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PREVALENCE OF OVERWEIGHT AND OBESITY AMONG MIDDLE SCHOOL CHILDREN IN ROMANIA

LUKÁCS NORBERT CSABA[1,*], BALLA BÉLA JÓZSEF[2]

ABSTRACT. Introduction. The early ages of adolescence, between 11-14, are accompanied by a great fluctuation of the values of sudden physical growth, of temperament and of personality. Periodical monitoring of somatic indicators and determining the body mass index are methods necessary for monitoring the state of health of school children. **Goals**. The goal of this study is to assess the prevalence of overweight and obesity among children in middle school within Bihor, Cluj and Sălaj county and to compare the obtained results with the results of other studies of this nature. **Subjects and methods**. The sample group was made up of 962 middle school students. The method used was anthropometry. The body mass index was calculated in accordance with the BMI reference chart according to age and gender. The results of the measurements were statistically processed with the SPSS program. The descriptive analysis was performed and the differences between the average values were tested with the independent samples t-test. We calculated the relation between different variables using the Pearson correlation coefficient. **Results**. In this study, the prevalence of overweight and obesity were 15.1% respectively 9.8%. There was a significant positive correlation between age and BMI, $r = 0.15$, $p < 0.001$, but a negative correlation between age and physical activity, $r = -0.25$, $p < 0.001$. **Conclusions.** The prevalence of overweight and obesity was 24.9%. The prevalence of overweight and obesity is higher in boys than in girls. The prevalence of overweight is higher in urban boys than in rural boys.

Keywords*: overweight, obesity, preadolescence, height, weight.*

REZUMAT. ***Incidența supraponderalității și obezității la copiii din ciclul gimnazial din România***. **Introducere.** Parcurgerea adolescenței timpurii, cu limite între 11 și 14 ani, se produce cu o mare variabilitate a indicilor creșterii fizice bruște, a temperamentului și a personalității. Supravegherea periodică a indicatorilor somatici și determinarea valorii indicelui de masă corporală reprezintă metode necesare de monitorizare a stării de sănătate a școlarilor.

[1] Partium Christian University, Oradea, Department of Human and Social Sciences.
[2] Babes-Bolyai University, Cluj-Napoca, Faculty of Physical Education and Sport.
** Corresponding author: lukacs.csaba@partium.ro.*

Obiective. Obiectivul acestui studiu a fost să evaluăm incidența supraponderalității și obezității la copii gimnaziali din județele Bihor, Cluj și Sălaj și să comparăm rezultatele obținute cu cele din alte studii asemănătoare. **Subiecți și metode.** Eșantionul a fost format din 962 elevi din ciclul gimnazial. Metoda de lucru a fost antropometria**.** Indicele de masă corporală s-a calculat conform hărții de referință a IMC după vârstă și gen. Datele măsurătorilor au fost prelucrate statistic cu ajutorul programului SPSS. A fost făcută analiza descriptivă iar diferențele dintre medii au fost testate cu ajutorul testului t pentru eșantioane independente. Legătura dintre variabile a fost calculat cu ajutorul coeficientului de corelație Pearson. **Rezultate**. În studiul prezent prevalența supraponderalității a fost de 15,1% iar cea a obezității de 9,8%. A existat o corelație pozitivă semnificativă între vârstă și IMC, r = 0,15, p <0,001, dar o corelație negativă între vârstă și activitatea fizică, r = - 0,25, p < 0,001. **Concluzii.** Prevalența supraponderalității și obezității a fost de 24.9%. Excesul de greutate este mai mare la băieți decât la fete. Prevalența excesului de greutate este mai mare la băieții din mediul urban decât la băieții din mediul rural.

Cuvinte-cheie*: supraponderalitate, obezitate, preadolescență, talie, greutate.*

Introduction

According to World Health Organization (2013), obesity is recognized as a major and independent risk factor. One in three children in Europe is overweight or obese and within the last 30 years obesity rates have doubled among children. The percentage of children aged 5-19 overweight and obese increased from 4% in 1975 to 18% in 2016 (WHO, 2018).

