

## Original Research

# Eating patterns in Children; should worry?

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## Abstract

**Background:** Obesity and overweight have increased prevalence in children during the last decades all over the world.

**Objectives:** The aim of this study was to determine the prevalence of overweight/obesity through the 12-18 year old schoolchildren in Brasov district and to describe eating patterns and the possible relationship between overweight/obesity and eating pattern.

**Material and method:** There were recruited 250 children for a cross-sectional study in Brasov district, Romania. Alimentary habit, snacking, meal frequencies were declared by the subjects using a retrospective questionnaire. Parents were asked to give information about family history regarding the presence of cardio-vascular risk factors. There were measured weight and height for all children and it was calculated body mass index calculated using international standard cutoff points (International Obesity Task Force values). It was also evaluated the level of physical activity for each children.

**Results:** Positive family history for cardio-vascular risk factor, eating pattern and physical activity were associated with overweight. Healthy eating pattern including fresh fruits and vegetables loses ground in favour of fast-food as the age increases.

**Conclusions:** The main finding was that, eating pattern in schoolchildren should worry both parents and school authorities. The family influence on childrens eating pattern decreases as the age grow, the busy school program determine lack of physical activities and failure of and the healthy alimentation. The prevalence of overweight was high and connected with dietary behaviour, independent associations were evident between eating patterns and overweight, indicating the need of the need for a common intervention on nutrition both from the family and from the educators.

## Keywords

- Eating patterns
- Children
- Obesity and overweight
- Family influence

## INTRODUCTION

In the 21<sup>st</sup> century obesity is considered as an “epidemic” disease of modern civilization. International statistics estimate that over the next 10 years, obesity will make more victims than smoking [1]. On the other hand it had been estimated that 80% of heart diseases, strokes and diabetes type II and 40% of cancers could be avoided if risk factors like obesity should be eliminated [1].

It had been demonstrated, according with the trend of increasing incidence of obesity in European Union countries, that deteriorating of diet regarding its quality and a decrease in practicing physical activity in childhood could be the basis of the disease. The direct consequence is that childhood obesity is increasing in both the United States America, and in European countries [1]. In Romania there are not many data regarding the incidence of the obesity in childhood but a briefly analyze of the social, economic and cultural environment allowed the presumption that are proper condition for promoting obesity. Spending increasingly more time indoors, watching television or computer programs, lower interest in sport as a mean

of recreation, and an eating pattern strongly influenced of advertisement but out of parental and educator’s control, are sufficient mechanisms for overweight and obesity at early ages. Approximately 80% of overweight adolescents will remain so during adult life or even become obese adults which will have serious consequences for future adult health, increased risk of cardiovascular degenerative diseases, cancer, hypertension, type II diabetes, locomotion disorders and depression.

The aim of the study is to determine the prevalence of obesity in adolescents in district Brasov and to analyze alimentary pattern and to establish a possible cause-effect relationship between these.

## MATERIAL AND METHODS

We conducted a prospective study between March 2018 and March 2019, in a high school in Brasov city. The study included 250 students, boys and girls, aged between 12 and 18 years old. Before including each subject in the study-group all parents were asked to give the written consent for participating at study.

The study design comprised two stages.

First stage, all children underwent a complete clinical examination at the medical office, in the presence of medical nurse and medical school doctor. The examination was performed with subject wearing shirt and short, in an ambient with thermal comfort.

There were performed for every subject measurement of:

- Weight (W), using electronic scale (EKS) with a deviation of 0,1 kg
- Height (H), using pedometer Electro metal with a deviation of 0,1 cm

It had been calculated body mass index (BMI) according with formula:

$$\text{BMI} = \text{Weight} \times \text{Height}^{-2} \text{ (kg} \times \text{m}^{-2}\text{)}$$

The BMI data were evaluated according with the recommendation of "Centers for Disease Control and Prevention" [2-4].

- blood pressure (BP) values included in the study were considered the arithmetic average of three measurements made at 1 minute interval with subject in clinostatism, at right arm using an sphygmomanometer Fazing calibrated. The values obtained were analyzed and interpreted according with "The Fourth Report on the Diagnosis, Evaluation and Treatment of High Blood Pressure in Children and Adolescents. National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents" [5,6].

