

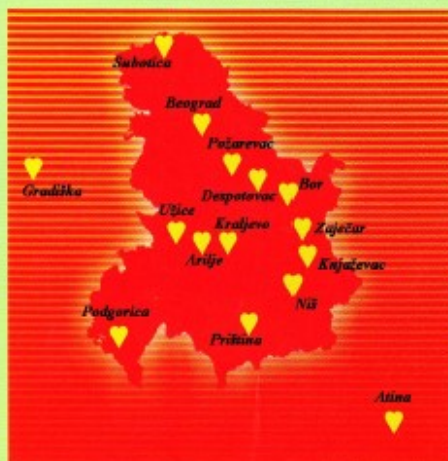
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NUTRITION QUALITY OF SCHOOL-AGE CHILDREN IN JUSAD STUDY

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Summary

Introduction: the optimal nutrition of children is one of the most important factors for healthy growth, development, and good health. Nutrition is one of the most important lifestyle factors that can be associated with the development of chronic non-communicable diseases (NCDs), especially cardiovascular ones. According to the World Health Organization, the potential nutritional risk factors for the development of atherosclerosis and cardiovascular diseases are a diet with an energy surplus concerning energy expenditure, followed by large amounts of total fats, saturated fatty acids, trans-fatty acids, cholesterol, animal proteins, refined carbohydrates, table salts, and alcohol, with an inadequate intake of complex carbohydrates, dietary fiber, polyunsaturated fatty acids, and antioxidant elements. Widespread eating habits in developed countries, and recently in developing countries, contribute to the epidemic of atherosclerosis and CVD.

This study aimed to determine the quality of family nutrition and nutritional risk factors in school-aged children. Methods: A seven-day consumer-analytical nutrition survey was conducted in 1998 and 2003 using the Family Nutrition Survey software to determine energy and nutrient intake in school-aged children of 10 (n = 1319) and 15 years of age (n = 966 children; 458 girls and 502 boys) in 10 and 13 YUSAD regional centers of study in Serbia.

Results: The average daily energy value of 10-year-olds in the 1998 YUSAD study in all centers was 2981.96 kcal, with proteins accounting for 14.76%, fats accounting for 40.08%, and carbohydrates accounting for 45.16%. Concerning the total energy value of the meal, fats of animal origin make up 23.35%, and vegetable fats 16.73%, followed by 7.99% of proteins of

animal origin and 6.77% of vegetable proteins. Saturated fatty acids make up 11.35%, polyunsaturated 7.76%, and monounsaturated 9.76% of the total daily energy value. The average daily intake of cholesterol was 226.69 mg (76.01 mg/1000 kcal), and dietary fiber 16.46 g/day (5.51 g/1000 kcal).

The average energy value of the family diet of 15-year-olds for both sexes during 2003 was 2881.2 kcal, with proteins at 14.89%, fats at 39.67%, and carbohydrates at 45.44%. The total energy value of the meal is 23.18% of animal fats and 16.48% of vegetable fats, 8.00% of animal proteins, and 6.89% of vegetable proteins. Saturated fatty acids make up 12.13%, monounsaturated 10.63%, and 7.10% of energy are polyunsaturated acids. The average daily intake of cholesterol was 229.4 mg (79 mg/1000 kcal) and dietary fiber 16.07 g/day (5.57 g/1000 kcal).

Based on the analysis of the percentage share of different food groups in the average daily energy during 1998, bread and cereals were represented with 33.79%, milk and dairy products with 10.19%, meat, eggs, and meat products with 15.08%, and fish only 1.04%, fats, and oils with 13.35%, sugar, and sweets with 8.35%, vegetables with 4.51%, fruits with 7.85%, legumes with 1.64%, nuts with 2.81%. The proportion of certain food groups in the average daily energy for both sexes at the age of 15 during 2003 was as follows: bread and cereals were represented with 31.74%, milk and dairy products with 9.80%, meat, eggs, and meat products with 17.32%, and fish only 1.35%, fats, and oils with 9.6%, sugar with 9.55%, vegetables with 3.40%, fruits with 8.20%, legumes with 2.80 %, nuts with 5.57%.

Comparing the percentage of certain food groups in children aged 10 and 15 in the years 1998 and 2003 observed with the recommendations for participation in the food pyramid, the low representation of vegetables with only 4.51% and 3.40% for the recommendations of 15-25%, as well as fruit with 7.85% and 8.20% for the recommendations of 10-15%, then fats and sugars with 21,7% and 19,20% with the 5% recommendation.

