (born in

Table 1. Classification of obesity according to Body Mass Index (World Health Organization) (1)

BMI	Nutrition grade
<18.5	Underweight
18.5-24.9	Normal weight
25-29.9	Overweight
30-34.9	Obesity I grade
35-39.9	Obesity II grade
>40	Obesity III grade

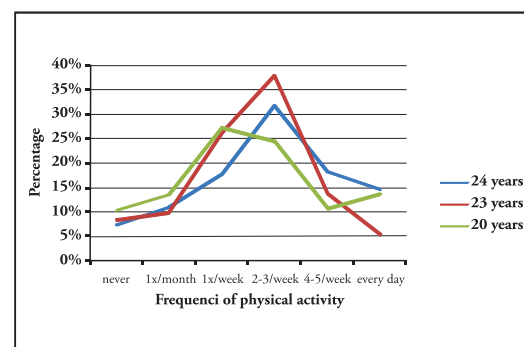


Figure 1. Distribution of physical activity according to age

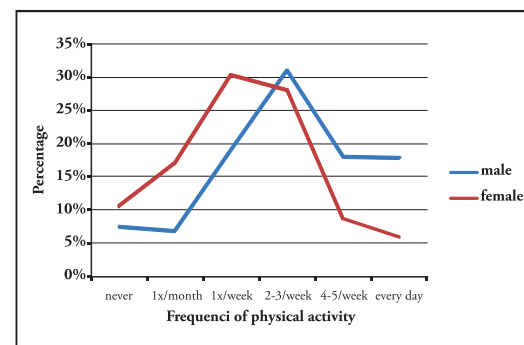


Figure 2. Distribution of physical activity according to gender

Table 2. Measures of central tendency for Body Mass Index according to gender

	Numbert	Range	Min	Max	X	SD
BMI - overall	800	18.99	15.82	34.81	22.1814	2.95219
BMI - male	400	17.09	17.72	34.81	23.9289	2.71786
BMI - female	400	13.25	15.82	29.07	20.4339	1.98573

Table 3 Distribution of Body Mass Index according to gender

	BMI						
	<18.5*	18.5-24.99	25-29.99*	30-34.99*	35-39.99	>40	Total
Males	4	280	102	14	0	0	400
Females	62	326	12	0	0	0	400
Total	66	606	114	14	0	0	800

*statistically significant difference

Table 4. Distribution of Body Mass Index according to age

	BMI						
	<18.5	18.5-24.99	25-29.99	30-34.99	35-39.99	>40	Total
First	38	293	64	5	0	0	400
Last	29	312	50	9	0	0	400
Total	67	605	114	14	0	0	800

*statistically significant difference

Table 5. Measures of central tendency for Body Mass Index according to physical activity

	Number	Min	Max	X	SD
Never	72	15.82	32.19	22.3015	3.33776
1 time a month	95	16.85	30.97	21.3714	2.81717
1 time a week	197	16.71	34.81	21.9317	3.14531
2-3 times a week	236	16.33	32.69	22.3371	2.83671
4-5 times a week	106	17.28	33.46	22.5314	2.86398
Everyday	94	16.76	28.39	22.6460	2.58335

1987-88) had a higher BMI in comparison to younger (born in 1991), which was 24.49 and 23.36, respectively. Contrary, younger female students (born in 1991) had a higher BMI (20.49) than their seniors (born in 1987-88) - 20.37. Given the age, there were no statistically significant differences (Table 4).

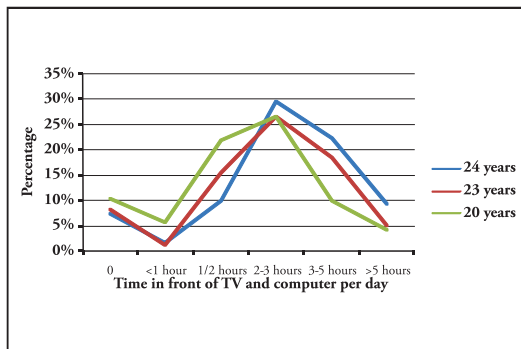


Figure 3. Spending time in front of TV and computer according to age

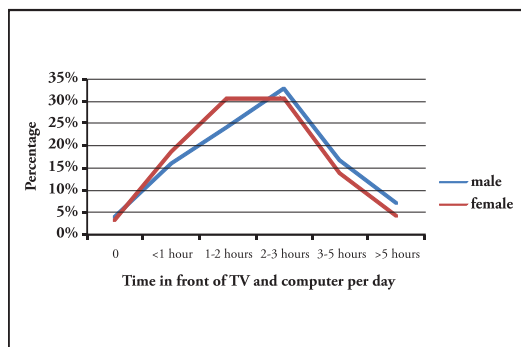


Figure 4. Spending time in front of TV and computer according to gender

Most students (56.4%) were physically active. Older students were more physically active compared to younger age students, 481 (60.1%) and 399 (49.9%), respectively ($p < 0.01$) (Figure 1). Female students were less engaged in physical activity than their male colleagues ($p < 0.001$) (Figure 2).

