

**SOCIOECONOMIC STATUS IN RELATION TO BMI IN MACEDONIAN ADOLESCENTS**Bojadzieva Biljana<sup>1</sup>, Nakeva N<sup>1</sup>, Zafirova B<sup>1</sup>, Matveeva N<sup>1</sup>, Cadikovska E<sup>1</sup>, Jovevska S<sup>2</sup><sup>1</sup>Institute of Anatomy, Faculty of Medicine, Skopje, Macedonia; <sup>2</sup>Goce Delchev University, Faculty of Medical Sciences, Shtip, Republic of Macedonia;**Abstract**

The objective of this study was to evaluate the nutritional status in Macedonian high school students in relation to their socioeconomic status (SES), education and employment of their parents. In this study 117 adolescent students (48 males and 69 females) at the age of 17 and 18 were included. We measured weight and height using standard procedures while BMI was calculated. The examinees completed the questionnaire including data for SES, parents' education and employment. Male students had significantly higher standard deviation scores for weight, height and BMI compared with females. The level of education and employment of students' mother had no significant influence on BMI but the level of education and employment of the father had a significant influence ( $p < 0,05$ ). A student whose fathers' was with a level of lower education had significantly higher scores for BMI opposite to those whose fathers have middle or higher level of education. Examinees with lower SES had significantly higher rates of BMI compared with those which SES was higher.

**Key words:** adolescents, socioeconomic status, nutritional anthropometry, obesity

**Introduction**

Obesity in childhood is a result of unhealthy sedentary lifestyle, fast food consumption and low level of physical activity. It's consequences in adulthood make this problem very important and attracts interest of researchers for early detection of health risk in child and adolescent population (1).

WHO declared an increasing obesity in 15-20% of people all over Europe. The organization stressed the seriousness of the problem especially in late puberty and adolescence, which is a very vulnerable period of life when teenagers make the eating habits and get the perception of their physical bodies (2). Besides genetic factors which are predictors for physical constitution and tendency for obesity, other factors that influence the dynamic of physical growth and development and biologic characteristics of child's body and system are: food, sociocultural or environmental factors and physical activity. There is a connection between SES and eating habits, especially in developed countries where nutritional stress is a major factor, and where influence of mass media and advertisement related to eating habits among adolescents is much higher than in developing countries (2, 3, 4, 5).

There are some anthropometrical indicators for evaluating nutritional status in children, adolescents and adults. The most used and validated is body mass index (Quetelet index = weight/height<sup>2</sup>) (3). It can be used as alternative indicator for direct measuring of body fat. It is an easy and simple method for early detection of nutritional status in children and adolescents. BMI is sex and age specific and it is referred as BMI - for - age (6).

The focus of this study was anthropometrically assessed nutritional status in Macedonian adolescents in relation to their socioeconomic differences.

**Material and methods****Subjects**

Data were obtained from a cross-sectional sample of students of two highschools in Skopje. The sample

included 117 healthy students (48 males and 69 females) at the age of 17 and 18, from selected schools and classes, which gave their consent for participation in the research. In order to avoid mistake in the selection of sample, volunteer students were not included. Subjects were grouped according to sex and age. The University Human Research Ethics Committee approved the experimental protocols.

**Anthropometry**

Anthropometric measurements were made during school hours, not interrupting the lessons. Body height (BH) was measured with Martin stadiometer. Subjects were standing facing ahead, and body height was measured as maximum distance from the floor to the highest point on the head. Shoes were off, both feet together, and arms at the sides. Heels, buttocks and upper back were in contact with the wall. Body height measurement can vary throughout the day, usually being higher in the morning, so to ensure reliability we measured height at the same time of the day. We measured body weight (BW) with scale, the persons standing with minimal arm movement at their side. These values were used to assess weight status, BMI (weight (kg)/height (sm<sup>2</sup>)). The cut-off points suggested by the WHO were used (WHO, 1995). Subject having BMI less than 18.5kg/m<sup>2</sup> were categorized as underweight, BMI from 18.5-24.9 normal weight, BMI from 25.0 – 29.9 overweight and BMI more than 30.0 obese. Every adolescent has his/her own anthropometric file with the following data: date of birth, date of examination and sex.

**Socioeconomic status (SES)**

To assess SES students completed the validated questionnaire. It contained a set of questions on household's financial situation, including car ownership, bedroom occupancy standards, holidays and home computers. Students were classified according to the summed score of the items, with the overall score being recorded to give values of FAS 1 (0-3) low SES, FAS 2 (4,5) middle and FAS 3 (6,7) high SES. They also gave

information about the level of education and employment of their parents.