By comparing the population nutritional objectives, the frequency of school children's families with certain nutritional risk factors has been determined. In 1998, it was determined that 67.07% of families consume fat above 30% of the daily energy value of food, 60.73% of families consume sugar food above 10% of the total energy value, and 53.32% of families consume saturated fatty acids above 10% of the energy value. Daily intake of salt above 6 g was found in all school children's families, dietary fiber < 20 g/day was found in 96.41% of families,

cholesterol above 300 mg/day was found in 20.47%, and P/Z was found below 0.45 in 74.18% of families. In 2003, the following frequency of nutritional risk factors in families was determined in children aged 15 by sex: cholesterol above 300 mg/day in 19.21% of girls and 23.71% of boys, fat above 30% EV in 62.66% girls and 63.15% of boys, sugar-group foods above 10% EV in 54.8% of girls and 58.37% of boys, saturated fatty acids above 10% EV in 56.37-56.58% of children, the unfavorable ratio between P/Z below 0.45 in 60.96-67.25% of school children. The consumption of table salt above 6 g/day and dietary fiber below 20 g/day is mainly present in all school children's families surveyed at 15 years of age.

Comparing the average energy and nutrient intake of children aged 10 years and older in 1998 with the daily intake recommendations (below 90% RDA) for children aged 7 to 10 years, a large percentage of school children's families have not received enough intake. Under 90% of the RDA, energy value was found in 14.93% of families, protein in 5.16%, calcium in 15.54%, iron in 3.79%, iodine in 37.07%, selenium in 99.92%, zinc in 34.50%, vitamin A in 99.85%, vitamin D in 99.92%, vitamin K in 57.39%, vitamin B1 in 1.97%, vitamin B2 in 2.96%, vitamin B6 in 10.76% vitamin B12 in 3.11% and vitamin E in 3.56% of school children. The average energy and nutrient intake during 2003 for boys and girls aged 15 years and older had been compared with the recommendation (RDA) for those aged 15-18 years. By comparing the average EV and nutrient intake with the recommended daily intake (RDA) for children aged 15-18 years, a large percentage of school children had an insufficient intake, especially of magnesium, zinc, selenium, iodine, vitamins A, D, and K. Below 90% of the RDA energy value was found in 22.7-24.1% of children, protein in 2.7-4.3% of school children, phosphorus in 12.7-16.8%, zinc in 45.4- 58.6%, magnesium in 15.9-19.4%, iodine in 38.4-41.9% of children, iron in 10.50% of boys and 24.60% of girls, calcium in 34.0-47.8% of school children. The greatest deficit was found in vitamin D (85.2-88.2%), followed by vitamin K (56.9-60.5%) and vitamin A (79.9-87.6%).

Discussion: Based on the results of this study, it is noted that in our early school-age environment, one or more risk factors may be associated with inadequate diet and poor lifestyle. School-age is a period when the needs for nutrients and energy are increased due to intensive growth and development and obligations in school. This is the period when eating habits and lifestyles are acquired, which continue into adulthood. The combined presence of several factors with a longer period of action increases the possibility of developing more severe forms and the

earlier appearance of atherosclerosis in increasingly younger age groups. Improving school-age nutrition is, therefore, necessary for good health, optimal nutrition, prevention of nutritional risk factors, and improved quality of life in adulthood. Given the determined quality of family nutrition, it would be necessary for the future to provide an optimal school supplementary meal to correct the qualitative deficits of family nutrition and improve the health of school children.

Conclusions and recommendations: the family diet of school children is characterized by a relatively high content of fat, saturated fatty acids, sugar, salt, and a small presence of vegetables, fruits, dietary fiber, and some minerals and vitamins, which may be a potential nutritional risk factor for atherosclerosis. The determined quality of family nutrition for school children, in addition to the influence of other environmental factors, may be associated with malnutrition, high incidence of obesity, hyperlipoproteinemia, hypertension, atherosclerosis, and cardiovascular diseases.

To undertake adequate nutritional intervention and prevention programs on time, as recommended by the WHO, it is necessary to continuously monitor the quality of school children's nutrition, develop dietary recommendations and implement the National Food and Nutrition Strategy and Action Plan, in particular for vulnerable categories. Engaging the entire community with multidisciplinary activities and monitoring and evaluating the results achieved by improving nutrition and health are the basis for the implementation of the program and action plan.

