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THE IMPACT OF NUTRITION, SEDENTARY BEHAVIOUR AND LIFESTYLE ON SCHOOL-AGE CHILDREN

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Abstract

Background and Aims. *Diet and lifestyle in school-age children have a particularly large impact on health, as well as various consequences in future. The objective of this papers it to assess the relationship between lifestyle and daily diet and the effects of an unhealthy diet.* ***Material and Methods.*** *An observational cohort study was conducted in Bucharest, in three schools and one high school on 100 children, between 2011 and 2013. The criterion for inclusion was the appropriate age (school-age). The protocol consisted in clinical examination, body mass index (BMI) calculation, questions about diet, physical activity and time spent watching television (TV).* ***Results.*** *Most children do not respect a schedule of meals and snacks (78%). Unhealthy diet (fast food, carbonated beverages, chocolate) registered higher preferences. Mean TV time was 2.32 hours/day (SD=1.92) and a strong evidence on relationship between age and number of hours allocated to TV was discovered (p< .01). Four percent of children were found to be under the 5th percentile (underweight), 18% between 85th and 95th percentile (overweight) and 14% above 95th percentile (obesity).* ***Conclusions***. *A sedentary life in this case was mainly determined by the time spent daily in front of the television rather than lack of exercise.*

key words: *nutrition, sedentary life, school-age child, BMI*

Background and Aims

In recent years, there has been an increasing focus on improving children's diet and lifestyle habits as part of an overall strategy for preventing obesity and chronic diseases such as cardiovascular disease (CVD), type 2 diabetes and osteoporosis. Therefore, it should be underlined that a proper diet which provides the daily requirement calories, nutrients and minerals necessary for growth and development, started at birth and diversified as recommended, is the key to a successful nutrition and lifestyle in school-age children.

Obesity among Romanian population might be explained by the persistence of existing levels of obesity prior to the collapse of communism, but the most plausible explanations for the obesity patterns observed in East European nations are declines in physical activity,

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increased real income, and increased use of cars, televisions and computers [1].

The lifestyle of school-age children is defined as a whole that includes physical activity, sedentary knowledge, hygiene standards, having a program of rest and studying environment. Parental intervention is often the only way to prevent certain nutritional diseases such as obesity, rickets or certain hypovitaminoses/vitamin deficiencies.

To prevent childhood obesity parents should encourage healthy eating habits (plenty of vegetables, fruits and whole-grain products, low-fat or non-fat milk or dairy products, lean meats, poultry, fish, lentils and beans for protein,lots of water and less sugar-sweetened beverages, sugar, sodium and saturated fat), help their children understand the benefits of being physically active and also to stay active and reduce sedentary time (reduced "screen time" - TV, video games, Internet) to no more than two hours a day and new fun activities to do with family members or on their own [2].

The aim of this paper was to assess the relationship between lifestyle and nutrition of school-age children, in particular the effects caused by an unhealthy diet and to evidence the underlying principles of a healthy diet and foods recommended in this age range.

Material and methods

Studied population

As the prevalence of overweight appears to be unequally distributed between population groups [1], we aimed to have a relatively equal number of boys and girls. We selected three primary schools and one high-school in Bucharest, Romania. Informed consent was obtained from the parents of the children and the children themselves (100 school-age children: 57 girls and 43 boys). This study was conducted between 2011 and 2013. The criterion for inclusion was the appropriate age (school-age children), so we have children who are aged between 8 years and 17 years (8 years-3%, 9 years-26%, 10 years-26%, 12 years-20%, 13 years-1%, 14 years-3%, 15 years-7% and 17 years-14%). The mean age was 11.55 years (SD= 2.82; skewness = 0.885 which means that our data has a moderate symmetry of distribution; kurtosis = -540).

Data collection

Data collection was performed by direct methods through observation, interview and physical examination applied to children. This questionnaire included questions about consistency of daily meals, types and quantity of drinks consumed daily, the types of exercises done daily and weekly, number of hours spent in front of computer or television (TV), and questions regarding compliance with the Ministry of Public Health (Romania) recommendations on food groups and their introduction into their daily diet.

