THE PREVALENCE OF CHILDHOOD OBESITY IN PUBLIC VERSUS PRIVATE SCHOOLS IN ROMANIA - A COMPARATIVE STUDY

Prevalenţa obezităţii infantile în şcolile publice versus private din România - un studiu comparativ

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Abstract.
Childhood obesity is an alarming public health issue in many countries worldwide, with over 41 million overweight children under the age of five, according to WHO (1). In 2013, in Romania, 26.75% of 8-years old children have been diagnosed as overweight and 11.64% as obese, according to Romanian National Institute of Public Health (2).

Study Objective & Methods. Considering these data, the aim of the current investigation was to study whether the type of school (public or private) has an impact on childhood obesity. For this purpose, we analysed the Body Mass Index (BMI) of 209 children from four different Romanian schools (three public schools and one private school). The BMI is a body weight measure based on the mass and the height of an individual.

Results. Our results indicate that the children from public school have an increased tendency towards obesity compared to children who attend a private school. The main factors identified to contribute to these differences are diet, schedule overload and the personal preference towards organized physical activities. Specifically, children from the public school have a more disorganized eating program, a high-carbohydrate diet and a lower preference towards organized physical activities whereas the children attending the private school have a more balanced dietary program and a higher preference towards organized physical activities.

Conclusions. From this study we conclude that more refined national guidelines concerning diet and physical activities for children from both public and private schooled children would have beneficial long and short terms effect.

Keywords: childhood obesity, public vs private school, diet, physical activity.

Introduction

One of the public health challenges that appeared on the national agenda of many developed and developing countries in the past two decades is childhood obesity. According to WHO, in 2013 there were more than 41 million overweight worldwide. This next generation of adults will be faced with an increased risk for several obesity related conditions later in life such as cardiovascular diseases, type 2 diabetes, hypertension or renal failure (Dean H., Flett B. 2002).

Genetics play an incontestable role in the whole obesity equation; however, for most of the children, environment is highly important in triggering and stimulating the expression of the overweight genes. To cite a well-known expression, the genes "load the gun" while the environment "pulls the trigger" (Bray G. 2002). Many changes in the world food industry led to various shifts in the eating habits and preferences of many people, adults and children. Many aliments nowadays contain higher amounts of sugars and preservatives, there are more saturated fat-products on the market and food and drinks in general are more available and more affordable than ever before. These facts, combined with a decline in energy consumption as a result of a more sedentary life, in part, stimulated by several technological developments (more cars, more computer-based activities), are examples of environmental triggers that nurture obesity.

The most immediate consequence of obesity in children takes place at psychological and social levels. Obese children are more predisposed to stigmas, stereotyping and discrimination at school, with some studies reporting that obese kids have fewer friends Strauss R.S. (2002) and that they experience more often their peers´ rejection. Both these factors, rejection and lack of friends during childhood, have been correlated with psychological struggles during adulthood, such as lower resistance to stress, increased anxiety and higher risk for depression (Bagwell C.L., et. al. 1998). Moreover, individuals who were obese or overweight as children or adolescents have higher chances of becoming adults with lower educational/ career achievements, lower likelihood of marriage and higher rates of poverty (Gortmaker S.L., et.al 1993).

Family and school have also been identified as influencing factors for children obesity. Children from families with both parents overweight have a higher predisposition of becoming obese themselves.The causeis not genetic predisposition but rather the family unhealthy eating habits and parental sedentary behavior (Lake J.K. et. Al. 1997). Children from lower-income families are more predisposed to obesity mainly because of poor diet and decreased opportunities to take part in physical activity that involve financial investment. The food provided at schools can also be a stimulant for obesity. Meals rich in fats and carbohydrates or fast food products sold at the "shop around the corner of the school" can significantly stimulate the increase in overweight and obese children and adolescents.

