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Anthropological-medical aspects of feeding behavior of children in modern society

Adina Baciu *

Institute of Anthropology "Fr. I. Rainer", Romanian Academy, Bucharest, Romania

* Corresponding author; Email: adinabbaciu@yahoo.com

ABSTRACT

Background: The field of nutrition research have shown that an appropriate nutritional balance for each professional occupation, age and environment in which the individual lives, is the ideal solution to prevent profound physiological changes.

Aim & Objectives

1. To understand the influence of the modern society on children physical development and diet.
2. To analyse from a medical anthropology perspective, a serie of factors and actual tendencies which led to a change in diet and consequently to the increase of the percetenge of overweight children.
3. To promote a balanced and healthy diet and life style at an early age.
4. To suggest recommendation.

Methods/Study Design: The study was conducted in Bucharest in 2010 on a sample of 472 subjects (11-14 years old), through medical and anthropometric examination. Questionnaires with 32 items relating to eating habits were used. The results were processed using statistical methods and compared with those obtained in 1977 on a control group of 142 children from Bucharest. In the study only children from a school with a standard schedule of 4-5 hours per day were included.

Study Design: Cross-sectional prospective study.

Consent: The study was conducted with parents' written consent, and the interviewed persons had the opportunity to withdraw at any time. Confidentiality respected Romanian and European legislation in force. During the research no person has withdrawn from the study.

Results/Findings: The percentage of children in the control group (34.55% male, 18.39% girls) who ate meat or sweets daily (32.73% male, 24.14% girls) was about equal, the difference being statistically insignificant ($p>0.05$). The percentage of girls in the study group (29.66%) who ate meat every day is less than those who ate sweets daily (42.97%), the difference being statistically significant ($p<0.05$). For boys the difference is statistically insignificant ($p>0.05$). The percentage of children who do have dinner in the study group (4.31% male, 6.84% girls) and in the control group (10.91% boys, 9.20% girls) is lower than those who do not eat anything in the morning (9.09% male, 15.59% girls-the study group and 18.18% boys, 13.79% girls-control group) and at noon (boys 5.26%, 8.75% girls-group study and 20.00% boys, 17.24% girls-control group), with a statistically significant difference ($p<0.05$).

Conclusion: Higher consumption of sweets, snacks, high percentage of children who consume cooked meal, meat or cheese in the evening, as well as those who eat in front of the television have contributed to increasing the percentage of overweight children in the study group compared to the control group, the difference being statistically significant ($p<0.05$).

The increase is significantly higher in the analysed sample of both boys and girls and requires that parents and children are better informed on the effects of an unhealthy diet on children development.

Keywords: Food, children, modern society

INTRODUCTION

Economic globalization has long been a recognized phenomenon that poses new problems often impossible to decipher. The expansion of the activities of large producer countries beyond their specific activities determined the expansion of some specific activities with influence on the communities concerned, and at the same time with effects on lifestyle, including diet. Food is strongly influenced by modern technology in many sectors. In the human ecosystem, food and nutrition is one of the most important parts. These have evolved in line with the standard of living, the change in the people's concepts, and with the science development. Healthy eating is a concept imposed by the fast pace of modern life. What is consumed not only affects health at the time, but determines the life quality and expectancy. Food and nutrition are important not only because of their impact on individual health status, but also due to the many risks associated with the technological and environmental factors. The role of food industry and culinary production units in ensuring a healthy diet is amplified by the research of the human nutrition and health and hygiene regulations, including those on food pollution, on one hand, and by the increasing consumer demands with regard to product quality, packaging and distribution, on the other hand (Dima & Pamfilie, 2006).

A proper diet implies a variety of food. The exclusion of a product or multiple products from the diet deprives the body of the possibility of optimal selection of the components needed for the synthesis of own compounds, because each food has its specific composition and therefore contains some substances that are not found in other products. These substances, even in very small amounts may influence the health and the development of the individual. Nutrients body requirement varies among individuals and inter-group, but even in the case of the same individual they may vary with age. Deviations of the body size of genetic causes are overlooked, being generally considered insignificant for the individual and society. But if these deviations of growth and development are determined by environmental or nutritional factors, the problem becomes more significant, and it is often accompanied by an increased susceptibility to infections, behavior change in various social situations (Ionescu-Târgoviște, 1981).

In the traditional diet, around 60-70% of the energy provided by food is supplied from starch and other complex carbohydrates, while sugar contributes in a small proportion to the daily energy intake, around 70% represents fat mainly of animal origin, while protein substances contribute with 10-14%. Modern diets have developed based on these proportions which we find by association in a range of food. The typical food of the industrialized countries is characterized by a higher energy level than necessary, supplemented by significant amounts of fat, sugar and cholesterol, while fruits, vegetables and starchy derivatives are the most underrepresented. As a result of these habits the health problems caused by dietary factors have extended and amplified (Brown, 1999). To enhance children's nutrition and health status, efforts should be on strategies that increase dietary diversity (Ekesa et al., 2009, Zugravu et al., 2009).

The past 20 years the prevalence of overweight and obesity has increased radically. An important contributor to overweight is an inadequate food intake, which is mainly prevalent

among low socio-economic groups. Different studies have shown that food prices may be an underlying factor for this phenomenon (Waterlander et al., 2010). Although various factors contribute to rising obesity levels, it has been suggested that the 'obesogenic environment' is fundamental (Macdonald et al., 2010, Tewfik, 2008). Obesity is associated with increased prevalence of type 2 diabetes and hypertension and introducing simple anthropometry is useful for early detection of obesity and its' comorbidities (Hai, 2010).

Internationally, due to the increase of the negative effects of unsupervised diets, especially in developed countries with highly diversified product offerings, the focus has increased on the study of nutrients impact on the metabolic balance and also on the importance of food balance and its effects on health. Feeding practices are influenced especially by certain elements specific to each individual living in a certain environment, economic, social and even aesthetic. Modern living conditions have greatly diversified traditional foods, and sedentarism has created a gap between the need and consumption. The most urgent need of contemporary man is to achieve a permanent balance between the requirements of the organism and the quantities of nutrients consumed via food. The field of nutrition research have shown more than ever that a nutritional balance, which is appropriate for each professional occupation, age and environment in which the individual lives is the ideal solution to prevent profound physiological changes, especially since they are irreversible (Pamfilie, 1996). An important role in ensuring a healthy diet lies with the nutritionists, food industry professionals, food specialists and services who must ensure through the food offer range a nutrition balance, and diverse menus that contain food of both animal and vegetal origin. In order for the consumer to adjust to and properly use the existing offer in food market, he/she should be educated since childhood to consciously choose the best food sources for his health. Balanced diet and especially opportunities to put knowledge into practice without further physical and economic efforts, may be the result of an appropriate education not only in the communities where we live, but also at the individual level.

The study aims to: understand the influence of the modern society on children physical development and diet; analyse from a medical anthropology perspective, a serie of factors and actual tendencies which led to a change in diet and consequently to the increase of the percentage of overweight children; promote a balanced and healthy diet and life style at an early age; suggest recommendation.

MATERIALS AND METHODS

This study was conducted in 2010 on a group of 472 subjects, with age between 11 and 14 years, of which 263 (55.72%) were girls and 209 (44.28%) boys. The group, consisting in students in Bucharest, was subject, to a medical and anthropometric examination. Anthropometric data of children consisted of the following variables: height, weight, chest circumference, abdominal circumference. Several questionnaires, 32 items in total, which included questions about eating habits, were used. The questionnaires were based upon the rational approach. They were constructed based on questions with single answers and following a preliminary statistical test, the unrelevant items were eliminated. The questionnaires in 2010 contain some questions with multiple variants from those of 1977 because in our country has increased the supply of foodstuff products in recent years. The results were processed using statistical methods. The results of this study were compared with those obtained in 1977 on a control group, consisting of 142 children (87 - 61.3% girls and 55 to 38.7% boys) from a school in Bucharest.

The number of the subjects is different in the samples due to the following two reasons:

1. Based on the preliminary statistical analysis we noticed significant statistical differences ($p < 0,05$) both concerning the antropometrical data, and the diets of the two samples, which determined us to continue the 2010 study on a higher number of children to see if the same tendencies are registerd.
2. The relatively high percentage of overweight children in the sample for the preliminary statistical anlysis had stimulated the parents' interest in this study and they requested that a higher number of children should be included in the sample analysed.

Inclusion criteria: Following criteria were used to include subjects in the present study:

- ✓ Children of age between 11 and 14 years, with parents consent;
- ✓ Children enrolled in a school with a standard schedule of 4-5 hours per day.

Exclusion criteria: Following criteria were used to exclude the subjects from the present study:

- ✓ Children younger than 11 years;
- ✓ Children from boarding schools;
- ✓ Children of whose parents did not consent to the study.