The school-age children included in this study also reported for the conditions during daily meals by selecting from the following categories: (1) standing, (2) directly from the pot, (3) while watching TV, (4) eating out of boredom, (5) emotional eating, (6) during night time or (7) eating a little but all the time. Preschooler's demographics (sex and date of birth) were also acquired.

Anthropometric measures

As the aim of the study was to assess the nutritional status of the school-age children included in the study during the design phase, we checked for the variability of a large set of nutritional status indices. The one showing the largest variability was body mass index (BMI) [3]. Therefore, to measure the scholar's height and weight, they were asked to remove their shoes, to be in light clothing and all the

measurements to be done in the morning, before lunch time [4].

Body mass index is calculated using weight and height measurements and is an indicator of body fatness, so even if it can't be used to diagnose health issues, it can be an early screening tool. For children and teens, BMI is evaluated using age- and gender-specific charts that take into account the different growth patterns for gender. Weight and the amount of fat in the body differ for boys and girls and those levels change as they grow taller and older [5]. To achieve a correlation between BMI and weight percentiles we used the calculator: BMI percentiles for boys (2 to 20 years) and BMI percentiles for girls (2 to 20 years)[6].

Statistical analysis

Data were cleaned and validated with the SPSS Statistics program (version 23). Descriptive statistics stratified by sex and age were computed. According to the categorical nature of the variables, Pearson Chi-square tests were used to compare proportions by gender and sex. Spearmen correlation coefficients were calculated as measures of association between variables. For all statistical tests there was considered a value of $p \leq .05$ to be statistically significant.

Results

Eating habits

From the total of 100 school-age children included in this study, 44% do not have 3 main meals every day, 34% have the main meals every day and the rest of 22% also have snacks in addition to the main meals. 70% (seventy percent) of the children eat breakfast daily, while 30% don't. The majority enjoys having snacks in addition to main meals (morning snacks: 63% and afternoon snacks: 76%). Lunch is taken daily by 74%, while dinner by 95%.

Concerning the number of meals served outside the house during the week, a high percentage of 42% said they do not take any meals outside the house, and the rest of 58% take between one and six meals outside the house during the week. On weekends, 38% do not take meals outside the house. 5% (Five percent) take 4 meals outside the house and 1% take 6 meals (during the week), while 10% take 4 meals outside the house and 2% take 6 meals (during the weekends).

A percentage of 9% have a daily fast-food consumption, 70% "from time to time", 6% "once/week" and 15% deny any fast-food consumption. The fast-food consumption was higher in females (47%) than in males (38%) and the percent of "every day" female consumption was double compared to the male one, yet no significant differences were found between sexes (Pearson Chi-Square Test, Cramer's V=.22 $p > .05$). We analyzed data in relation to percentile interpretation and we discovered the following results: obese females had a significant higher consumption than males ($p < .05$); overweight males and females did now show a significant relationship ($p > .05$); normal weight females had a higher consumption than males, yet no significant relationship was found ($p > .05$) When it comes to what children eat during school time, 54% have their homemade sandwich, 16% eat bakery products, 16% eat chips, snacks or crackers, 13% use to eat chocolate and candies, 1% eat fruits and 0% yoghurt. Sweets findings among children showed that 56% preferred chocolate, 20% chose ice cream, 11% chose cookies, 7% chose wafers, 5% chose candies and 1% chose jam.

Asked about daily fluid intake, we found the following results: 41% drink tea every day, 37% drink fruit juice, 50% drink carbonated beverages and a percentage of 71% drink water every day. Of the 71% of the children who drink

water daily, the highest percentage of 22% drinks 1 liter of water every day (Table 1).

Table 1. Daily fluid intake of children in the study group.

Quantity (ml/day)	Percent of children (%)
0 ml	29%
250 ml	3%
500 ml	5%
750 ml	9%
1000 ml	22%
1250 ml	10%
1500 ml	8%
1750 ml	3%
2000 ml	11%

Related to the conditions during daily meals, we confronted the following situations: 100% eat out of boredom (100%-"sometimes"), 21% eat when emotional and 51% eat during night time.