The second stage of the study consisted of a questionnaire distributed to all children.

Subjects were encouraged to answer to the questions themselves, with sincerity, under protection of anonymity especially regarding alcohol consumption and smoking. Parental intervention was asked only about family history of chronic disease. The confidentiality of responses was an important issue so that subjects could answer honestly without fear of making public the answers and of ant repercussions from parents or educators.

The questionnaire had included the following:

- Identification data: name, age, gender;
- A family history: the presence of chronic diseases in first and second degree relatives. There were of interesting for the study diseases like: essential hypertension, cardiovascular disease as myocardial infarction, stroke, obesity, dyslipidemia, type II diabetes (we admitted the participation of the parents at this point);
- Meals / day: regular / irregular (motivation); we consider regular meal timetable: breakfast, lunch and dinner and two snacks at 10,00 am and 4,00 pm.
- Data related to the regularity of consumption of fruits and vegetables; it had been requested an accurate frequency appreciated as it follows: frequently – at least once per week, occasionally – at least once per month, never;

- Data related to the consumption of "fast food": frequently, occasionally, never;

- Data related to the consumption of carbonated sweetened beverages: frequently, occasionally, never;

- Data related to participation in physical education classes in school: yes / no (free medical / other reasons)

- Data related to the habit of sport practicing as recreation: yes /no;

- Data regarding the evaluation of the children's knowledge about obesity: evaluated with answer yes (children have knowledge) / no (children have not knowledge);

- Data regarding the necessity of a medical educational program in schools about obesity: evaluated with answer yes (it is necessary) / no (it is not necessary).

Data were statistically analyzed.

## RESULTS AND DISCUSSIONS

Clinical examination, measurement of weight and height and BMI calculation, and blood pressure measurement were performed for all 250 participating children (100%) – 56% boys (no = 140) and 44% girls (no = 110). The demographic and clinical characteristics of the study group are presented in (Table 1). Mean age was 15,12 years. The distribution between normal weight and overweight was 226/250 (90,4%) and 24/250 (9,6%). The prevalence of overweight was 5,8% for girls and 3,8% for boys. There were no children with obesity. Blood pressure, systolic as well as diastolic values were normal for age, gender and height according with the criteria included in "The Fourth Report on the Diagnosis, Evaluation and Treatment of High Blood Pressure in Children and Adolescents. National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents" [5,6]. There were not children with criteria of hypertension or high –normal blood pressure.

**Table 1:** Demographic and clinical characteristics of study group.

Parameters	Values
Age mean (years)	15,12
<b>Gender</b>	
Male (%)	56
Female (%)	44
<b>BMI (kg•m<sup>-2</sup>)</b>	
Male, mean	21,57
Female, mean	21,45
Normal weight (%)	90,4
Overweight (%)	9,6
<b>Blood pressure</b>	
SBP, mean (mmHg)	102,16
DBP, mean (mmHg)	66,33
<b>Family history*</b>	
Positive (%)	47,2
Negative (%)	52,8

BMI = Body Mass Index; SBP = Systolic Blood Pressure; DBP = Diastolic Blood Pressure; \***Family history:** The Presence of Essential Hypertension, Obesity, Diabetes Mellitus Type 2, Dyslipidemia, Chronic Cardiovascular Pathology.

The distribution of the number of subjects on age – groups is shown in (Figure 1). The groups aged 13-14 years old and 14-15 years old had 25 subjects and the others groups had each one 50 subjects.

The distribution on gender of the subjects was balanced and it is shown in (Figure 2).

BMI was calculated for both gender, boys (BMI mean value = 21, 57 kg·m<sup>-2</sup>) and girls (BMI mean value = 21,45kg·m<sup>-2</sup>). BMI trend was to grow up with the age for boys as well for girls which could be considered a physiologic one but it has to be pointed out that the analyze of the BMI in subjects over the 17 years old, both boys and girls, met the criteria for overweight with values over the 95<sup>th</sup> for age and gender. There were 60 cases of overweight (24%). The majority of children (190 cases, 76%) had normal BMI for age and gender. There were no significant differences in terms of mean of BMI between boys and girls (BMI = 21.57 kg·m<sup>-2</sup> for boys and BMI = 21,45 kg·m<sup>-2</sup> for girls). For boys, the critical age was between 15 and 18 years of age with a slightly decrease for the 16 to 17 age-group and for girls, the critical domain was between 16 and 18 year of age. This could be due to a lot of reasons, some of them physiologic, as sexual maturation, gain of muscular mass but also to some particular characteristics

of this age connected with social, emotional and psychological changes. During adolescence period the children became more independent regarding a lot of aspects including dietary. The results are shown in (Graphic 1,2).