The potential nutritional risk factors presented in school children, as well as the high frequency of risk values for lipid parameters, obesity, and hypertension in the presence of other associated atherogenic risk factors and high CVD mortality and morbidity, indicate the need for preventive measures in childhood, with parallel strategy implementation, high risk and population strategies in the form of promotion of proper nutrition and health following population nutrition goals and WHO prevention recommendations - "Global Strategy on diet, physical activity, and health".

Keywords: Nutrition, school children, nutritional risk factors, atherosclerosis, prevention

INTRODUCTION

Optimal school-age children diet is one of the most important factors for their proper growth, development, nutrition and good health. Improper diet and inadequate intake of certain nutrients is a potential nutritional risk factor for malnutrition and the development of chronic non-communicable diseases (CNCD), especially cardiovascular diseases. The ratio of individual nutrients to the total energy value of food is considered to have the greatest impact on the development of chronic and cardiovascular diseases (CVD). Risk factors for atherosclerosis and CVD are numerous and have a cumulative effect (1,2,3).

The World Health Organization (WHO) points out that urbanization, industrialization, market globalization and economic development have influenced in recent decades sudden changes in lifestyle and diet in terms of increased consumption of high energy density foods, high fat consumption, especially saturated fats, and insufficient carbohydrate intake with a sedentary lifestyle and lower energy expenditure, have significantly contributed to the increase in CNCD rate (1,2,4).

According to the WHO, potential nutritional risk factors for the development of atherosclerosis and cardiovascular diseases include diet with energy intake exceeding energy expenditure, a large amount of total fat, saturated fatty acids, trans-fatty acids, cholesterol, animal protein, refined carbohydrates, table salt and alcohol, with insufficient intake of complex carbohydrates, dietary fiber, polyunsaturated fatty acids and antioxidant elements. Widespread habits of this diet in developed countries, and more recently in developing countries, contribute to the epidemic of atherosclerosis and CVD (1,2).

Past results of monitoring the quality of family and social nutrition of the population in our environment indicate that it is inadequate and unbalanced, with the presence of potential nutritional risk factors, which is associated with the occurrence of nutritional and health disorders and malnutrition diseases, both in adults, youth and in children. Improper diet and inadequate lifestyle affect the occurrence of most risk factors for CVD at an increasingly earlier age. Most behavior-related risk factors, such as diet and lifestyle, are acquired and established in childhood and are of persistent nature (tracking phenomenon), indicating great potential for

prevention and the need to implement primary prevention and proper nutrition promotion programs at as early an age as possible (5-23).

The study aimed to determine the quality and nutritional value of school-age children nutrition, as well as nutritional risk factors and their distribution in the examined families of school-age children aged 10 and 15 in the representative sample in the JUSAD study during 1998 and 2003.

METHODS

The quality of family nutrition of school children aged 10 and 15 in the Yugoslav Study of Atherosclerosis Precursors in School Children (JUSAD) was analyzed by the method of consumption analytical nutrition survey lasting 7 days. During 1998, 1319 school-age children's families were included from the following 13 centers: Arilje, Belgrade, Gradište (Republika Srpska), Despotovac, Zaječar, Kraljevo, Knjaževac, Priština, Podgorica, Užice, Niš, Požarevac and Subotica. During 2003, the survey included 960 families (458 girls and 502 boys) of school children aged 15 in 10 regional centers of the JUSAD study (Arilje, Belgrade, Bor, Despotovac, Knjaževac, Kraljevo, Požarevac, Subotica, Užice, Zaječar).

A seven-day consumption analytical nutrition survey was conducted during 1998 and 2003 using the Family Nutrition Survey software to determine energy and nutrient intake and nutritional risk factors of school-age children family nutrition (24, 25). Nutritional risk factors were assessed relative to the current population nutrition goals of the World Health Organization and the recommended daily intake of energy and nutrients for a certain age (RDA) (1,26,27,28,29).