Physical activity

In regards to this group of school-age children, we observed that 25% of schoolchildren do not participate in physical education classes and 75% participate as follows: 16%-1 hour/week and 59%-2 hours/week. When it comes to outdoor activities, 35% of children do not participate at all in them, and the remaining 65% participate as follows: 12%-1 hour/week, 27%-2 hours/week, 11%-3 hours/week, 10%-4 hours/week, 4%-5 hours/week and 1%- 8 hours/week (Table 2). The mean for physical education classes participation is 1.34 hours (SD= 0.85) while the mean for outdoor activities is 1.67 (SD= 1.63). The number of hours allocated to physical education classes for overweight and obese children do not differ significantly (p> .05). Also, for obese and normal weight children the number of hours allocated to physical education do not differ significantly (p> .05).

Asked if they practice other sports, only 29% gave an affirmative answer compared to the remaining 71%. The children's favorite sports are football, dance, skating, modern dance, basketball, karate, swimming, walking, but also music, fitness, pilates and gymnastics. Most children practice these sports between 2 and 4 hours weekly.

Table 2. Number of hours allocated weekly for physical activities.

Physical education classes		Outdoor activities	
Hours/ Week	Percent of children (%)	Hours/ Week	Percent of children (%)
0 hours/week	25%	0 hours/week	35%
1 hour/week	16%	1 hour/week	12%
2 hours/week	59%	2 hours/week	27%
		3 hours/week	11%
		4 hours/week	10%
		5 hours/week	4%
		8 hours/week	1%

Time spent watching television

Below, we can see the results of the number of hours that children use to watch TV daily in relation to percentile interpretation (Figure 1): 18% deny watching TV daily, 19%-1 h/day, 25%-2 h/day, 16%-3 h/day, 9%-4 h/day, 6%-5 h/day, 3%-6 h/day, 1%-7 h/day and 3%-8 h/day. We also found out from other questions relating TV viewing that of the 100 children, 5% always watch TV during meals, 31% frequently look at TV during meals, 28% sometimes and 13% almost never.

Mean TV time for the entire number of children was 2.32 hours/day (SD=1.92). Mean TV time for both obese and overweight children was found to be over 2 hours/day (obese children: 2.2 hours/day, overweight children: 2.3 hours/day). An equal number of obese males and females watch TV, while overweight females (9 females) watch more TV than males (6 males),yet no significant relationship was found for neither obese children (p> .05) nor overweight children (p> .05).