The criteria were similar both in 2010 and in 1977.

Consent: The study was conducted with parents' written consent, and the interviewed persons had the opportunity to withdraw at any time. Confidentiality respected Romanian and European legislation in force. The method used is a non-invasive and no risks investigation. During the research no person has withdrawn from the study.

Study Design: Cross-sectional prospective study.

In the statistical processing, a database with data on children investigated was set. As part of the statistical analysis there were calculated several statistical indicators with great power of synthesis such as averages, standard deviations, minimum values, median values, modal values (for quantitative variables of individuals), proportions or percentages (for qualitative variables), and a statistical comparison of the correlation (association) indicators of the variables listed above was performed.

For the comparison of the mean values of the quantitative variables the test "t" (test, "Student") was used. If the calculated value of the test was "lower" than the critical value T_t (read from special tables prepared for the distribution of Student accurately risk-based or offered by computer), it was considered that the difference between the average values statistically significant (marked by 'ns'), in which case p - value (or risk, " p ") $> 0,05$, and if the calculated value of the test was "bigger" than the critical value T_t read from tables ($p < 0,05$), was considered a statistically significant difference between the average values.

In the second case, depending on the values of p were considered cases:

- $0,01 < p < 0,05$, difference is statistically significant;
- $0,001 < p < 0,01$, difference is statistically very significant;
- $p < 0,001$, the difference is highly significant.

RESULTS AND DISCUSSION

Table 1: The structure lots by gender

Gender\ Groups	Study group		Control Group		Total	
	No.	%	No.	%	No.	%
Girls	263	55.72	87	61,3	350	59.25
Boys	209	44.28	55	38,7	264	40.75
Total	472	100,0	142	100,0	614	100,0

In the table above is to be noticed that the percentage of girls is higher in the analysed sample.

In Tables 2-5 and Fig. 1-2 presents the main statistical indicators of variables: height, weight, chest area, abdominal area, as well as comparative data between groups and sexes. A special place was given to body mass index (BMI).

Table 2: Statistical indicators of anthropometric variables in study group

Varia./Ind. Fic.		Minimum	Maximum	Average	Std.Dev.	C.V.%	N
Height (cm)	Girls	134.10	173.60	156.60	7.54	4.82	263
	Boys	125.50	186.10	157.29	10.94	6.96	209
Weight (kg)	Girls	27.00	84.00	48.37	10.22	21.12	263
	Boys	31.00	78.00	49.04	11.61	23.68	209
B.M.I.	Girls	12.72	31.62	19.59	3.22	16.42	263
	Boys	13.84	28.94	19.62	3.05	15.57	209
Chest area (cm)	Girls	61.50	103.00	80.25	7.87	9.81	263
	Boys	60.50	111.50	78.90	9.33	11.82	209
Abdominal area (cm)	Girls	53.00	96.50	68.33	7.65	11.20	263
	Boys	56.00	106.50	71.99	9.38	13.03	209

Std. Dev. = Standard Deviation (S.D.)

Table 3: Statistical indicators of anthropometric variables in the control group

Varia./Ind. Fic.		Minimum	Maximum	Average	Std.Dev.	C.V.%	N
Height (cm)	Girls	118.00	174.00	146.51	16.86	11.51	87
	Boys	109.00	176.00	145.27	17.23	11.86	55
Weight (kg)	Girls	19.00	77.00	43.18	17.76	41.13	87
	Boys	20.00	76.00	41.22	16.66	40.42	55
B.M.I.	Girls	11.48	34.18	19.13	4.30	22.48	87
	Boys	12.40	26.93	18.68	3.76	20.13	55
Chest area (cm)	Girls	43.00	95.00	65.86	11.65	17.69	87
	Boys	50.00	83.00	65.40	8.80	13.46	55
Abdominal area (cm)	Girls	49.00	110.00	66.53	12.61	18.95	87
	Boys	50.00	112.00	64.40	11.03	17.13	55

Table 4: Test "T" between the groups of girls studied and control group

Dimensions	Average	Std.Dev.	N	Average	Std.Dev.	N	T test	P value
Height (cm)	156.60	7.54	263	146.51	16.86	87	5.41 s	0.001***
Weight (kg)	48.37	10.22	263	43.18	17.76	87	2.59 s	0.030*
B.M.I.	19.59	3.22	263	19.13	4.30	87	0.92 ns	0.346
Chest area (cm)	80.25	7.87	263	65.86	11.65	87	10.74 s	0.00005***
Abdominal area (cm)	68.33	7.65	263	66.53	12.61	87	1.26 ns	0.246

* $p \leq 0.05$ (statistically significant difference)
 ** $p \leq 0.01$ (statistically very significant difference)
 *** $p \leq 0.001$ (statistically highly significant difference)

Table 5: Test "T" between the group of boys studied and control group

Dimensions	Average	Std.Dev.	N	Average	Std.Dev.	N	T test	P value
Height (cm)	157.29	10.94	209	145.27	17.23	55	4.92 s	0.001***
Weight (kg)	49.04	11.61	209	41.22	16.66	55	3.28 s	0.012*
B.M.I.	19.62	3.05	209	18.68	3.76	55	1.71 ns	0.125
Chest area (cm)	78.90	9.33	209	65.40	8.80	55	9.99 s	0.00001***
Abdominal area (cm)	71.99	9.38	209	64.40	11.03	55	4.68 s	0.001***

* $p \leq 0.05$ (statistically significant difference)
 ** $p \leq 0.01$ (statistically very significant difference)
 *** $p \leq 0.001$ (statistically highly significant difference)

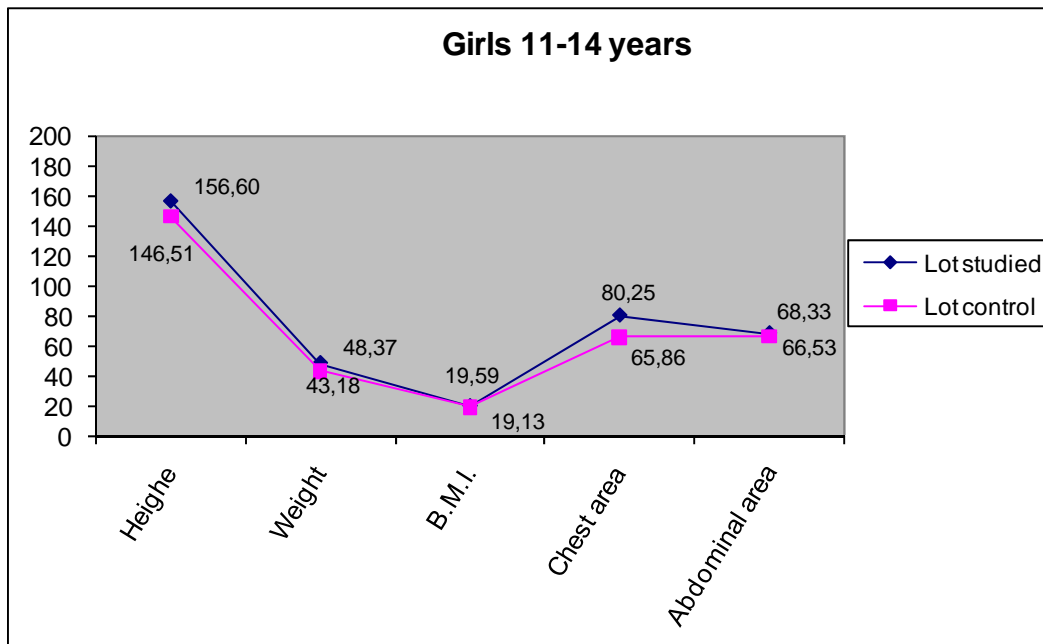


Fig. 1: The level comparison between study group and control group the mean values of anthropometric variables of the girls