Blood pressure values were normal in all age-groups both in boys and girls. The mean value of systolic blood pressure was 102,16 mmHg and for the diastolic blood pressure was 66,33 mmHg.

Family history was obtained for each subject through the questionnaires. Children could ask parents about the information regarding family history. There were considered positive the presence of one or more of: essential hypertension, obesity, dyslipidemia, and diabetes mellitus type 2, chronic cardiovascular diseases. Positive family history was in 118 subjects (47,2%) and negative in 132 (52,8%) (Figure 3). All the subjects included in “overweight” group (60 children) had positive family history, and also 58 children from “normal weight” group. Children with positive family history for cardio-vascular risk factors should be the target of “preventive medicine”. They and their families should be advised about the necessity of dietary changes, life style changes including practicing regular sport or physical activities, avoiding or diminishing the consume of fast-food and beverages. They represent the future adults at risk for cardiovascular diseases. Studies had demonstrated that these children had already an “obesity-like” pattern of gaining weight in next years

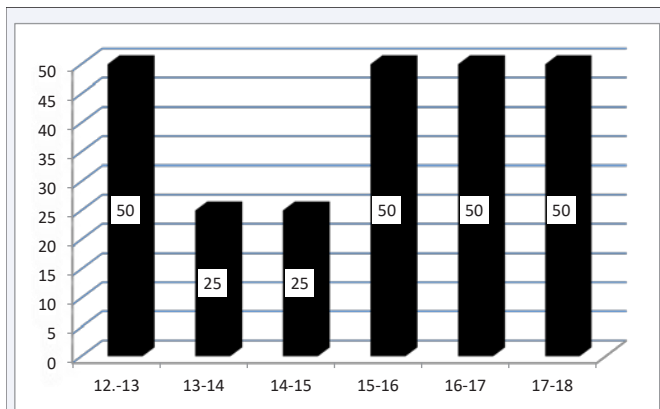


Figure 1 The distribution of the cases on age-groups.

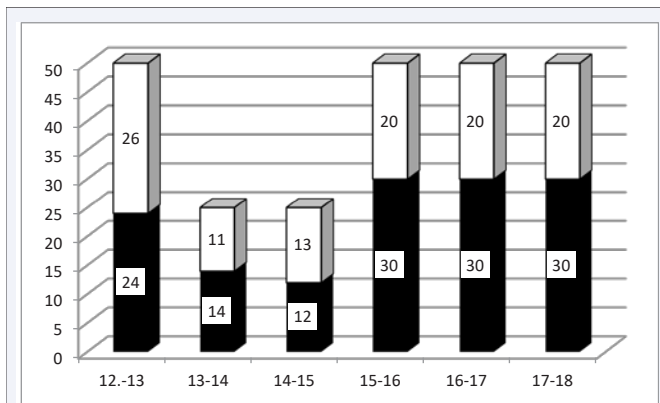
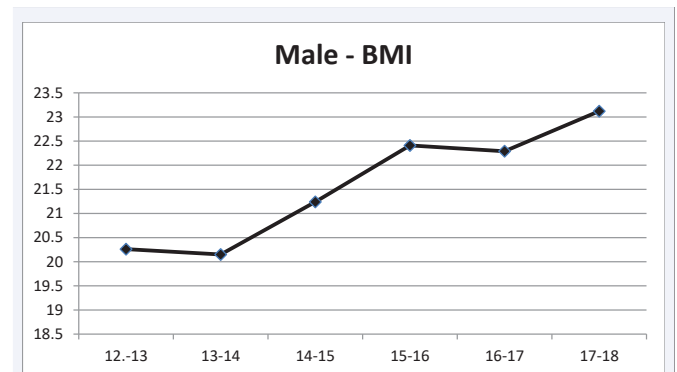
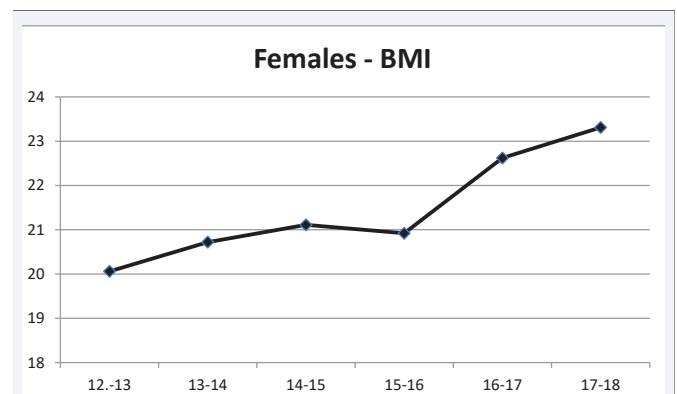