According to the study called Health Behaviors for School-aged Children (HBSC), in Romania in the 2013-2014 school year, the percentage of overweight or obese girls of age 11 was 14%, of age 13 it was 11% and of age 15 it was 10%. In boys of age 11 this percentage was 33%, for those of age 13, it was 26% and for the 15 years old boys it was 21% (Ahluwalia et al., 2015).

The action plan of WHO (2016) for prevention and control of non-communicable diseases and adoption of a healthy lifestyle between 2016-2025, is meant to decrease with at least 25% the rates of premature mortality caused by cardiovascular diseases, cancer, diabetes or chronic diseases of the respiratory system. The body fat percentage is considered to be the most accurate way of determining adiposity (Welcome, 2017). The body mass index (BMI), which does not quantify body fat directly, has been established as a simple and effective clinical screening tool (Freedman, Horlick, Berenson, 2013 & Wohlfahrt-Veje, 2014).

Most overweight or obese children will probably be obese in their youth as well (Freedman et al., 2005), or will suffer of non-communicable diseases (Guo et al., 2000).

Obesity is associated with a significant increase in mortality, with a life expectancy decrease of 5–10 years (Berrington de Gonzalez et al., 2010; Kuk et al., 2011; Prospective Studies Collaboration et al., 2009).BMI is an instrument that represents the standard in the assessment of the risks that appear as a result of the weight excess. People whose BMI is too high or too low are predisposed to develop certain health problems. In order to determine the weight excess the current weight is referred to the ideal weight depending on height, age and gender. In this regard the Center for Disease Control and Prevention (CDC) recommends the use of growth charts.

In 2004, upon the recommendation of CDC, 15 health care organizations have revised the BMI values. Children whose BMI by age and gender was located between the 85^{th} -95^{th} percentiles, were considered as overweight and those with higher values were classified as being obese (Barlow & Committee, 2007).

Objectives

The goal of this study was to assess the prevalence of overweight and obesity among children in middle school within the Bihor, Cluj and Sălaj county and to compare the obtained results with the results of other studies of this nature.

Design, Setting, and Participants

A cross-sectional study was performed on a sample of Romanian (N=962, Boys=486, Girls=476) adolescent population. The height and the weight was measured in the second semester of the 2015-2016 school year. The sample was selected from the following counties: Bihor county (49.4%), Cluj county (38.7%) and Sălaj county (11.9%). They were pupils of 12 different schools.

In this study, the anthropometric method was used to measure the two somatic indicators: height and weight together using the cut-off points of body mass index (BMI) according to WHO standards (WHO, 2007). The Physical Activity Questionnaire for Adolescence (PAQ-A) (Kowalski, Crocker, & Faulkner, 1997) was applied to measure the physical activity level of the adolescents.

The data of the individual measurements were processed statistically on computer with the Statistical Package for Social Sciences: version 20.0 SPSS Inc. (SPSS) program. The descriptive analysis was performed and the differences between the means were tested with the independent samples t-test. We calculated the relation between different variables using the Pearson correlation coefficient.