Physically active students had a higher BMI average. The lowest BMI average was observed in students who were physically active only one time per month (\bar{X} (BMI)=21.37), while the highest BMI was noted in students who were physically active every day (\bar{X} (BMI) =22.64) ($p=0.05$; $r=0.091$) (Table 5).

Sedentary lifestyle was present in students because highest percentage of students, 417 (52.1%) spent more than 2 hours a day with TV or computer. Older students were more likely to lead a sedentary way of life. The difference was statistically significant by age ($p < 0.01$), but not by gender ($p > 0.05$) (Figure 3, Figure 4).

DISCUSSION

In the modern world, massive non-contagious diseases are among the most important medical and socio-economic problems (1). They are largely preventable, and the most common risk factors that can be prevented by changing lifestyle are eating disorders and lack of physical activity (4).

Malnutrition is a problem mainly in girls. The problem is often self-initiated fasting or vom-

ting, which usually occurs in young adolescent girls who are not satisfied with their physical appearance (2). Anorexia occurs in about 1% of adolescent girls in developing countries. About 4% of girls are suffering from bulimia and this disorder occurs slightly later than anorexia (13). The results of our study showed that the prevalence of malnutrition was high at female students. This matches the prevalence in some European countries like Italy (8) and Spain (9). The lower prevalence of underweight female students (6.06%) was recorded two years earlier in Novi Sad at the Faculty of Sport and Physical Education (14).

The biggest problem with obesity is faced by America where overweight was noted in 25% of female students (6). A study from Saudi Arabia (2010) also pointed out the alarming situation regarding obesity, as even 47.9% female students have BMI ≥ 25 (15). In Thailand, the prevalence of obesity is similar to the findings of this study (16%) and male students were also more obese than female students (16).

The prevalence of obesity similar to the results of this study with higher prevalence in males is found in European countries, like Italy (8) where the prevalence of overweight in male and female students (BMI ≥ 25) was 20.5% and 10% (8), in Spain 28.1% and 18.4% (9), in Bulgaria (2004) 21.2% and 11.3% (10), and in the Czech Republic (2008) 30.5% and 15.2% (17), respectively. Our findings were similar to these studies, but statistically significant differences were found only for gender. The prevalence of overweight and obese male students in other countries is usually twice higher compared to the prevalence of female students (12), while this ratio in our case was almost 10 times higher. Perhaps the reason for this is that female students in Novi Sad pay more attention to their appearance, the type and quantity of food taken in compared to female students in other countries.

Similar results in terms of overweight and obesity were obtained two years earlier by the students of the Faculty of Sport and Physical Education in Novi Sad (28% males and 9% females) (14). The prevalence of obese male students reported in Niš (2008) was 7% among males and 1% among females (17).

Analyses of mean value of BMI may point out that student life affects male students by establishing bad habits, while the girls are affected by stress, resulting in loss of body weight. Current situation presented in our study relating to physical activity in Novi Sad has shown better results than the results obtained 2 years ago in Niš, where 34% of female students and 63% of male students exercise less than twice a week (17).

This survey did not obtain a correlation between higher level of physical activity with lower BMI, which was expected. Instead, students who were physically more active had a higher BMI, even with statistically significant correlation. A similar situation was noted also among medical students in Belgrade (2006), where the older generations had a higher BMI in spite of frequent physical activity (18).

According to the results of this study, the cause of overweight and obesity among male students of the University of Novi Sad was more likely inadequate nutrition than lack of physical activity and sedentary lifestyle.

It is obvious that the obesity is one of the most important preventable risk factors and the action for reducing obesity and promoting adoption of healthy eating and behaviour patterns, both at high risk group and on population level, must be integrated into national policies of many countries. The focus should be directed to the education of young people, because they can easily adopt healthy habits that should maintain for life. Moreover, education of youth, above all, is cost-effective and cost-beneficial from the point of social medicine and economic analysis (19). The results of this study point out the necessity of an integral approach to the prevention and control of risk factors, especially among young people.