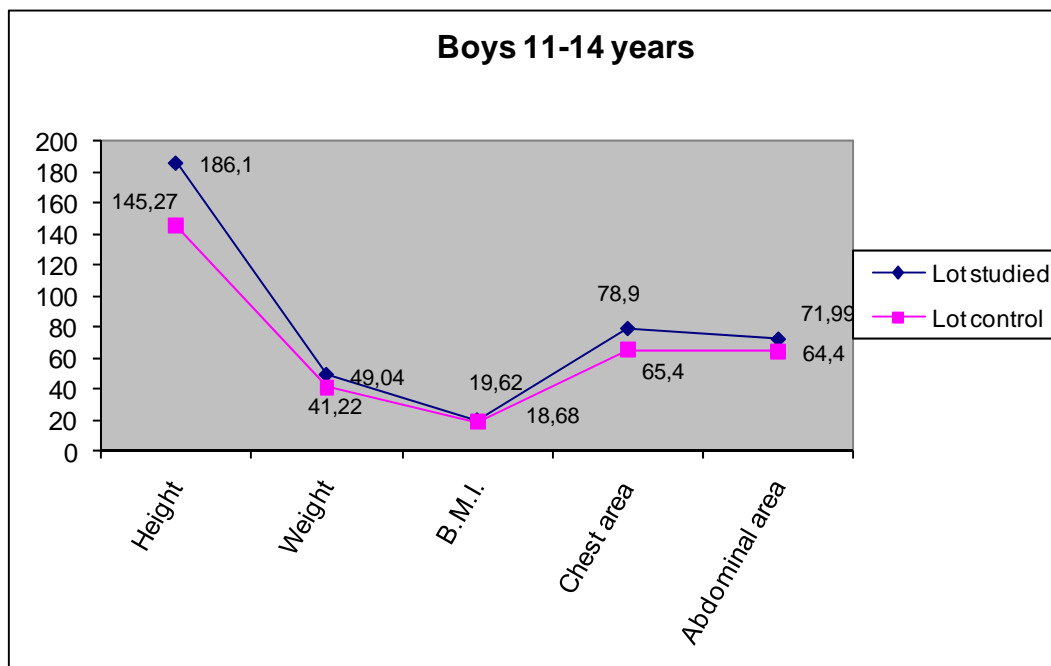


Fig. 2: The level comparison between study group and control group the mean values of anthropometric variables of the boys

By applying the test, "t" to compare mean values of anthropometric variables considered in this paper (Tables 2-5 and Fig. 1-2) between the study group and control group were shown the following:

- The statistically significant difference ($p < 0.05$) at both boys and girls on height, weight, thoracic perimeter, within the meaning of values in subjects older study group (studied in 2010) than the control group (studied in 1977);
- The statistically significant difference ($p < 0.05$) in the abdominal area boys on the meaning of values in subjects older study group compared to the control group;
- It can not be judged the statistically significant difference ($p > 0.05$) between the structures of the body mass index (BMI) between both groups and between sexes.

Among the indicators presented in Tables 2-5 we retained body mass index (BMI), on which subjects were grouped into categories: underweight, normal weight, overweight and obese - thinking the body mass as a variable quality of corporeality. The structural distributions of lots of children in the sexes according to weight status are presented in the Table 6 and Figures 3-6. The percentage of obese children ($BMI \geq 30.00$) in both groups was not significant, which is why I included them in the overweight category.

Table 6: The structure lots of children according to gender depending of weight status - BMI categories

Weight status/Lots	Lot studied				Lot control			
	Girls		Boys		Girls		Boys	
	N	%	N	%	N	%	N	%
Underweight: B.M.I. < 18,50	104	39.54	89	42.58	44	50.57	32	58,18
Normal weight: B.M.I.: [18,5;24,99]	144	54.76	102	48.8	39	44.68	19	34.55
Overweight:								

B.M.I.: [25,0;29,99]	15	5.7	18	8.62	4	4.75	4	7.27
Total	263	100.0	209	100.0	87	100.0	55	100.0

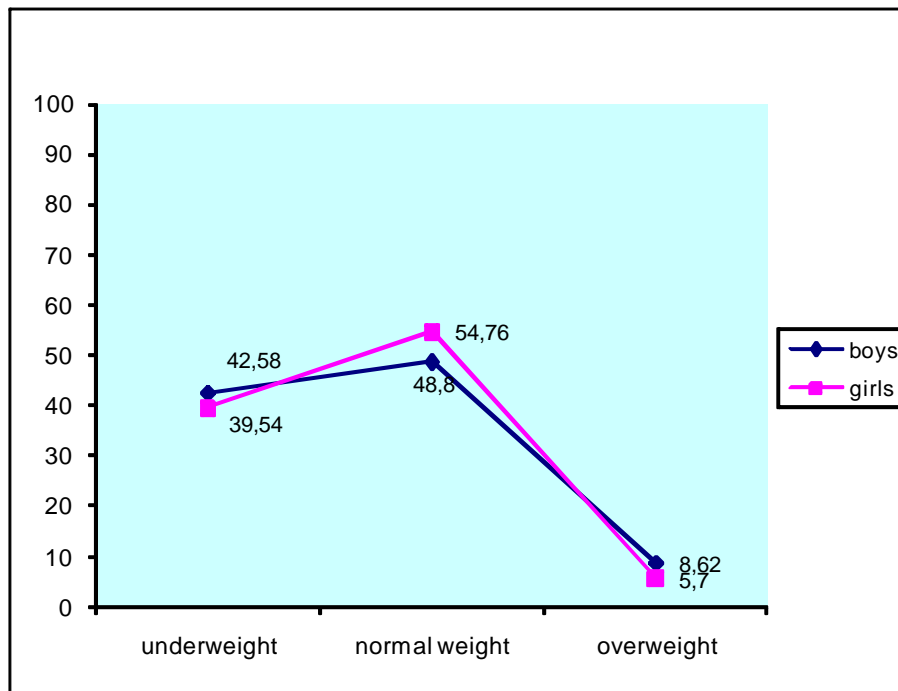


Fig. 3: The structure of the study group by sex according to weight status

According to Table 6 and Figure 3 of the study group, most children are normal weight. There is a statistically significant difference ($p < 0.05$) between boys and girls in underweight and overweight categories, the percentage of boys in these categories were higher than girls.

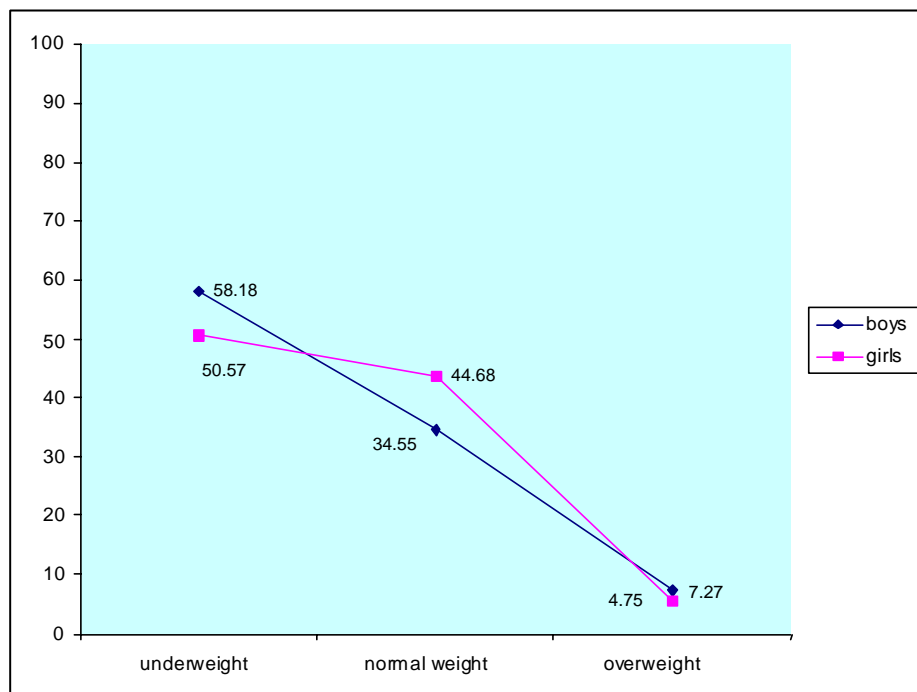


Fig. 4: The structure of the control group by sex according to weight status

Table 6 and Figure 4 show that in the control group the majority of children are underweight. There is a statistically significant difference ($p < 0.05$) between girls and boys in the control group, meaning that the percentage of underweight and overweight boys more than girls. The percentage of normal-weight girls is higher than boys.