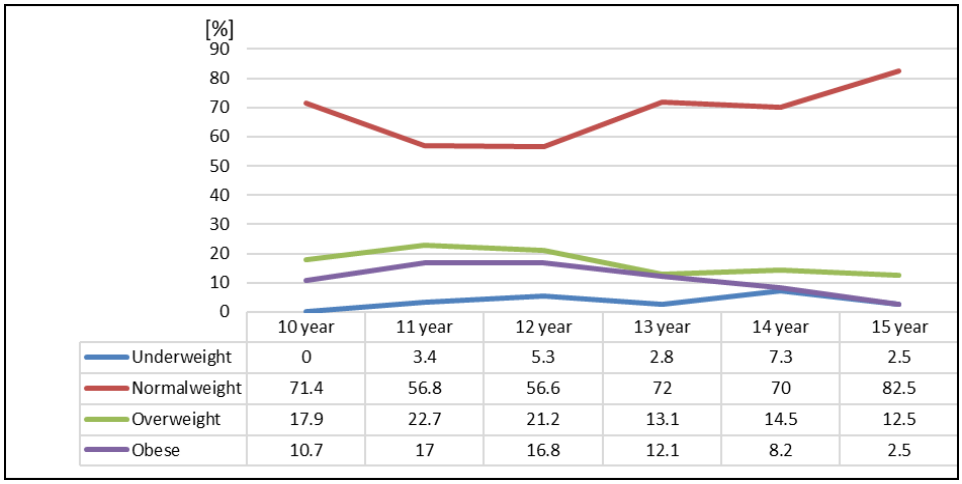
Results

A total of 962 school children were investigated, 50.5% were male (N = 486), and 49.5% were female (N = 476). The mean age was 12.74±1.39 years (12.88±1.39 of boys and 12.60±1.39 of girls. 59.9% were urban inhabitants while 40.1% were rural inhabitants. The range was from 10.0 to 15.4 years of age. In this study, the prevalence of overweight (OW) and obesity (OB) were 15.1% and respectively 9.8%. As shown in table 1, boys were more likely to be OW and OB than girls (17.3%-12.8% vs. 12.4%-7.1%, $p < 0.05$).

	Underweight (<5th) [%]	**Normal weight (5th – 85th) [%]**	**Overweight (85th-95th) [%]**	**Obese (≥ 95th) [%]**
Total sample N = 962	3.7	71.4	15.1	9.8
Girls N = 476	3.2	76.8	12.8	7.1
Urban Girls = 286	2.2	76.9	12.9	8.0
Rural Girls = 189	4.7	76.3	12.6	5.8
Boys N = 486	4.3	66.0	17.3	12.4
Urban Boys = 290	4.5	66.6	19.3	9.7
Rural Boys = 196	4.1	65.3	14.3	16.3

Table 1. BMI distribution by the gender of the subjects

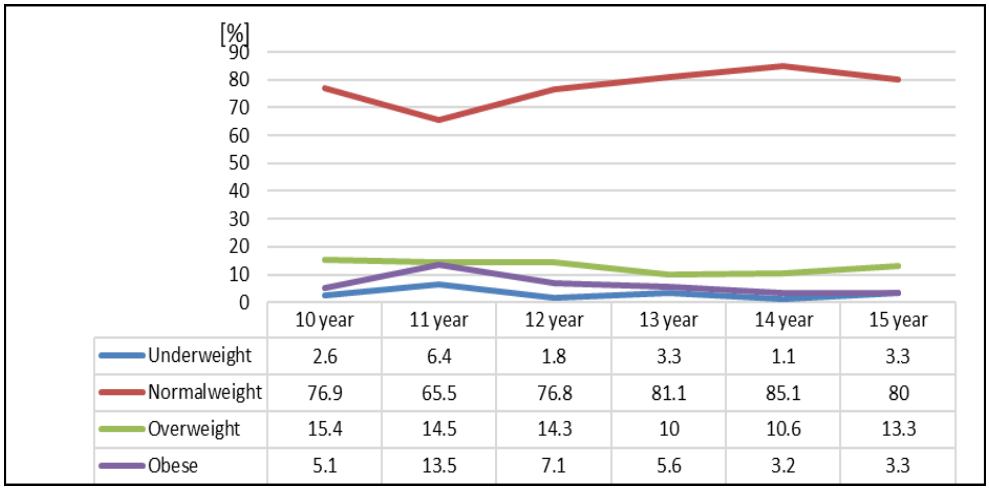
No significant differences were found between the mean BMI values of rural and urban students in either boys ($p = 0.60$) or girls ($p = 0 .730$), in contrast, there is a significant difference between the mean BMI rates of boys (20.48 ± 3.93) and girls (19.9 ± 3.74) ($p = 0.19$).