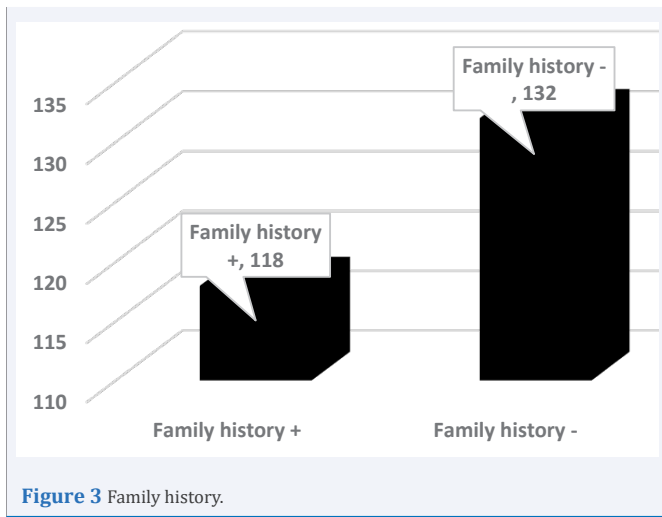
Figure 2 The distribution of the cases on gender and age-groups.



Graphic 1: Meal timetable.



Graphic 2 The distribution of BMI in females. Fruits dietary – all the children consume fruits.



and during adulthood, and it is very likely they already have stiffness of carotid artery [7] and early atherosclerotic structural changes of the vessels, subclinical modifications [8,9].

The data obtained through questionnaires were processed. Because of the difference of number of cases in group 2 (age – group 13-14 years) and group 3 (age-group 14-15 years) each of them having 25 subjects comparative with the others groups of age with 50 subjects, the results were expressed in percentages to maintain the real proportion.

The first extensive study conducted in children was “Bogalusa Heart Study” who pointed out at that time that alimentation in children from two years old should worry both parents and physicians [10]. The diet, described as “typical American” for ‘80-’90 years, had a very high level of fat and sodium and a low contain in fiber. The impact was even higher when the information was correlated with pathological studies in children who died in car accident and at whom were present in the aorta atherosclerotic plaques beginning with 3 years of age, and in the coronary arteries over 10 years of age [11]. Moreover, these findings were not associated only with dietary but also with obesity, blood high level of low density lipoprotein --cholesterol (LDL --Cholesterol) and high blood pressure. The more risk factors involved the greater atherosclerotic plaques extension [12].