Study Objective & Methods

The purpose of our study was tocompare the prevalence of childhood obesity in Romanian public schools *versus* private schools. The whole study involved 209 participants, namely childrenaged 11-12 years, enrolled in the V^{th} and VI^{th} grades infour different schools (three public and one private school) from the South-Est of Romania: School No. 1 Modelu, School No. 2 Călăraşi, Bilingual HighSchool "Decebal" from Bucharest and The American Private School from Bucharest.The nutritional status (i.e. underweight, normal weight, overweight, obese) of the selected participants has been estimated by measuring theirbody mass index (BMI) (weight/height^2 of an individual) and following theInternational Criteria establishing the thresholds for these weight categories defined by Cole and colleagues in 2000 (10). In Table1 we show the BMI thresholds internationally established for overweight and obese male and females aged 11, 11.5 and 12 years old. Additionally, a questionnaire has been used to estimate the physical activity, nutritional habits and the use of modern technologies (computer, tablet etc.) for each child participating in the study.

Age	BMI threshold overweight		BMI threshold obese	
	M	F	M	F
11 years	20.55	20.74	25.10	25.42
11.5 years	20.89	21.20	25.58	26.05
12 years	21.22	21.68	26.02	26.67

Table 1. BMI thresholds internationally established for overweight and obese male and females aged 11, 11.5 and 12 years old (10).

Results

From the 209 subjects considered in the study, 104 (49.76%) stem from a rural environment whereas 105 (50.23%) from an urban one. Moreover, 177 (84.68%) originated from three public schools and only 32 (15.31%) from a private school. The BMI measurements revealed that in the public schools there are 23.80% overweight, 72.28% normal weight and 3.96% underweight children aged 11-12 years old (see Fig. 1). The subjects from the private school are all children with a normal weight for their age. Answers from the questionnaire revealed that 35.59% of the publicschool children did not practice any physical activity outside the schoolrevealing one of the causes for the large number of overweight children found in the public schools.

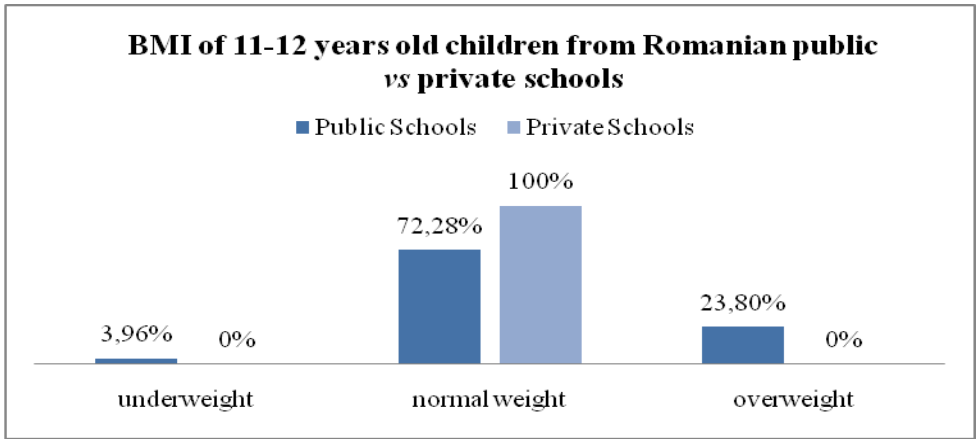

Figure 1.Percentages of underweight, normal weight and overweight children in four different public and private schools from Romania.

We have also compared the average BMI for the Vth graders participating in the study divided into rural and urban categories according to their school of provenience. The results indicate a slightly larger (but not statistically significant) average BMI in the rural case (though only when including the urban private school), see Fig 2.