	10 year	11 year	12 year	13 year	14 year	15 year
Underweight	0	3.4	5.3	2.8	7.3	2.5
Normalweight	71.4	56.8	56.6	72	70	82.5
Overweight	17.9	22.7	21.2	13.1	14.5	12.5
Obese	10.7	17	16.8	12.1	8.2	2.5

Fig. 1. The prevalence and tendency of the overweight and obesity for boys aged 10 to 15

The first and second figure shows the categories calculated from the table broken down by age. In both cases, the same trend can be observed, with a higher proportion of children aged 10–12 years being overweight and obese, while at the same time having a lower proportion of those with a normal body weight. In both gender, there is a gradual decrease in overweight and obese people between the ages of 13 and 15.



	10 year	11 year	12 year	13 year	14 year	15 year
Underweight	2.6	6.4	1.8	3.3	1.1	3.3
Normalweight	76.9	65.5	76.8	81.1	85.1	80
Overweight	15.4	14.5	14.3	10	10.6	13.3
Obese	5.1	13.5	7.1	5.6	3.2	3.3

Fig. 2. The prevalence and tendency of the overweight and obesity for girls aged 10 to 15

We found a very weak negative correlation between BMI and Physical Activity Score for girls, $r = - 0.10$, $p = 0.04$. In overweight individuals, the correlation between the two variables is stronger, $r = - 0.18$, $p = 0.03$, whereas in obese individuals there is no correlation, $r = - 0.173$, $p = 0.12$.

There was a significant positive correlation between age and BMI, $r = 0.155$, $p < 0.001$, but a negative correlation between age and physical activity, $r = -0.25$, $p < 0.001$. The physical activity level of the boys was 2.95 ± 0.73, and of the girls was 2.74 ± 0.68, the difference between the two scores was significant ($p < 0.05$).

Discussion

During the school year 2009-2010 a sample of 3780 students aged 11 to 15, 19% boys and 9% girls, were overweight or obese (Rădulescu, Ghiorghiu, Pleşca, 2020).

In the Romanian adult population, the prevalence of overweight and obesity is extremely high compared to the world average published by WHO. According to the study of Popa et al., (2020) on 900 individuals aged 18-65, 29.56% were overweight and 21.33% were obese. In a 2016 a different study reported a higher incidence, 34.7% overweight and 31.9% obese in the Romanian population aged 20-79 (Popa et al., 2016).

According to the study of WHO, in 2016, 39% of adults aged 18 years and over were overweight and 13% were obese (WHO, 2020).

The most comprehensive study in recent years has been performed by Chirita-Emandi et al. published in 2016, of 25060 subjects age 6-19, in which the frequency of underweight was 5% (3.7% in our study), 66.6% had normal weight (71.4%), 17.5% (15.1%) overweight and 11% (9.8) were obese. Based on only the 10-15 age group, the proportion of overweight was 18.78% and that of the obese 9.46%.

In a 2013 study, Chirita-Emandi, Puiu, Gafencu, and Pienar examined subjects aged 7–18 years and found that 18.2% of the subject were overweight and 7.2% were obese (Chirita-Emandi, Puiu, Gafencu & Pienar, 2013). We believe that it is difficult to obtain representative data for Romania in terms of the incidence of obesity and overweight due to the lack of representative cross sectional studies.

The 2016 study by Chirita-Emandi et al., though it counts data from a sample of more than 25.000 subjects, measurements were made between 2006 and 2015 from 12 different research groups.

Conclusion

The prevalence of overweight and obesity in this Romanian adolescence sample was 24.9%. The prevalence of overweight and obesity was higher in boys than in girls. The prevalence of overweight is higher in urban boys than in rural boys; however, the rural boys were more likely to be obese than the urban boys. The frequency curve presented in our study was similar to curves seen in other studies in this topic. Similarly, the data we presented was almost identical to the data from other prevalence studies conducted in Romania.

Within a population of school-aged children, the chronological variability of maturation depends on the level of urbanization, environmental factors and individual factors. BMI is an indirect indicator to determine the adipose tissue. Due to the big differences between the biological age and the chronological age, the body mass index cannot be considered an instrument of diagnosis. It is rather considered a screening indicator and for additional tests we recommend using simultaneously the skinfold test or the analysis of the adipose tissue by bio-impedance.

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