RESULTS

The average consumption of certain food groups per person during the day and year with a percentage share relative to the average energy value of the family nutrition of school children aged 10 and 15 years in the JUSAD study during 1998 and 2003, is shown in Tables 1 and 2. Based on the analysis of the percentage share of different food groups in the average daily energy during 1998, bread and cereals were represented with 33.79%, milk and products with

10.19%, meat, eggs and meat products 15.08%, and fish with only 1.04%, fats and oils with 13.35%, sugar and sweets with 8.35%, vegetables and vegetable products with 4.51%, fruit and fruit products 7.85%, legumes with 1.64%, nuts with 2.81% (Table 1; Chart 1).

Based on the analysis of the percentage share of individual food groups in the average daily energy for both sexes aged 15 years during 2003, bread and cereals were represented with 31.74%, milk and products with 9.80%, meat, eggs and meat products 17.32%, and fish with only 1.35%, fat and oils with 9.6%, sugar with 9.55%, vegetables and vegetable products with 3.40%, fruit and fruit products with 8.20%, legumes with 2.80%, nuts with 5.57% (Table 1; Chart 1).

Table 2 shows the average daily consumption of certain food groups in the daily diet of boys and girls aged 15, especially by sex during 2003. Chart 2 shows the percentage share of individual food groups relative to the total daily energy value during 2003 for boys and girls aged 15 years. Comparing the percentage representation of certain food groups in children aged 10 and 15 in the observed years (1998 and 2003) with the intake recommendations by the food pyramid, the low representation of vegetables stands out with only 4.51 and 3.40% compared to recommended 15-25%, as well as fruit with 7.85% and 8.20%, respectively, relative to recommended 10-15%, then fat and sugar with 21.7% and 19.20%, respectively, relative to recommended 5% (Chart 3).

The average daily energy value of a 10-year-old child's family-based diet in the JUSAD study in 1998 within all centers was 2981.96 kcal, with proteins represented with 14.76%, fats with 40.08% and carbohydrates with 45.16%. Relative to the total energy value of a meal, animal origin fats account for 23.35%, and vegetable fats for 16.73%, followed by 7.99% of animal protein and 6.77% of plant protein. Saturated fatty acids make up 11.35%, polyunsaturated 7.76%, and monounsaturated 9.76% relative to the total daily energy value. The average daily intake of cholesterol was 226.69 mg (76.01 mg/1000 kcal) and of dietary fibers was 16.46 g/day (5.51 g/1000 kcal) (Table 3).

The average energy value of the family nutrition of school children aged 15 years for both sexes during 2003 was 2881.2 kcal, with proteins present with 14.89%, fats with 39.67%

and carbohydrates with 45.44%. Relative to the total energy value of a meal, animal origin fats account for 23.18%, and vegetable fats for 16.48%, followed by 8.00% of animal protein and 6.89% of plant protein. Saturated fatty acids make up 12.13%, monounsaturated 10.63%, polyunsaturated 7.10% of energy. The average daily intake of cholesterol was 229.4 mg (79 mg/1000 kcal) and of dietary fibers was 16.07 g/day (5.57 g/1000 kcal) (Table 3). Table 4 shows the energy value and content of macronutrients in the daily diet of boys and girls aged 15 years, especially by sex during 2003.

The average content of mineral matters and vitamins during 1988 and 2003 is given in Tables 5 and 6.

Less than 90% of the RDA energy value was found in 22.7-24.1% of children, protein in 2.7-4.3% of school-age children's families, phosphorus in 12.7-16.8%, zinc in 45.4-58.6%, magnesium in 15.9-19.4%, iodine in 38.4-41.9% of children, iron in 10.50% of boys and 24.60% of girls, calcium in 34.0-47, 8% of school-age children's families (Chart 7). Less than 90% of the RDA vitamins is shown in Chart 8. The greatest deficiency was found for vitamin D (85.2-88.2%), followed by vitamin K (56.9-60.5%) and vitamin A (79.9-87.6%).

Comparing with the population nutrition goals found the number of school children's families with some nutritional risk factors. During 1998, in children aged 10 years, it was found that 67.07% of families consume total fat >30% of daily energy value (EV), 60.73% of families use foods from the sugar group above 10% of total EV, 53.32% of families consume saturated fatty acids above 10% of the energy value. Daily salt intake above 6 g was found in all school children families, dietary fiber < 20 g/day was found in 96.41% of families, cholesterol above 300 mg/day in 20.47% and P/Z ratio below 0.45 in 74.18% of families (Chart 4). During 2003, the following frequency of nutritional risk factors was determined by sex in the families of children aged 15: cholesterol above 300 mg/day in 19.21% of girls and 23.71% of boys, fat above 30% EV in 62.66% of girls and 63.15% of boys, sugar group food above 10% EV in 54.8% of girls and 58.37% of boys, saturated fatty acids above 10% EV in 56.37-56.58%, unfavorable P/Z ratio below 0.45 in 60.96-67.25% of school children families. Consumption of

table salt above 6 g/day and dietary plant fiber below 20 g/day was found mainly in all examined families of school children aged 15 years (Chart 5).