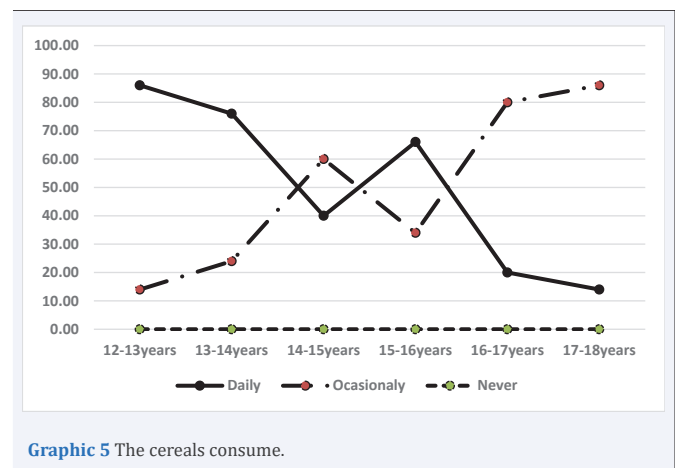
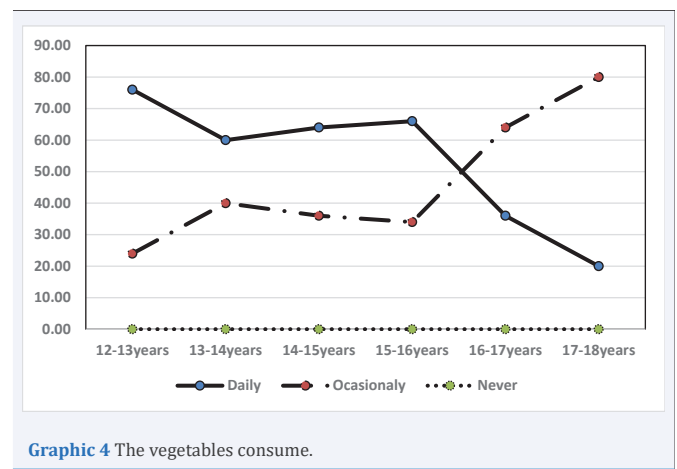
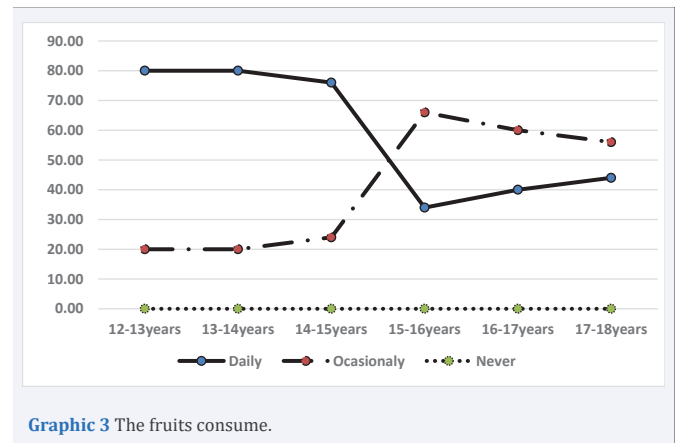
After processing the data obtained from questionnaires the results were as it follows.

The consume of fresh fruits and vegetables was present in all children included in study. Until 15 year old age the daily consume was constantly present. After this age a slightly decrease had occurred with a slightly increase in adolescents. The presence of the fruits in children dietary became “weekly” instead of “daily” (Graphic 3,4).

The habit of eating cereals was present at all age-groups. As it was expected, the frequency of eating cereals decreases with increasing in age. Until 14 year age majority of subjects used to eat (43/50 in age-group 12-13 year and 19/25 in age-group 13-14 year). Starting with age 15 year the consume decreased dramatically (12/50 at age-group 15-16 year, 10/50 at age-group

16-17 year and 7/50 at age-group 17-18 year). A weak point of this study was that there was not specified what kind of cereals were consumed. It is well known that children prefer sweetened chocolate cereals instead of whole grains which are less tasty. Common cereals in supermarket dedicated to children are with addition of sugar, chocolate, taste enhancers, and for this reason they are not healthy anymore (Graphic 5).

Over 15 year of age food preferences changed dramatically with evident decreasing in fresh vegetables and fruits and cereals consume.