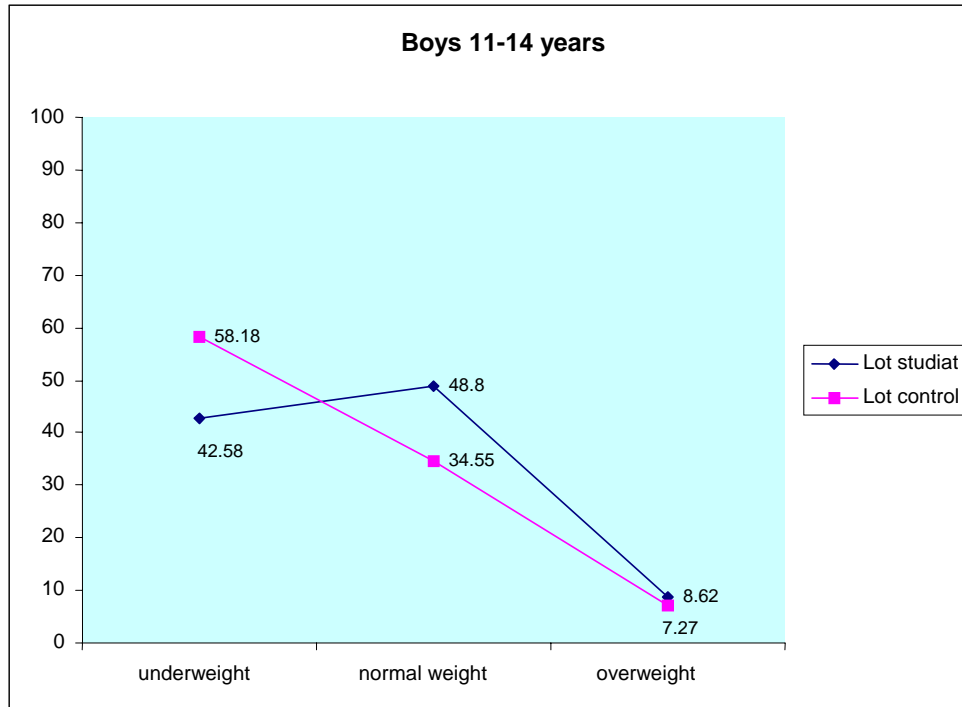


Fig. 5: The structure lots of gender (boys) by weight status

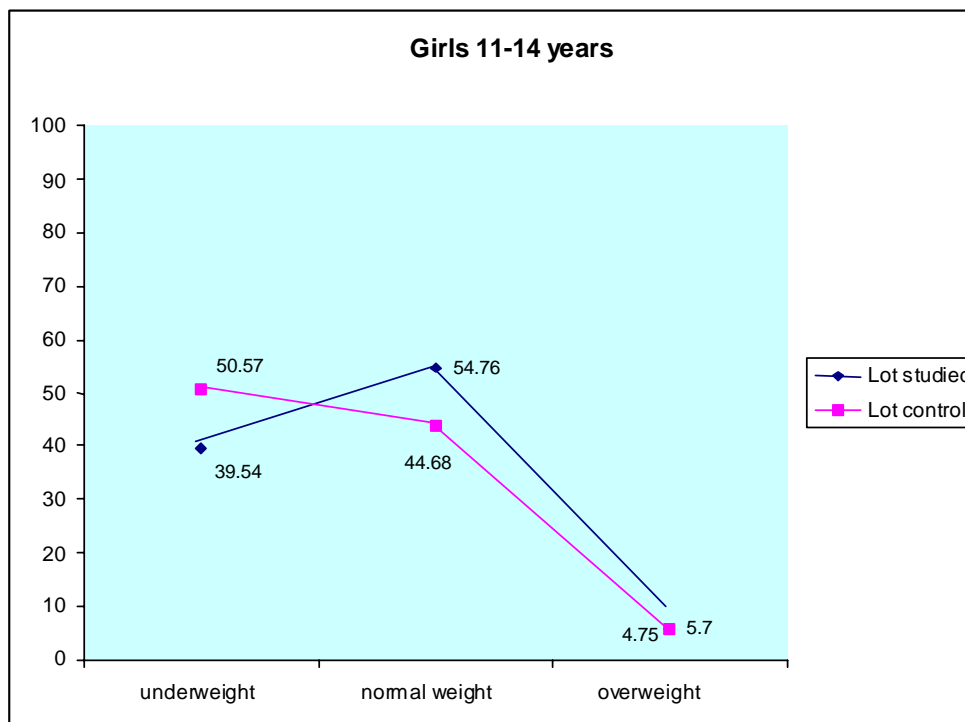


Fig. 6: The structure lots of gender (girls) according to weight status

Figures 5 and 6 refer to statistically significant differences ($p < 0.05$) between boys and girls in the two groups. The study group notes that the percentage of underweight children, both girls and boys has declined compared to the control group. Instead, the significantly increased the percentage of normal weight children and those who are overweight.

Next we comment on the answers to some questions in surveys of students.

Item 1. What foods usually consumed in the morning?

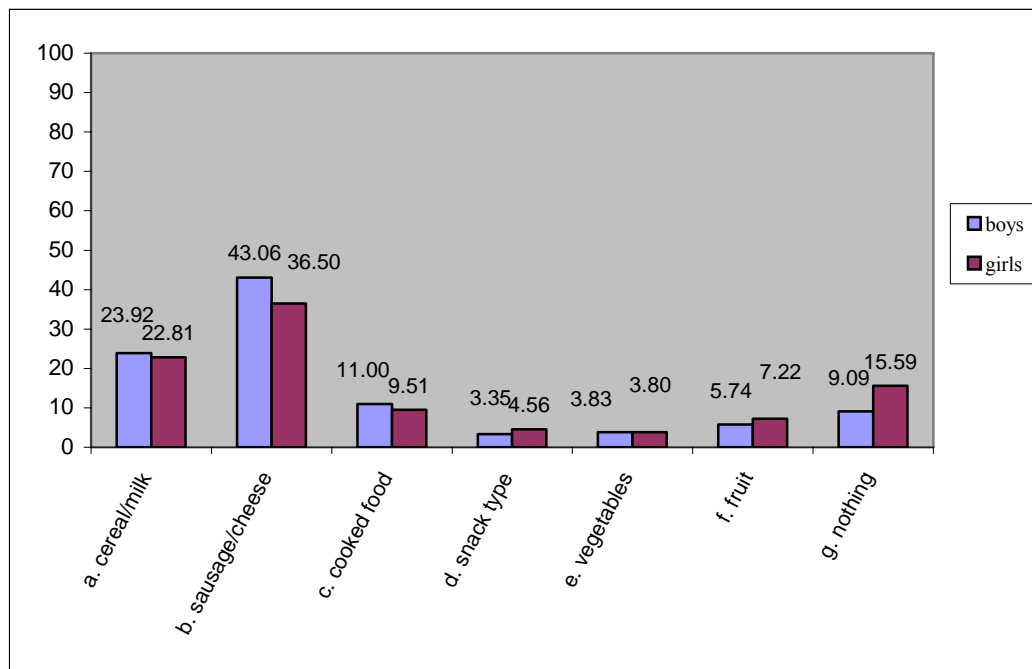


Fig. 7: The distribution of food consumed in the morning in the study group

Figure 7 shows that most girls and boys prefer to eat meat or cheese in the morning and a very small percentage prefer snack-type products or vegetables. It is noteworthy that over 15% of girls and 9% of boys do not eat anything in the morning.

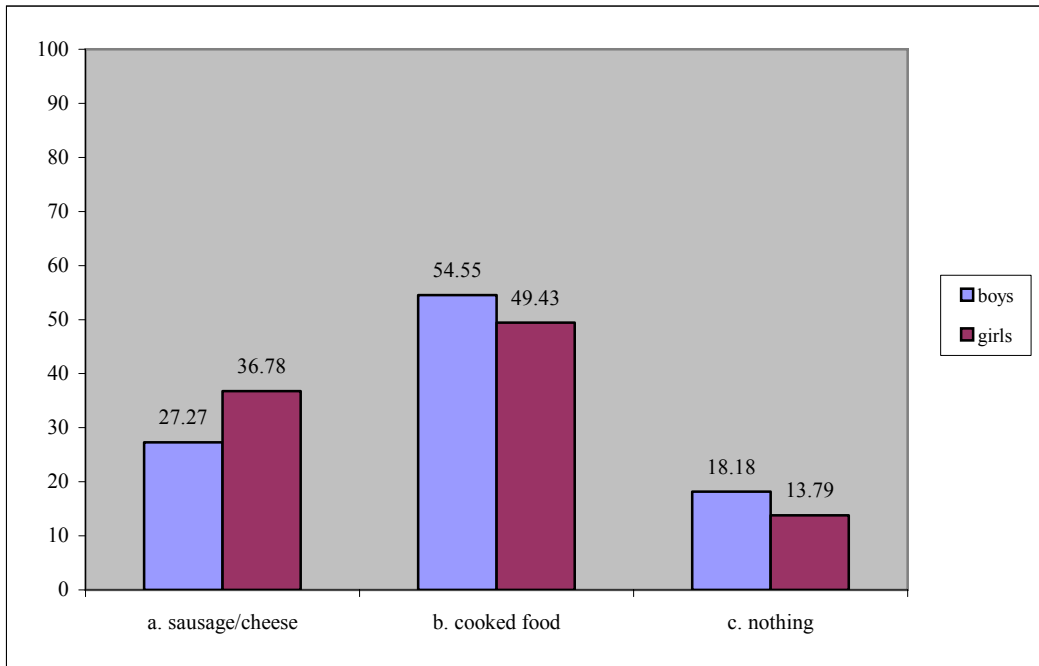


Fig. 8: The distribution of food consumed in the morning in the control group

Previous Figure shows that most children in the control group studied in 1977 in the morning ate cooked food. The percentage of children who do not eat anything in the morning is greater than that of children in the study group, the difference being statistically significant ($p < 0.05$).