### Statistics

The data were analyzed with descriptive statistics represented by measures of central tendency and its deviation (arithmetic mean value  $\pm$  and standard deviation). Testing the significance of differences between two arithmetic series was done by analysis of variance – ANOVA, and values of  $p < 0.05$  were considered to be statistically significant.

### Results

The study included 117 adolescents (69 females and 48 males) at the age of 17 and 18. Values of BMI for males and females are presented in Table 1. The values of underweight, healthy weight, overweight and obese female students were 4.53%, 79.7%, 15.9%, respectively 2.08%, 60.4%, 33.3% and 4.1% male students.

Male students have statistically higher values

for body weight, body height and BMI compared to females (Table 2).

Of all students 58,9% females and 77% males have mother and father with middle level of education, 11% females and 5,12% males have mother and father with low level of education, only 29,9% females and 25,6% males have mother and father with high level of education and only 3,4% males have father with no education (Table 3). Level of mother's education has no significant influence on mean value of BMI of the examinees, while the fathers educational level has significant influence ( $p < 0,05$ ). The examinees whose fathers were with low level of education had higher values for BMI compared to BMI of those whose fathers had middle or higher level of education (Table 4.).

Ninety students (76.9%) answered that their mothers were employed and 88.03% that their fathers were employed, contrary to those who have unemployed mothers (23.07%) and unemployed father (11.96%). (Table 5).

**Table 1.** Nutritional status of adolescents

BMI	underweight	healty weight	overweight	obese
female (69)	4.53%	79.7%	15.9%	
male (48)	2.08%	60.4%	33.3%	4.1%

**Table 2.** Body height, weight and BMI by sex (mean value (x) and standard deviation (SD))

	BH X $\pm$ SD	BW X $\pm$ SD	BMI X $\pm$ SD
Female	162.71 $\pm$ 6.23	59.44 $\pm$ 7.01	22.48 $\pm$ 2.56
Male	174.04 $\pm$ 4.37	72.39 $\pm$ 10.69	23.87 $\pm$ 3.19

**Table 3.** Descriptive statistics of level of parents' education

education	No education	Low level	Middle level	High level
<b>Mother n=117</b>		13 (11.1%)	69 (58.9%)	35 (29.9%)
<b>Father n=117</b>	4 (3.4%)	6 (5.12%)	77 (65.8%)	30 (25.6%)

Analysis of Variance  $F=2.78$   $p=0.044$

**Table 4.** Influence of level of parents' education to subjects' BMI

Father education	BMI (X $\pm$ SD)
No education (n=4)	25.55 $\pm$ 2.91
Low (n=6)	25.52 $\pm$ 2.95
Middle (n=77)	22.81 $\pm$ 3.04
High (n=30)	22.84 $\pm$ 2.21

**Table 5.** Descriptive statistics of parents' employment

Parent employment	employed	Not employed
<b>Mother (n=117)</b>	90 (76.9%)	27 (23.07%)
<b>Father (n=117)</b>	103 (88.03%)	14 (11.96%)

**Table 6.** Socioeconomic differences according to questionnaire

<b>FAS1 (Does your family has a car or van)</b>		
No	15	12.82%
Yes(one)	62	52.99%
Yes (two or more)	40	34.1%
<b>FAS2 (Do you have your own bedroom)</b>		
Ne	5	4.27%
Da	112	95.72%
<b>FAS3 (During the past year, did you go away on holiday (vacation) with your family?)</b>		
I haven't been	8	6.83%
Once	46	39.31%
Twice	40	34.18%
More than two times	23	19.65%
<b>FAS4 (How many computers does your family own)</b>		
None	4	3.41%
One	60	51.28%
Two	37	31.62%
More than two	16	13.67%

**Table 7.** Distribution of examinees according to their SES

SES	(N)	%
<b>low</b>	(19)	16.2%
<b>middle</b>	(52)	44.4%
<b>high</b>	(46)	39.3%

**Table 8.** Correlation of SES with BMI

SES		BMI (X±SD)
<b>Low</b>	<b>(n=19)</b>	24.24±3.37
<b>Middle</b>	<b>(n=52)</b>	22.27±2.39
<b>High</b>	<b>(n=46)</b>	23.43±3.05

To determine the SES, students described their family affluence on the basis of 4 variables which constitute the three objective indicators of Family affluence scale (FAS): Does your family has a car or van; Do you have your own bedroom; During the past year did you go away on holiday (vacation) with your family?; How many computers does your family own? The answered questions are shown in Table 6. According to FAS score 16.2 % of all the examinees lives in low SES, 44.4% middle and 39.3% high SES (Table 7). Adolescents with low SES had significantly higher values for BMI compared to those with middle SES ( $p < 0.05$ ) (Table 8).