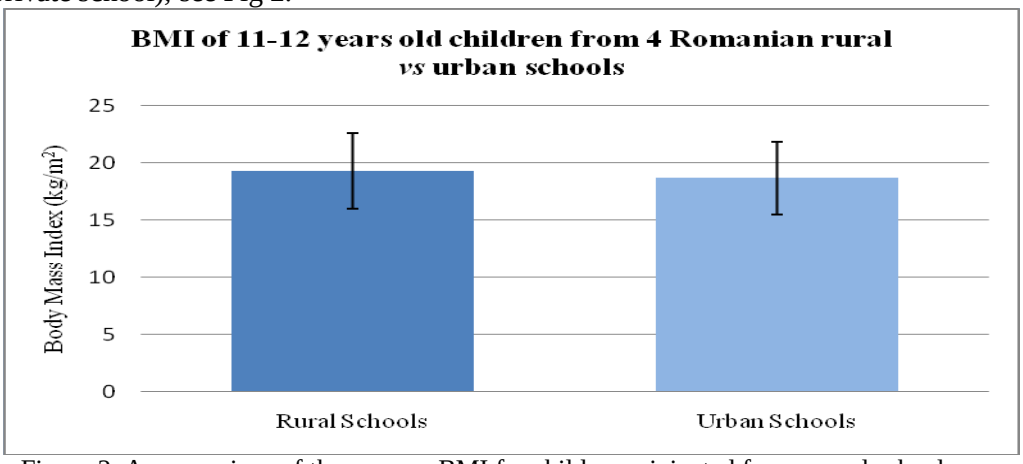

Figure 2. A comparison of the average BMI for children originated from a rural school versus children originated from 3 urban schools.

When we compared the BMI group means of the children from public schools versus the ones from the private school investigated (see Fig. 3), we observed the following differences:the children attending Modelu No.1 School had a significantly higher BMI (M=19.26, SD=3.32) compared to the children studying in the American Private School from Bucharest (M=17.67, SD = 0.73),(t = 3.332, p = 0.001). After checking the variance within these groups using *Levene´s* test, we observed a significant difference (p=0.001), which indicates that the variances within each one of these two groups have to be considered. When we compared the BMI of the children from the School No.2 Călăraşi (M=20.06, SD=17.67) with the BMIs of the subjects from the American Private School Bucharest (M=17.67, SD=0.73), we observed again a statistically significant difference between these two groups (t=2.250, p=0.045), again with a significant difference between the within-variances of the two groups (*Levene´s* test: F=47.136, p=0.001). However, when comparing the BMI of the children from the Bilingual "Decebal" School Bucharest (M=19.13, SD=4.26) with the BMI of the children from the American Private School Bucharest (M=17.67, SD=0.73), we observed no statistically significant difference (t=1.82, p=0.078), here again encountering the same significant difference in the variances within each one of these two groups (*Levene´s test*: F=23.295, p=0.001).

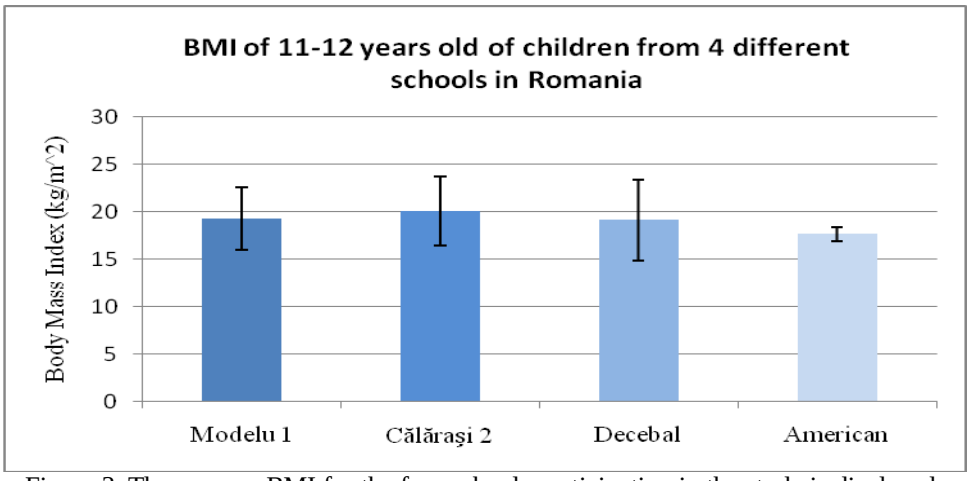

Figure 3. The average BMI for the four schools participating in the study is displayed.