Item 2. What food do you usually eat for lunch?

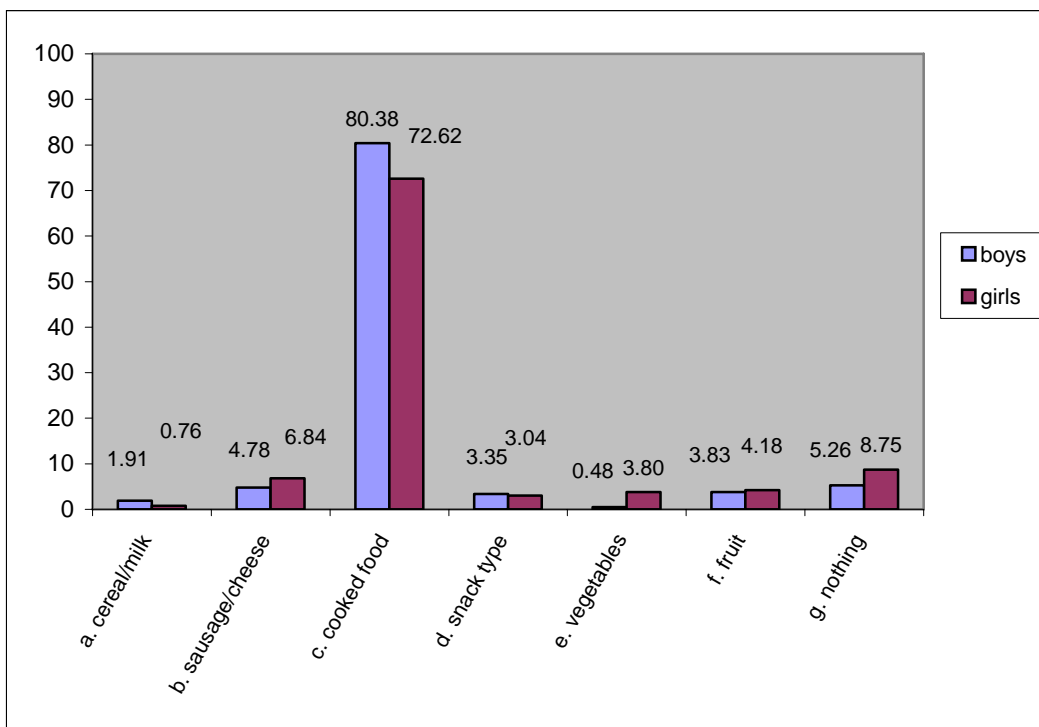


Fig. 9: The distribution of food consumed at lunchtime in the study group

It is noted of the previous figure that 80.38% of boys and 72.62% of girls eat cooked food for lunch. Also a rather high percentage of children who do not eat anything for lunch is maintained.

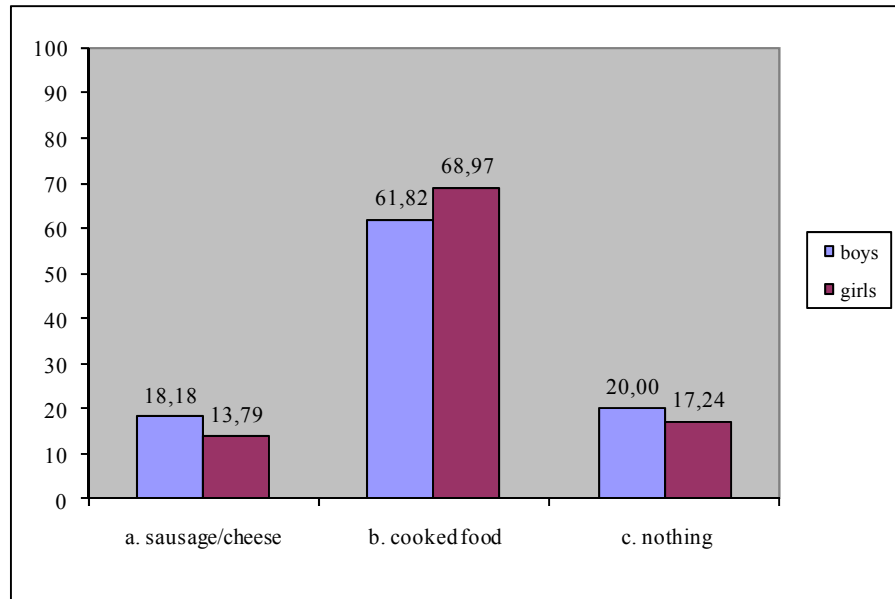


Fig. 10: The distribution of food consumed at lunchtime in the control group

Figure 10 shows that most children in the control group ate cooked food for lunch. The percentage of children in the control group who do not eat anything for lunch is much higher than that of children in the study group.

Item 3. What food do you eat in the evening?

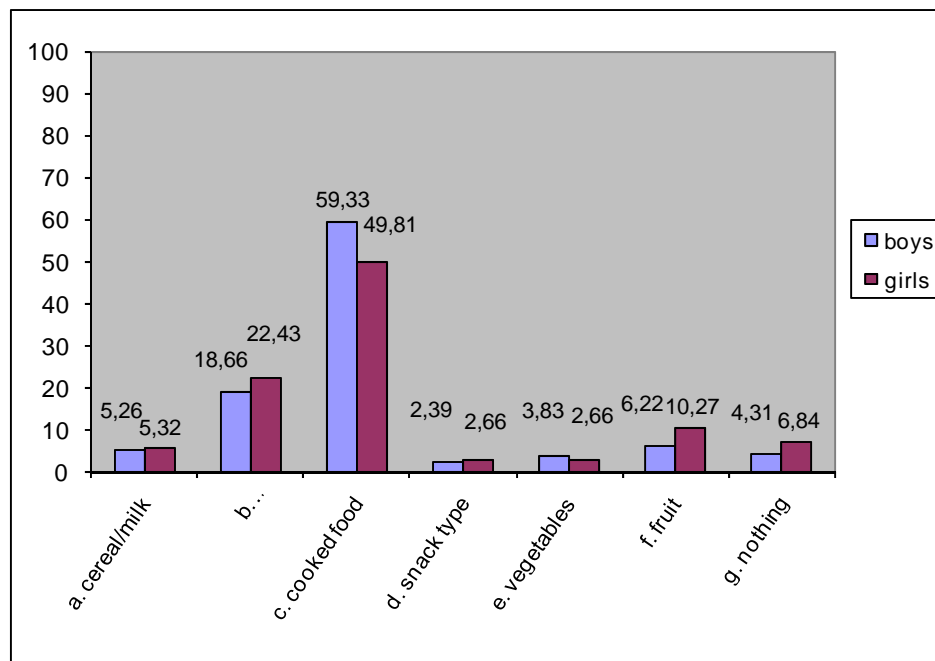


Fig. 11: The distribution of food consumed in the evening in the study group

The previous figure shows that 60% of girls and 50% of boys prefer cooking the evening, but many evenings eating meat or cheese and fruit. While many many subjects do not eat anything in the morning and at lunch, the number of those who do not anything

eat in the evening is very low. This is part of modern life, when people tend not to eat anything during the day and to consume more foods with high nutritional value in the evening. This led, among other things, to an increasing percentage of obese children in recent years, as evident from other studies (Piyush et al., 2010; Vălean et al., 2009).

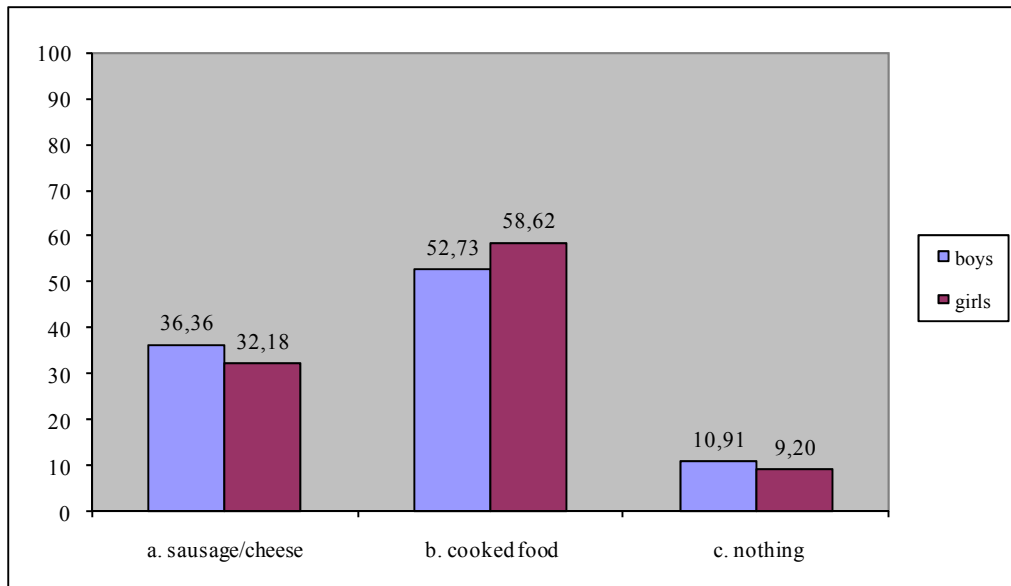


Fig. 12: The distribution of food consumed in the evening in the control group

Figure 12 indicates a similar distribution in the control group/sample of girls and boys who prefer coke meal also in the evening, to the one in the study group. At the same time, a high number of children eat processed meat and cheese in the evening. It results that the percentage of children who do not eat anything in the evening is less than the percentage of children who do not eat anything in the morning or at lunch, and it is higher than the percentage in the study group, with a statistically significant difference ($p < 0.05$).