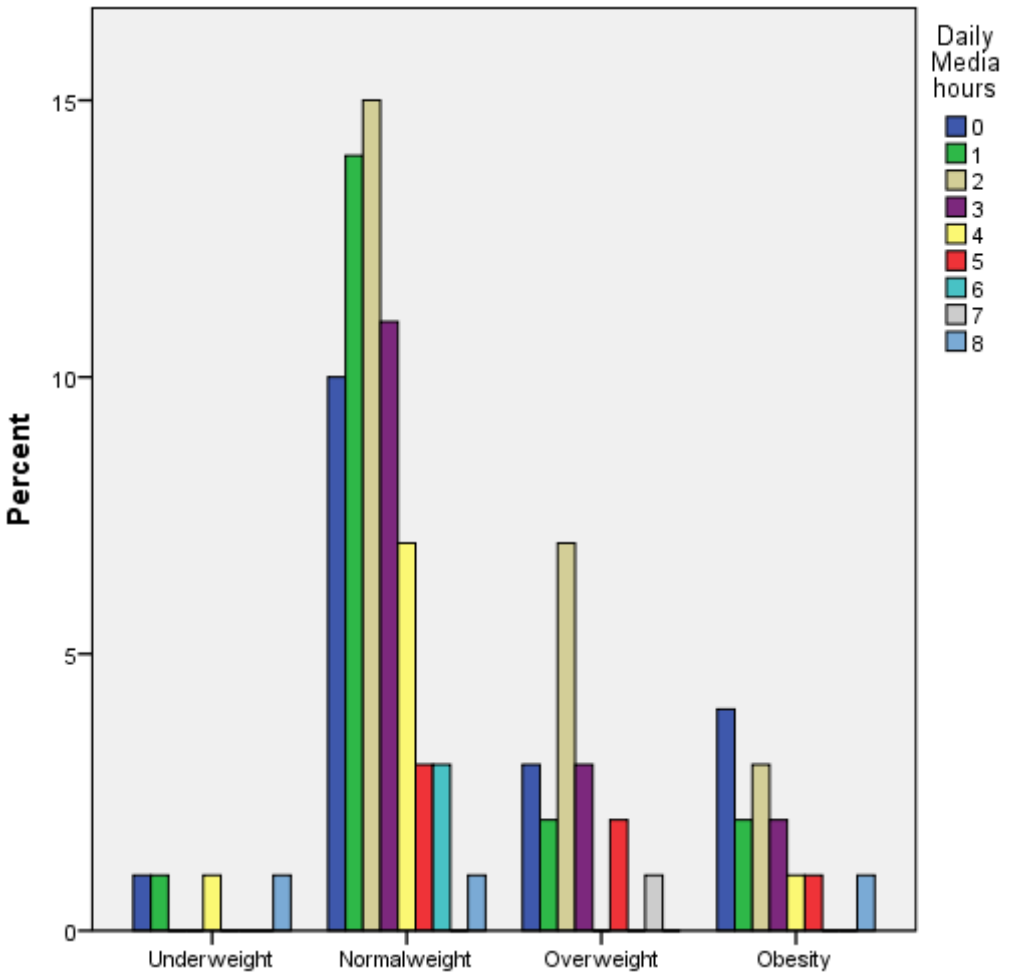

Figure 1. *Daily media hours in relation to percentile interpretation.*

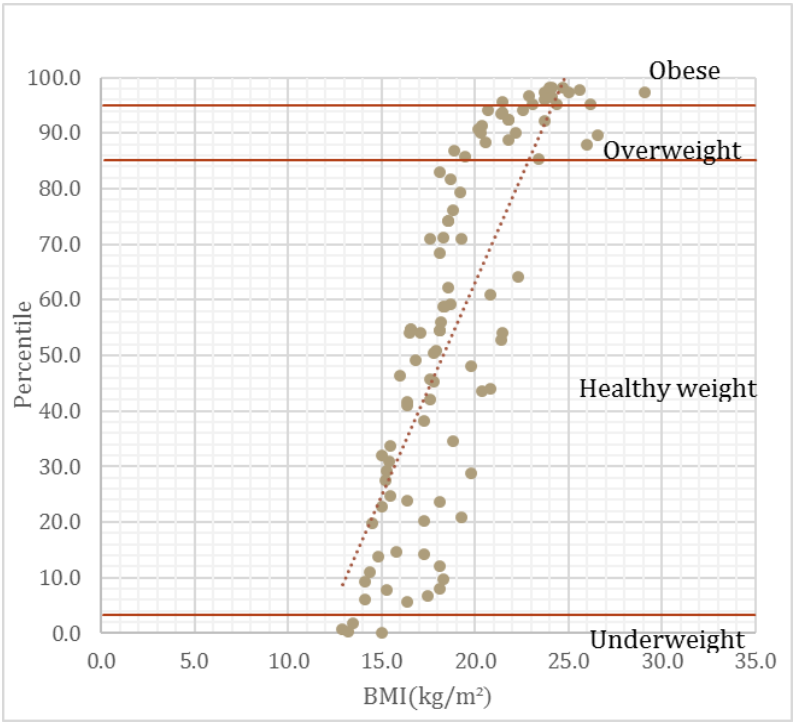

Figure 2. *Correlation between BMI and weight percentiles for school-age children.*

On the other hand, when analyzing normalweight children using Bivariate correlation, we discovered strong evidence on relationship between age (Mean=11.25, SD=2.96) and the number of hours allocated to TV (Mean=2.3, SD=1.77), r= .33, p< .01. High levels of age are associated with high levels of hours allocated to TV.

BMI

Children over age 2, or teens whose BMI is less than the 5th percentile are considered underweight; between the 5th percentile and the 85th percentile children are considered to have normal weight; between the 85th and 95th percentile they are considered overweight while children with BMI ≥ 95th percentile are considered obese.