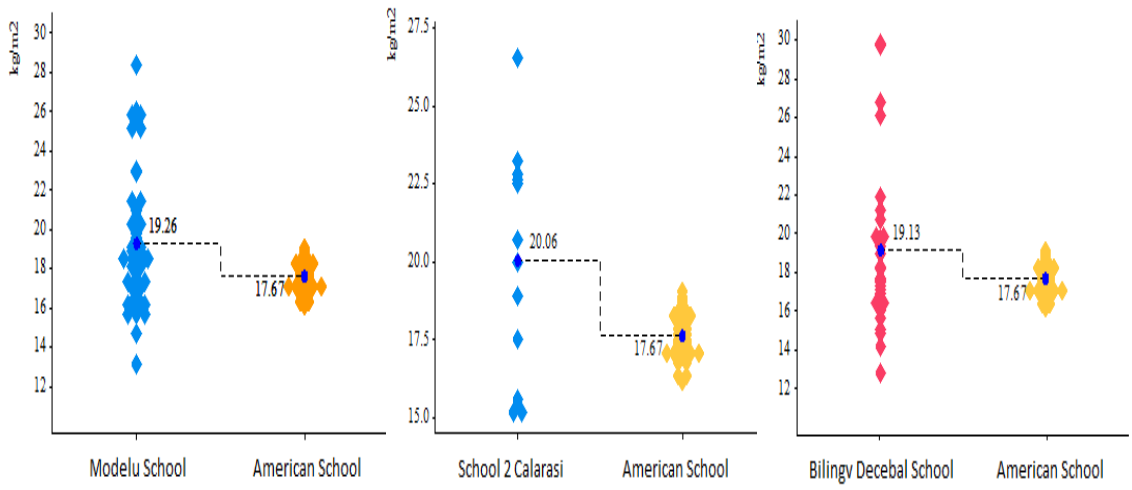

Fig.4. BMI Distribution of children belonging to different public schools versus the American Private School from Bucharest.

Conclusions

In the current study, we compared the Body Mass Index (BMI) of children from four different schools from Romania (three public schools from both urban and rural environment and one urban private school). Although no big differences have been observed in the BMI of children living and studying in the rural vs urban areas, we found some differences between the BMI of the children who study in two public schools compared to the childrenfrom the American Private School in Bucharest.

These differences can be explained by a series of factors. One of them is the awareness of both children and their parents about importance of a healthy diet. In public schools, an increased percentage of the parents whose children are overweight were themselves overweight, which suggests a dietary unbalance that had its roots in the family´s consumption behavior. Although in the public environment children do not have information about a healthy diet, the interest shown in this direction was very high.The children, following the evaluation, asked a series of questions about diet and physical activity (more information can be found in (11)).However, the situation was different in the private school that we studied. Less parents were overweight and had a healthier diet. The school itself

is equipped with a nutritionist who advises the parents about the healthier food options which they can provide to their children but also who designs the content of the meals that are served at the canteen to these children after the courses.

Secondly, the amount of physical activities in which the children are involved can also be a cofactor to the increased number of overweight children observed in the public schools. Many children from the three public schools that we studied did not practice any sport outside of the school curricula. However, in the public school, there are more children that practice one ore more sports outside the school program (11). Moreover, these children were also encouraged by the school pedagogue to practice other sports (private football, basketball, tennis, swimming, etc.).

Lastly, theaccessibility to healthier food during school program can be another contributing factor. Many public schools in Romania do not have a canteen; in most cases, there are small kiosks inside or outside the school area that sell alimentary products to the students. After analyzing the type of products sold by some of these kiosks (11), we observed an increased amount of fast food products and a low percentage of healthier food options (fruits, salads, sandwiches). However, the private school we studied was equipped with a canteen and no kiosks were observed inside the school perimeter.

We conclude that more efforts from the school side can be directed to inform both parents and the students about the importance of having a healthy diet and what kind of dietary choices they canmake in order to have a nutritious and healthy diet.

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