Item 4. Do you eat fruits every day?

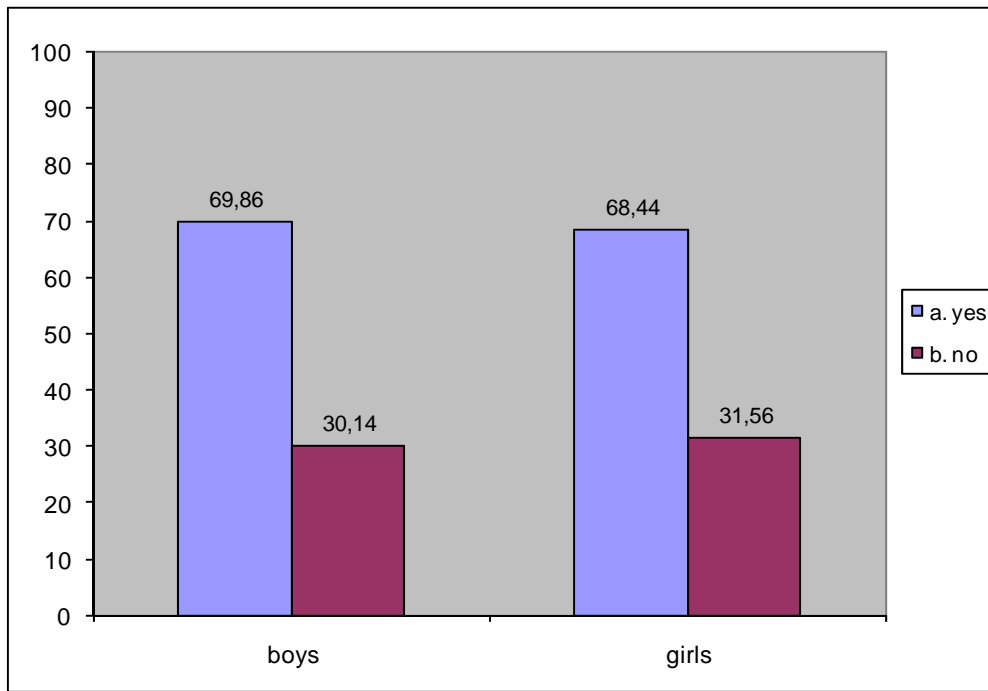


Fig. 13. The distribution of subjects who consumed fruits daily in the study group

Figure 13 shows that most girls and boys in the study group eat fruits daily, also in line with other studies (Albu et al., 2009).

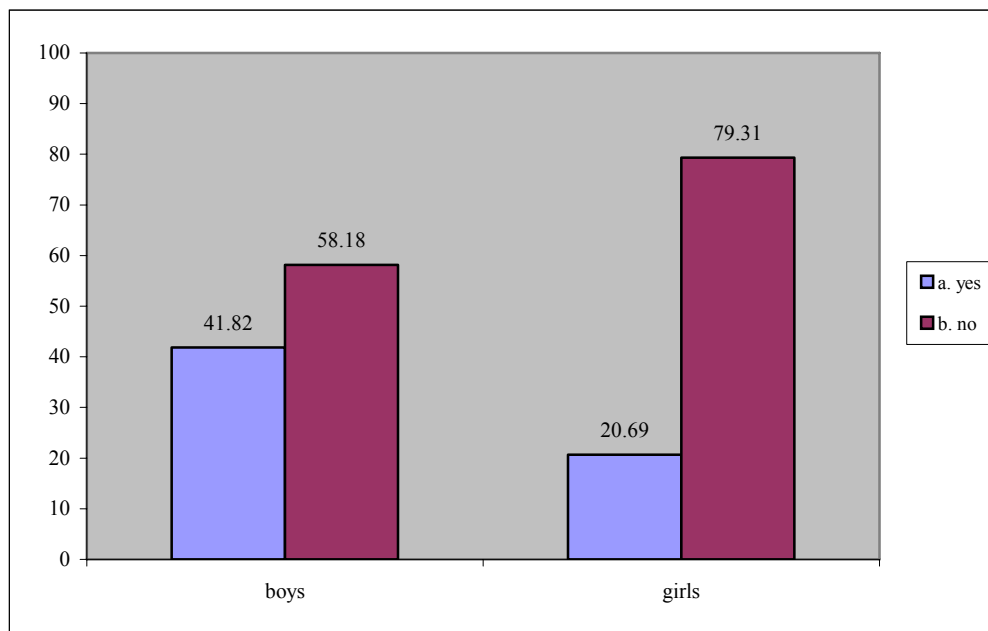


Fig. 14: The distribution of subjects who consumed fruits daily in the control group

The Figure 14 shows that, unlike children in the study group, most children in the control group did not eat fruit every day.

Item 5. Do you eat meat every day?

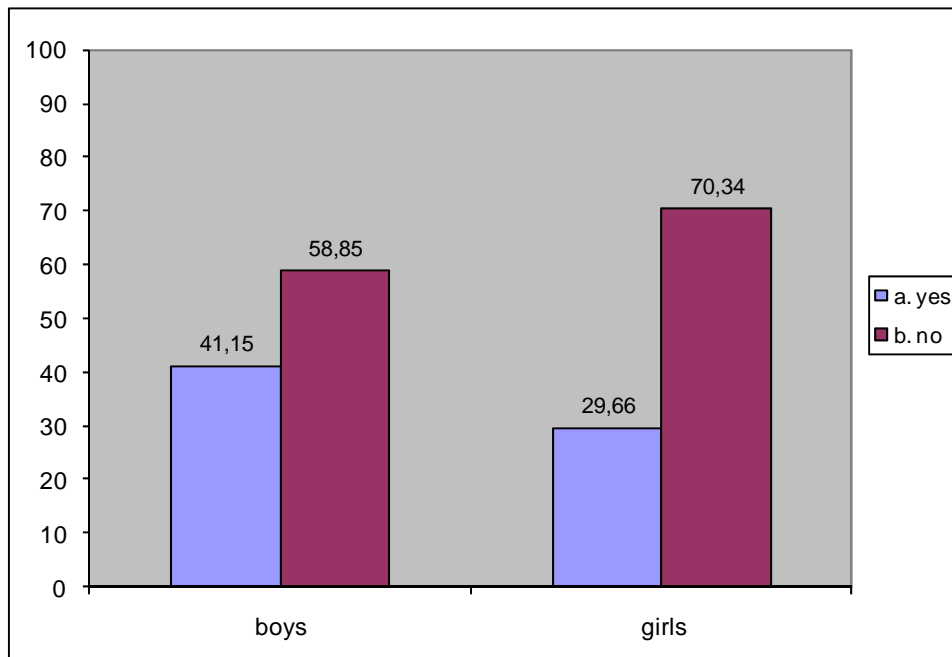


Fig. 15: The distribution of subjects who consumed meat daily in the study group

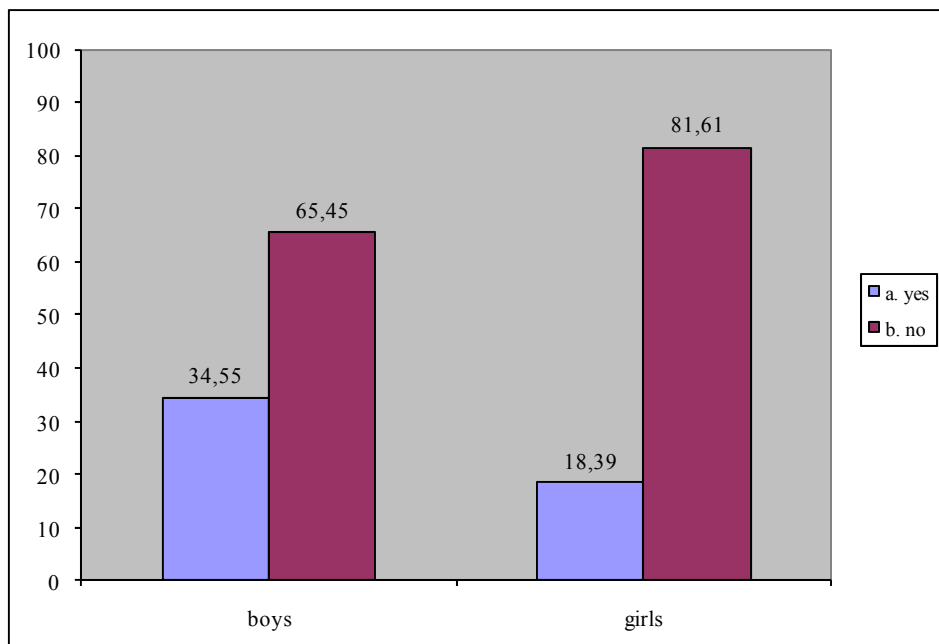


Fig. 16: The distribution of subjects who consumed meat daily in the control group

The Figures 15 and 16 shows that most children in both groups do not eat meat or meat products every day. The percentage of children who ate meat every day is less than in the control group from the study group, there is a statistically significant difference ($p < 0.05$).