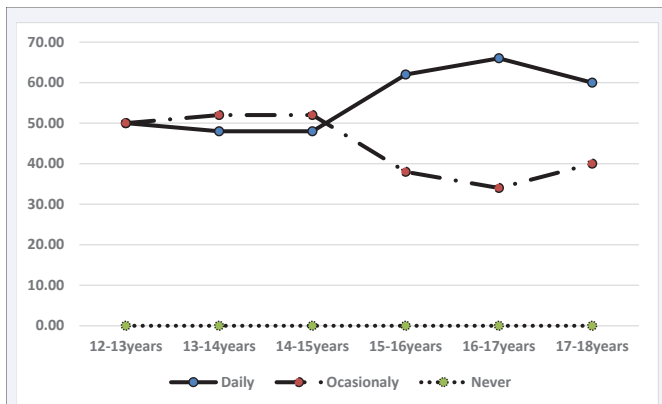


The habit of fast-food consumption was present in all age-groups (Graphic 6). Between 12 and 15 year the daily and weekly consume was almost in the same average, 25/50 (age-group 12-13 year) and 12/25 and 13/25 (age-group 13-14 year) and 12/25 and 13/25 (age-group 14-15 year). As the age increased the daily consumption of fast-food increased and the occasionally consumption decreased showing the typical alimentary preference in adolescence. This issue is of the most importance because intake of high energy food then requirements associated with encourages sedentary behavior and decrease of physical activity is strongly connected with obesity [13]. A study of Bowman *et al* [14] had shown that regular consume of fast-food is less healthful because of the high level of energy, the high energy density per gram, higher fat intake with low fruits and vegetables intake. There are data suggesting that consumption of fast food by children has increased by 300% in two decades [15].

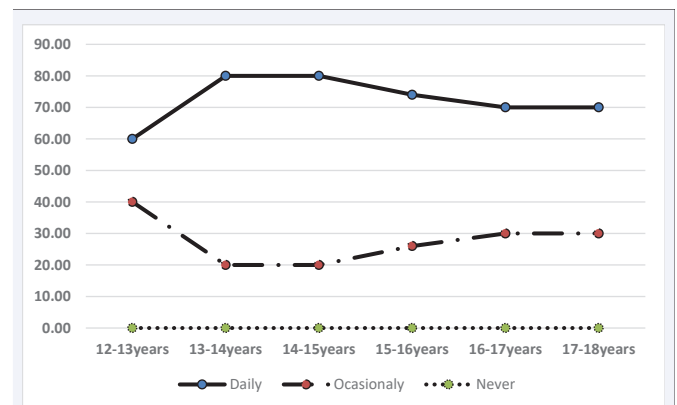
Soft drinks consumption habit, especially sweetened and carbonated, was present in all subjects. The lowest daily consumption was in first age-group (20/50 subjects). The highest daily consumption was between 14 and 16 years old, decreasing constantly after age 16 (Graphic 7,8). Usually soft drinks are not considering by children and even parents by having a great impact of diet and energy intake. They are assimilated with water consumption which is so wrong. In last decades the quantity of soft drinks had raised dramatically and should be account as an important source of sugar [16]. One prospective study had reported a positive association between consumption of sugar-sweetened drinks and obesity [17].

High energy diet intake as a result of increased consumption of fast-food and soft drinks, erratic food supply correlated with sedentary behavior is the milestone of obesity in adulthood [18] and probably, also in children [13].

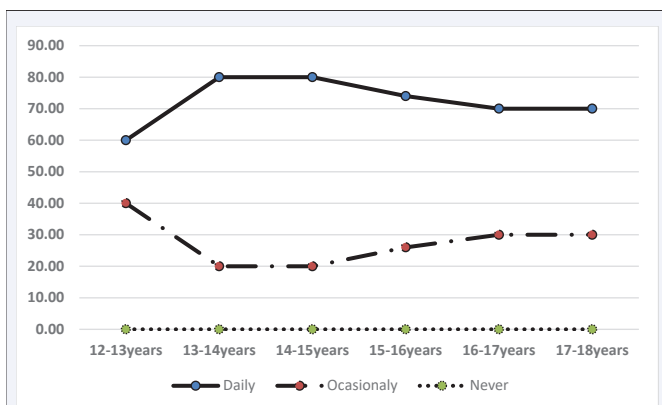
Meal timetable is shown in (Figure 4). Subjects included in primary school program had regular meal timetable in a greater percentage then subjects attending high school program (90% in 12-13 years, 86% in 13-14 years, 80% in 14-15 years age-groups vs 44% in 15-16 years, 38% in 16-17 years and 44% in 17-18 years age-groups). Most of children declared as main reason for failure of a regular meal timetable hard school program, homework, and extracurricular duties and private lessons. The last three age-groups especially complained about it claiming a constantly, permanently increased pressure from school, professors and parents. The crowded educational program was also the main reason for preferring quick snacks and fast-food which allowed them to save time. The majority of subjects, 186/250 (74,4%) used to skip breakfast and this habit makes them at increased risk of weight gain [19,20]. All of them complained that there was no enough time to eat on time, two dishes at lunch time. Dinner was late in the night when subjects reached home or they used to skip dinner and preferred to eat snacks during the afternoon. In adults, some experimental research had shown changes in the number of eating episodes per day had little effect on body weight<sup>13</sup>. Snacks with high energy intake delayed the request