Looking at Figure 2, we see that out of the 100 children, 4 children are underweight, 3 were male and 1 female, aged 9, 10 and 17. The highest number is of normal weight children, 64: 27 boys and 37 girls, aged between 8 years and 17 years. A total of 18 children are overweight, 10 of whom were female and 8 male, with a predominant age of 10 years. In the category of obesity we found 14 children: 8 girls and 6 boys, aged 9 to 15 years (Table 3).

Table 3. The number of obese school-age children according to body mass index against age group and sex.

BMI															
Age (years)	P_{95}			$>P_{95}<P_{97}$			P_{97}			$>P_{97}$			n		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
9	-	-	-	1	1	2	-	-	-	2	2	4	3	3	6
10	-	-	-	0	3	3	-	-	-	0	2	2	0	5	5
12	-	-	-	1	0	1	-	-	-	-	-	-	1	0	1
14	-	-	-	1	0	1	-	-	-	-	-	-	1	0	1
15	-	-	-	-	-	-	-	-	-	1	0	1	1	0	1
Total	-	-	-	3	4	7	-	-	-	3	4	7	6	8	14

M (male); F(female); T (total); n=amount.

Half of the obese children (50%: 36% male, 14% female) and half of the overweight children (50%: 25% male, 25% female) eat fast-food "from time to time". 28.5% (Twenty-eight point five percent) of the obese children have a "daily" consumption of fast-food (7.1%: male, 21.4% female) and 16.6% (5.5%:male, 11.1%: female) of the overweight children have a "daily" consumption of fast-food.

Discussion

According to the American Academy of Pediatrics Committee on Nutrition, a preschool-age child has 3 meals per day (breakfast, lunch and dinner) and some snacks, meanwhile a school-age child has fewer meals and snacks per day [7]. In our study 44% do not follow these recommendations.

Although daily breakfast consumption is considered to be good for health, including for a good nutritional status, cognitive function and body weight control, it appears that among school-age children its true role is not known. In a meta-analysis of several studies on the benefits of breakfast consumption by school-age children, conducted in 2010 by Szajewska et al., it was found that in 13 out of 16 total studies breakfast has a protective effect against becoming overweight or obese [8]. In our study, there is a percentage of 70% children with a daily breakfast consumption. Choosing "dinner" as favorite meal makes us think that either the needs are being higher than the intake, either there are psychological factors involved, for example, dinner may be the only daily meal that is served with the entire family. It can be said that psychosocially, eating behavior relies on the

parents' active participation as nutritional educators through family interactions that affect the children's eating habits [9].

More children take meals outside the house on weekends than during the week even if the time frame is tighter. The number of children that take 4 and 6 meals outside the home during the weekend has doubled comparing to week time.

It can be said that too much fast food consumption has adverse effects on nutritional status due to its excess of carbohydrates and lipids, and due to its low content of nutrients, thus, the consumption of 70% ("from time to time" consumption) is rather alarming. We also noticed that females tend to have a higher inclination towards this type of food. When we asked the children in our study about fruit consumption at school, just 1% responded affirmatively and not even one child responded affirmatively to yoghurt consumption at school. This is also worrying because fruits and vegetables are recommended daily for a proper growth and development, especially at school age. The healthiest product from our high sugar content foods or deserts (jam) is preferred by 1 child out of 100.

The Dietary Guidelines for Americans recommends no more than one serving of 100g fruit juice as part of the daily fruit intake. Fruit smoothies are usually very high in calories, and so aren't recommended as daily beverages [10]. The fact that children included in our study drink fruit juice daily in a percentage of 37% makes us wonder that maybe the parents are not very informed.

The Beverage Guidance Panel gave its "least recommended" designation to beverages that are sweetened with sugar, high-fructose corn syrup, or other high-calorie sweeteners and that have few other nutrients. These include carbonated drinks that provide so many calories and virtually no other nutrients [10]. Even if these are known facts, we discovered a carbonated drinks consumption of 50%.

Table 4. The European Food Safety Authority's recommendations for fluid intake for children [11].