Item 6. Do you eat sweets every day?

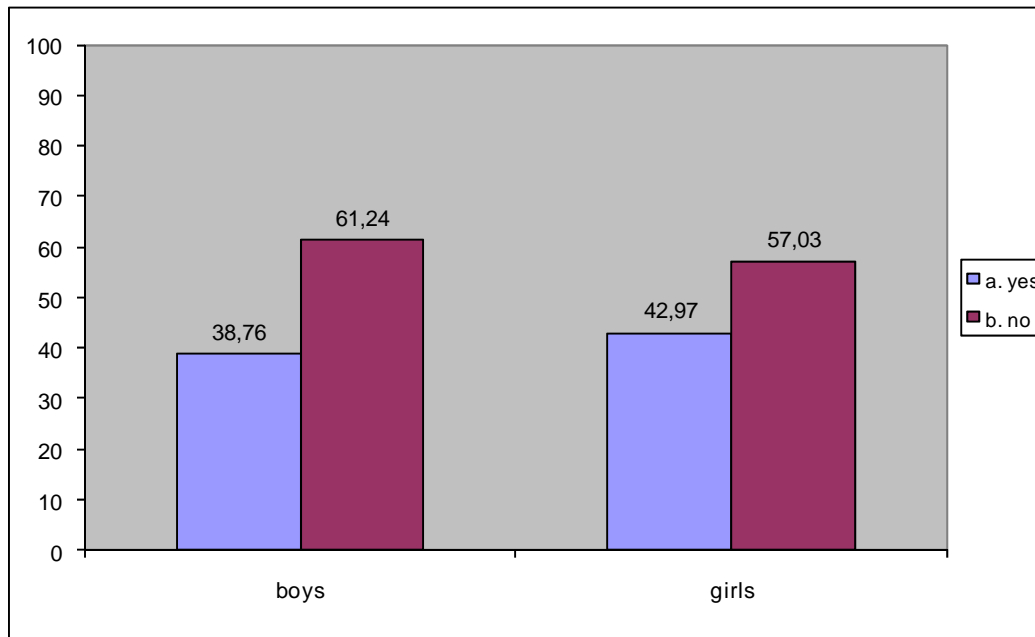


Fig. 17: The distribution of subjects who consumed sweets daily in the study group

The previous figure shows that the percentage of girls and boys in the study group who consumed daily concentrated sweets is lower than those who do not eat these products every day. The percentage of boys who do not eat sweets every day is higher than girls who consumed sweets daily.

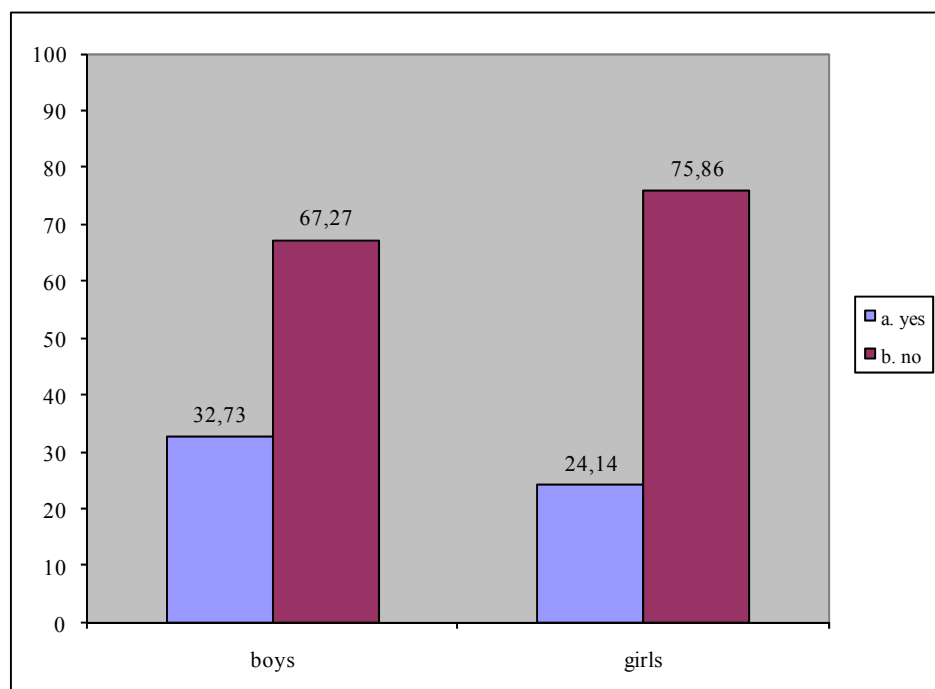


Fig. 18: The distribution of subjects who consumed sweets daily in the control group

The Figure 18 shows that most children in the control group did not eat sweets every day, the percentage of those who do not eat sweets every day are larger than those in the study group, both girls and boys, the difference being statistically significant ($p < 0.05$).

Item 7. What do you prefer to eat?

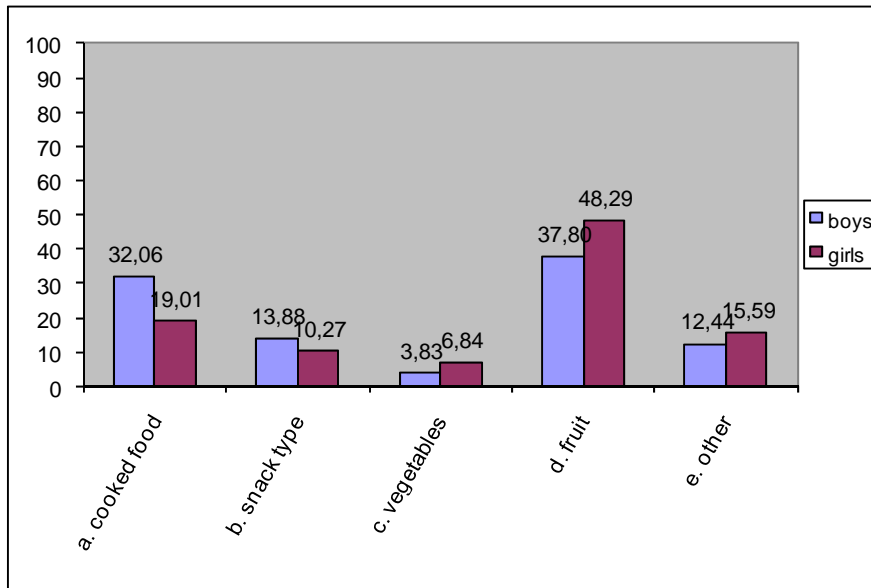


Fig. 19: The distribution of consumption of preferred food in the study group

In Figure 19 note that most subjects preferred to eat fruits, many prefer cooked food and very few vegetables.

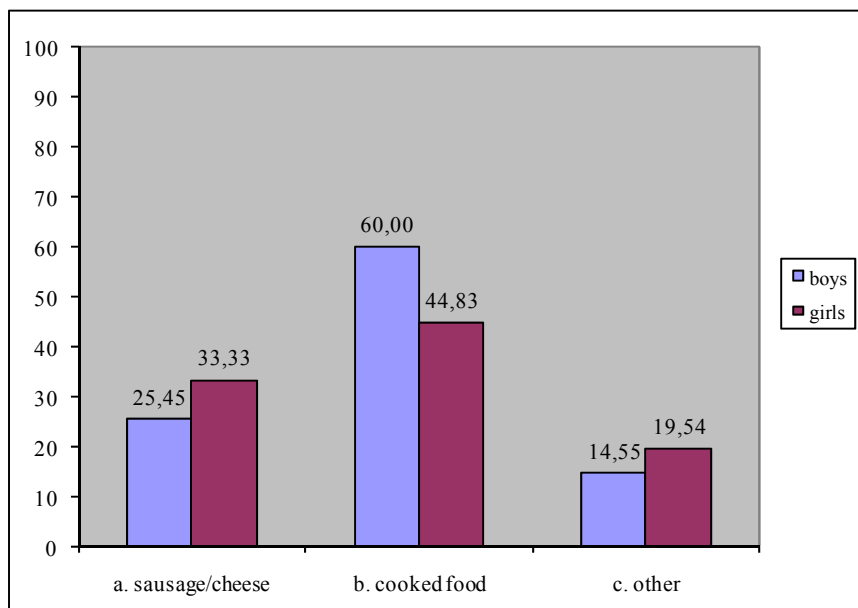


Fig. 20: The distribution of consumption of preferred food in the control group

The previous figure shows that most children in the control group preferred cooked food.