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TRANSPARENCY DECLARATIONS

Competing interests: none to declare

REFERENCE

1. Müller MJ, Bös-Weisphal A, Geisler C, Onur S. Physiological vs. pathological changes of nutritional status over life time. Nestle Nutr Workshop Ser Clin Perform Programme 2005; 10:31-9.
2. Gavrić Ž. Stavovi adolescentkinja u vezi ishrane i tjelesnog izgleda. Med Data Rev 2011; 3:131-4.
3. Singh GK, Siahpush M, Hiatt RA, Timsina LR. Dramatic increases in obesity and overweight prevalence and body mass index among ethnic-immigrant and social class groups in the United States. J Community Health 2011; 36:94-110.
4. Novaković B, Mirosavljević M. Higijena ishrane. Novi Sad: Medicinski fakultet, 2002.
5. Anonymous. Youth Risk Behavior Surveillance: National College Health Risk Behavior Survey – United States, 1995. MMWR cdc Surveill Summ 1997; 46:1-56.
6. Napolitano MA, Himes S. Race, weight, and correlates of binge eating in female college students. Eat Behav 2011; 12:29-36.
7. Huang TT, Harris KJ, Lee RE, Nazir N, Born W, Kaur H. Assessing overweight, obesity, diet, and physical activity in college students. J Am Coll Health 2003; 52: 83-6.
8. Istituto nazionale di statistica. Condizioni di salute, fattori di rischio e ricorso ai servizi sanitari - Health condition risk factors and the use of health services, 2007. <http://apps.who.int/nutrition/landscape/mddetails.aspx?sourcecode=102953&template=nutrition> (March 5 2011)
9. Ministerio de Sanidad y Consumo. Encuesta Nacional de Salud, 2007. http://www.msc.es/profesionales/saludPublica/prevPromocion/promocion/desigualdadSalud/docs/Health_and_the_Roma_Community.pdf (March 5 2011)
10. Petrova S, Angelova K. Scientific background of Food-Based dietary Guidelines for Bulgarians. Bulgarian Science 2006; 4:19-33.
11. Rakić D, Petrović Đ. Zdravlje dece i adolescenata. Priručnik za praćenje zdravstvenog stanja i unapređenja zdravlja dece i adolescenata. Novi Sad: Društvo nastavnika fizičkog vaspitanja grada Novog Sada, Uprava za sport i omladinu. 2006; 11-50; 57-151.
12. Eaton DK, Kann L, Kinchen S, Ross J, Hawkins J, Harris WA, Lowry R, McManus T, Chyen D, Shanklin S, Lim C, Grunbaum JA, Wechsler H. Youth risk behavior surveillance - United States, 2005. MMWR Surveill Summ 2006; 55: 1-108.
13. Ivanović-Kovačević S. Poremećaji ishrane. U: Nedić A, Živanović O. Psihijatrija. Novi Sad: Medicinski fakultet, 2009; 364-74.
14. Srdić B, Dimitrić G, Obradović B. Antropološke karakteristike studenata Fakulteta sporta i fizičkog vaspitanja. Glasnik Antropološkog društva Srbije 2009; 44:463-70.
15. Al-Rethaiaa AS, Fahmy AE, Al-Schwaibat NM. Obesity and eating habits among college students in Saudi Arabia: a cross sectional study. Nutr J 2010; 9: 39.
16. Banwell C, Lim L, Seubsman SA, Bain C, Dixon J, Sleight A. Body mass index and health-related behaviours in a national cohort of 87,134 Thai Open University students. J Epidemiol Community Health 2009; 63:366-72.
17. Stojanović D, Višnjić A, Mitrović V, Stojanović M. Faktori rizika od nastanka oboljenja kardiovaskularnog sistema u studentskoj populaciji. Vojnosanit pregled 2009; 66:453-8.
18. Maksimović J, Maksimović M, Anđelković M. Glasnik zavoda za zaštitu zdravlja Srbije 2006; 78:26-33.
19. Grujić V. Uloga menadžmenta u podizanju zdravstvenog potencijala dece i omladine. Med pregl 2001; 54:511-6.

Telesna ishranjenost i fizička aktivnost kod studenata Univerziteta u Novom Sadu

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SAŽETAK

Cilj Utvrditi stanje uhranjenosti i fizičku aktivnost kod studenata u Novom Sadu.

Metode Istraživanje je sprovedeno među studentima Univerziteta u Novom Sadu, u periodu od oktobra 2010. do februara 2011. godine. Ispitivanje je uključilo 800 studenata, prve i završne godine studija (uzrasta 20 – 24 godine), podjednako zastupljene polne strukture. Kao instrument je korišćen anoni-mni anketni upitnik, sastavljen za potrebe ovog istraživanja. Statistička obrada vršena je u SPSS15.

Rezultati Stariji studenti imaju prosečno viši ITM ($\bar{X}=24,49$) od mlađih ($\bar{X}=23,36$), za razliku od studentkinja gde mlađe imaju nešto viši ITM ($\bar{X}=20,49$) nego starije ($\bar{X}=20,37$). Preuhranjenih i gojaznih studenata bilo je 116 (29%), dok je 62 (15,5%) studentkinja bilo neuhranjeno. Fizički je aktivno bilo 451 (56,4%) studenata. Stariji studenti bili su fizički aktivniji, 481 (60,1%) u odnosu na mlađe, 399 (49,9%) ($p<0,01$). Fizički aktivniji studenti imali su viši indeks telesne mase (ITM). Kod studenata je ustanovljen sedentaran način života, 417 (52,1%) studenata provodili su više od dva sata dnevno uz TV i kompjuter.

Zaključak Studenti su skloniji gojaznosti, a studentkinje pothranjenosti. Sedentarni način života je takođe prisutan u velikom procentu i to više kod studenata završnih godina. Sve to ukazuje na neophodnu potrebu integrisanog pristupa u prevenciji i kontroli rizičnih faktora, posebno kod mlađih.

Ključne reči: gojaznost, pothranjenost, mladi, upitnik.