### Discussion

Today unhealthy sedentary lifestyle, fast-food consumption, low level of physical activity cause obesity in childhood, which is a serious problem. It attracts the interest of researchers for early detection of health risk in child and adolescent population (1). Overweight and obesity carry serious health consequences that can last into adulthood such as emotional and social difficulties

and health problems. Symptoms began to appear in the early school years: high blood pressure, high cholesterol level, respiratory abnormalities, and insulin resistance, and they are predictions of other serious diseases as hearth disease, type 2 diabetes, gallbladder disease and sleep and digestive disorders (5). Besides genetic factors which are predictors for physical constitution and tendency for obesity, other important factors that influence dynamic of physical growth and development and biologic characteristics of child body and systems are: food, sociocultural or environmental factors and physical activity. The values of BMI showed that overweight and obesity was found in 31.4% of children in the fifth grade and 20 % in the first year of high school. This condition can be an alarm to undertake more preventive measures with proper education about benefits of healthy eating habits and more physical activity in children and adolescents (7). According to our results majority of the Macedonian adolescents at the age of 17 and 18 have normal weight. There were 79.9% females with normal weight and 15.9% overweight, and there were 60.4% males with normal weight, 33, and 3% with overweight and 4.1% obese. Males had statistically higher values for body weight, body height and BMI compared to females which we expected.

There is a connection between SES and eating habits, especially in developed countries where the influence of mass media and advertisement related to eating habits among adolescents is much bigger than in developing countries (2, 3, 4, 5). Macedonia belongs to developing countries with a high percent of unemployed residents (34.9% in 2007) and only 8% of people with high education (7). When family income is enough, children can have more quality food and proper nutrition intake so they can assess their potential of growth and have normal weight and healthy body. Although Macedonia has no problem with undernutrition, the world bank reports 7% of residents with low level of income, hence they cannot receive minimal calories intake (8). The influence of socioeconomic status of adolescents' and the level of education and employment of adolescents' parents have definitely influence on the morphological characteristics of adolescent body and it is different among different populations. A large number of studies have shown that children from families with low socioeconomic status have bigger BMI than those living in families with middle or high SES. The reason could be that low socioeconomic status restricts families' opportunities to adopt healthy behaviors such as eating fruit and vegetables and practicing physical activity (5). In the study of Morgenstern et al the relationship between SES and BMI was partially mediated through the higher television exposure (4). According to Turkish scientists Can Pelin et al. who made a research with healthy adolescents at age of 19, there were no statistically significant differences between those with low, middle and high SES and BMI but there was a positive correlation between educational level of adolescents' parents and BMI (9). Adolescents whose mother was with a higher level of education had significantly higher values of body weight and BMI

compared with those whose mother had middle and low level of education. Similar were the results for the father education. According to multi indicators cluster research from 2005/2006 children in Macedonia whose mothers were with middle education had more normal weight than those whose mother had no education, and the were underweight (8). We found that level of education of adolescents' mothers had no significant influence on mean values of BMI in examinees, while the educational level of fathers had significant influence ( $p < 0,05$ ). The examinees whose fathers were with low level of education had higher values for BMI compared to BMI of those whose father had middle or higher level of education. Also the adolescents with low SES had significantly higher values for BMI compared with those with middle SES.

According to Maruf PT et al. there were no differences in the influence of SES on body weight and BMI in examinees that visited private or public schools, but those who visited private schools had an average higher body height (10). Jennifer A. has found that children with family with low SES had higher BMI values, which was similar to our findings. According to her opinion those children and families had difficulty in receiving advices for healthy diets and control of body weight. It is also very important that children and adolescents with higher values of BMI have lower confidence about their physical appearance (11).

### Conclusion

The present study showed that majority of Macedonian adolescents, both male and female have normal weight and that SES has influence to nutritional status. Those who live in low SES have higher values for BMI. In our opinion it is very important to implement more educational programs in primary and secondary school about consequences of sedentary lifestyle and eating fast food and to present benefits of more physical activity and its positive effects on body and mind.

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