Sex	Age	Amount of fluid from drinks only (l/day)
Boys and Girls	2- 3	0.9- 1.0
Boys and Girls	4- 8	1.1- 1.3
Girls	9- 13	1.3- 1.5
Boys	9- 13	1.5- 1.7
Girls	14- 18	1.4- 1.6
Boys	14- 18	1.8- 2.0

A daily fluid intake for children as seen in Table 4 is recommended because, if lost fluid is not replaced, dehydration will result. There is some evidence that patterns of drinking are established in childhood, and so, it is important that children are educated to maintain an adequate fluid intake [12]. According to the recommendations and analysis (by sex and age for each child) of Tables 1 and 4, we notice that only 32% of all school-age children respect these recommendations, because in this study we have an age range between 8 to 17 years, and recommendations for this range are 1.1 to 2 liters of water daily.

The American Academy of Child and Adolescent Psychiatry has drawn attention to the fact that depression in pediatric patients is associated with either a weight loss or a significant increase, which is why particular attention should be given to the emotional moments of eating (21% of children from our study are in this category) [13].

The American Heart Association recommends that all children aged 2 and older should participate in at least 60 minutes of enjoyable physical activities of a moderate intensity every day. Physical activity helps with: controlling weight, reducing blood pressure, raising HDL ("good") cholesterol, reducing the

risk of diabetes and some kinds of cancer, improved psychological well-being, including gaining more self-confidence and higher self-esteem [14]. Analyzing the physical activity results, we see that only 75% participate in physical education classes (the majority: 59% with 2hours/week), 65% participate in outdoor activities (27% with 2 hours/week) and just a percentage of 29% practice other sports, so we can clearly affirm that physical activity is still a weak spot among school-age children and that it should be promoted more. The mean for hours allocated to outdoor activities is higher than the mean for hours allocated to physical activity classes, even if there is a lower percentage of participation in outdoor activities than in physical education classes.

The main recommendation is that time spent in front of the screen should be limited to less than 2 hours per day, and if children are younger than 2 years, they should have restricted access to multimedia resources. Because many children will overcome these recommendations, it is very important to have no TV nearby at mealtimes, as well as in the child's bedroom.

These recommendations are followed by a small percentage of children from our study, more exactly 19% who watch TV daily for one hour. The highest percentage recorded in those who watch TV daily for 2 hours is 25%. Although the percentages decrease with increasing daily hours of viewing, it is still worrying that some children get to stay up to 8 hours daily in front of the TV or computer. There is, however, an 18% of all school children who deny the presence of TV in their daily activities. We have also concluded that more females watch TV than males and that age and hours allocated to TV watching are associated.

The correlation between BMI and weight percentiles for school-age children part of our study has made it possible to see the age range where overweight and obesity affects the most: 9 and 10 years (both girls and boys, but the highest percentage was found in boys with age of 10: 80% overweight) and less: 14-15 years. This result is consistent with the findings of a Kaiser Permanente study of 710,949 children and teens, the study translating into more than 45.000 extremely obese children. The percentage of extreme obesity peaked at 10 years in boys and at 12 years in girls [15].

The strength of our study is that it is among the few that show a relationship between specific eating and patterns of sedentary behavior and BMI concerning the Romanian school-age population. It also underlines the importance of conducting similar studies in other regions of our country. On the other hand, some limitations make it more difficult to apply it to the whole population of Romanian school-age children: a relatively small number of schools involved in this study (4) and the fact that all the children were from an urban area, so they are believed to have easier access to information, television and media, more types of food (healthy and non-healthy) and more types of outdoor activities than the children from rural areas.

Conclusions

Referring to the diet of school-age children, we noticed that most of them do not respect a schedule of meals and snacks within a normal day, more than two thirds of them occasionally eat fast food and half of them have a daily consumption of carbonated beverages. An aspect that must be highlighted is the increased preference in obese females towards fast food meals.

Lifestyle findings revealed that a high number of children watch television daily, one third often eat while watching television and three quarters participate in physical education classes. Also, we pointed out strong evidence on

the relationship between age and the number of hours allocated to television watching.

We can strongly conclude that, in our study, television had a higher impact than the lack of physical exercise as a contributing factor to a sedentary lifestyle.

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