Item 8. Do you eat in front of the TV?

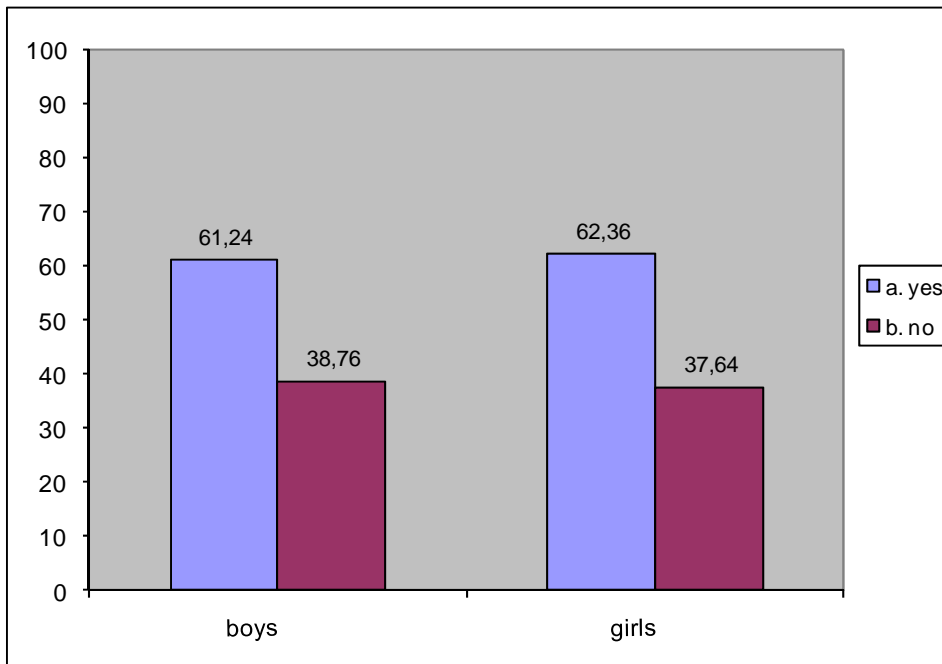


Fig. 21: The distribution of subjects who eat in front of the TV in study group

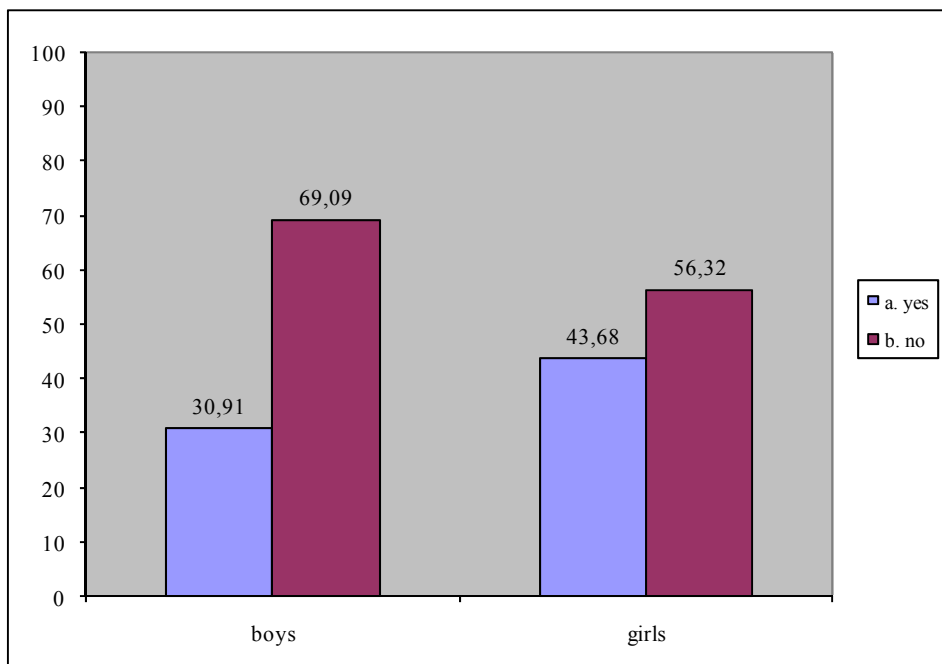


Fig. 22: The distribution of subjects who eat in front of the TV in the control group

From Figures 21 and 22 we see that most girls and boys in the study group eat in front of the TV, unlike those in the control group, this may be one of the causes that led to the increase in the percentage of overweight children in the study group to control group.

STUDY LIMITATIONS

Children's responses may be subjective, so that the study should be extended to a larger number of subjects. Further longitudinal study would dispel some of the shortcomings of this research and complement the results obtained.

CONCLUSIONS

Current food market trends related especially to globalization, require also a shift in the way in which the food intakes are spread during the day. 9.09% of boys and 15.59% of girls from the study group, 18.18% of boys and 13.79% of girls, respectively, in the control group do not eat anything the morning. 5.26% of boys and 8.75% of girls from the study group and 20.00% of boys and 17.24% of girls in the control group do not eat anything for lunch. 6.84% of boys and 4.31% of girls in the study group and 10.91% of boys and 9.20% of girls in the control group do not eat anything in the evening. It is noted in both groups the percentage of children who do not eat in the evening is lower than that of children who do not eat anything the morning and at noon (that would be the main meals), with a statistically significant difference ($p < 0.05$).

The new millennium brings new challenges in the area of food supply. More and more processed products are consumed, and technology is increasingly used to get more nutritious, safer food and also with a more attractive commercial features. Lately we have a variety of mutations in both the production and consumption of food, changes in composition and structure that influence in more or less beneficial way the human body (Prejbeanu et al., 2007). The percentage of children in the study group who prefer to eat cooked food is lower than the percentage in the control group, the difference being statistically significant ($p < 0.05$). It also noted that in the study group a high percentage (13.88% boys and 10.27% girls) of subjects preferred to eat the snack-type products, less known in the control group of children studied in 1977.

Economic globalization has led not only to the diversification of the range of industrial products, but has also major influences on consumer habits and methods of traditional influences of the different communities which live together or come into contact every day. In the recent decades, our country has been influenced by trends coming from developed countries or multinational companies, which are, especially for young people, extremely, although unjustified, attractive and have adverse effects on the body over time. Higher consumption of sweets, snack-type products, a high percentage of children who consume cooked meal, meat or cheese in the evening, and a high percentage of children (60%) eating in front of the TV are factors, which besides others, have contributed to increasing the percentage of overweight children in the study group in 2010 (8.62% boys, 5.7% girls) compared to control the control group studied in 1977 (7.27% boys, 4.75% girls), the difference being statistically significant ($p < 0.05$). The increase is significantly higher in the study sample of both boys and girls and requires that parents and children are better informed on the effects of an unhealthy diet on children development.

Overall food consumption has doubled in the past 40 years, representing an increase faster than population growth. There are of course large regional differences resulting from socio-economic differences. In Romania the structure of children daily diet has changed also in, the most visible change being the increased consumption of carbohydrates and lipids due to the affluence of imported food, and the decreased protein consumption (Collison et al., 2010; Malik et al., 2006). In the control group of 1977 the percentage of children (34.55% boys and 18.39% girls) who ate meat daily was about equal to that of students who ate sweets every day (32.73% boys and 24.14% girls), the difference being statistically insignificant

($p > 0.05$). But in 2010 the percentage of girls (29.66%) in the study group who ate meat every day is lower than those who ate sweets every day (42.97%), the difference being statistically significant ($p < 0.05$). For boys the difference is statistically insignificant ($p > 0.05$).

Balanced diet and especially the information/knowledge of how to achieve it without economic and physical efforts, could be the result of an appropriate education both at the level of communities in which we live, but also at individual level. Taking into account these aspects, it is desirable that nutrition specialists consider various existing food habits and preferences in different regions of the world and contribute through well-designed nutrition educational programs to the consolidation of the positive ones and to changing the negative ones.

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