Graphic 6 The fast-food consume.



Graphic 8 T Sport playing.



Graphic 7 The beverages consume.

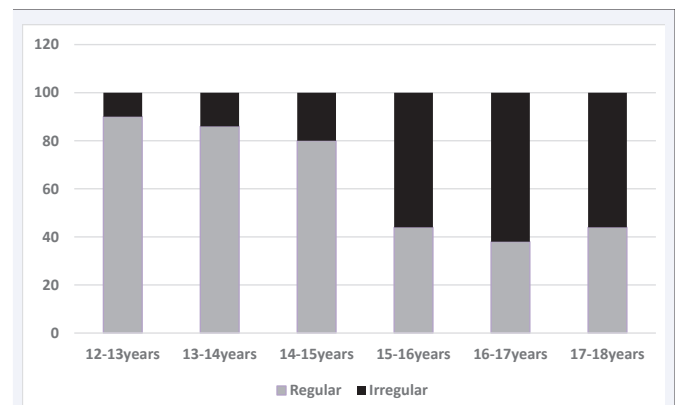


Figure 4 Meal timetable.



for the next meal with less than an hour and did not reduce the energy consumed at the subsequent meal [21-23].

Regarding the habit of playing sports, all the subjects were attending hours of physical education included in the school curriculum. Practicing sport outside the school, was present in 165/250 subjects (66%) most of them children in primary school. As the age of the subjects increased was observed a decreased in practicing sport outside school. Lack of time for relaxation because of homework was the main reason for practicing less sport and all the subjects admitted that they would like to spare more time with physical activities.

These results are suggestive for a sedentary "lifestyle" which is favorable to obesity in children. The results are similar with other previous studies which had demonstrated a while ago a marked decrease in physical activity in the older and preadolescent child [24]. Some studies in United Kingdom had shown that children appear to become less active as they get older, and in adolescence physical activities decrease significant [25].

So called "obesogenic" environment involved in unfavorable outcome of the overweight children. Although in the study group there were not obese children, the prevalence of the overweight 24% is worrying considering that "obesogenic" environment it will maintain and even worsen. This means that in early adulthood these children will become obese adults who will associate other cardio-vascular risk factors. Not only environment but also micro-environment created at home, in families, has a great impact on the future of offspring. The family life style, including eating behavior, playing sport habit, and the time spent at TV [26] plays an important role in determining the risk for obesity [27-29]. Energy expenditure is part of the obesity equation. Any failure of energy expenditure will contribute to the development of obesity. Data suggest a reduced walking and cycling behavior and an increased using of cars to travel from home to school or to other extracurricular activities [30,31].

Assessment of knowledge related to obesity showed that only 91/250 subjects (36,4%) knew about obesity, causes and connection with diet and sport while 159/250 (63,6%) considered obesity a problem of image and not of health referring to the beauty pattern offered by the media. This observation brings into question the need for a more aggressive and efficient educational program regarding obesity in the schools.

In conclusion, the main finding of the study is the failure of a healthy diet as the children get older. Paradoxically this failure is strong connected with school field, the place where children spend most of their time. Busy school curriculum, lack of basic nutrition and obesity information, lack of any control from school and professors of children alimentation and lack of control over food scams in the vicinity of the school where children are supplied may be the cause of poor alimentary diet. The older the children the higher preference for fast food and soft drinks. For sure there is an association between eating pattern and overweight which suggest that quick and drastic intervention should be taken as soon as possible.

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