By comparing the average energy value and nutrient intake of children aged 10 in 1998 with the recommended dietary allowances (RDA) for children aged 7-10, the percentage of school children families with insufficient intake was found. Less than 90% of the RDA energy value was found in 14.93% of families, protein in 5.16%, calcium in 15.54%, iron in 3.79%, iodine in 37.07%, selenium in 99.92%, zinc in 34.50%, vitamin A in 99.85%, vitamin D in 99.92%, vitamin K in 57.39%, vitamin B1 in 1.97%, vitamin B2 in 2.96%, vitamin B6 in 10.76%, vitamin B12 in 3.11% and vitamin E in 3.56% of school children families (Chart 6). The average energy value and nutrient intake during 2003 in boys and girls aged 15 years were compared with the recommendations (RDA) for the age of 15-18 years. A comparison of average EV and nutrient intake with the recommended dietary allowances (RDA) for children aged 15-18 showed that a large percentage of school children had insufficient intake, especially of magnesium, zinc, selenium, iodine, vitamins A, D and K

The percentage of individual nutrients from different food groups in the family-based diet of school children aged 10 and 15 during 1998 and 2003 is given in Tables 7 and 8.

Since the number of evaluated surveys varies greatly from center to center, and in some centers, it is even below the minimum necessary for optimal assessment of the nutrition quality in the area, the data shown in the following tables for centers with fewer surveys must be taken with a grain of salt. The average consumption of certain groups of foods in the school children family nutrition in 1998 and 2003 is shown by individual centers in Tables 9 and 10, and the percentage share relative to the total energy value is given in Tables 11 and 12. The percentage share of macronutrients relative to the total energy value of the daily diet by individual centers is shown in Tables 13 and 14. The content of individual nutrients in total and per 1000 kcal (Nutrient density index) is shown by centers in Tables 15, 16, 17 and 18. Frequency of potential nutritional factors of school children family nutrition by individual centers is shown in Tables 19 and 20.

DISCUSSION

School age is a period when the needs for nutrients and energy are increased due to intensive growth and development and school obligations. This is the period when eating habits and lifestyle are acquired which continue into adulthood. Therefore, the improvement of school-age nutrition is necessary for good health, optimal nutrition, prevention of nutritional risk factors and better quality of life in adulthood.

Inadequate representation of certain food groups in the family nutrition of school children during 1998 and 2003 relative to the recommendations can be a potential risk factor for atherosclerosis. Thus, in the JUSAD study, the share of fruit and fruit products (7.85-8.2%), as well as vegetables and vegetable products (3.4-4.51%) is extremely low compared to the recommendations of 10-15% and 15-25%, respectively. The share of cereals is at the lower recommended limit with 33.79-31.74%, while the share of meat and meat products (20.57-24.74%), as well as fats, oils and sugar (19.2-21.7%) is significantly above the recommendations of 10% and 5%, respectively (Chart 3). This structure of the share of foods in the family diet can be associated with a high frequency of nutritional risk factors in the form of surpluses or deficits of certain nutrients.

Insufficient consumption of fruit and vegetables in school children is a potential nutritional risk factor for atherosclerosis. The World Health Organization's analysis of global disease severity and risk factors contributing to CNCD and CVD in Europe found that the top ten risk factors include smoking, alcohol consumption, obesity, hypertension, elevated cholesterol level, insufficient fruit and vegetable consumption, and physical inactivity and diet with increased intake of saturated fats (2).

Research on eating habits in school children and youth in Serbia aged 7-19 indicates that there are risk factors in the form of insufficient consumption of fruit and vegetables (only 46% consume daily), that white bread is consumed by more than 60% of respondents, and animal origin fats are used for food preparation by about 40% of respondents. Potential nutritional risk factors in school-age children aged 10-18 in the North Bačka District are found in the form of irregular meal timings during the day and inadequate food consumption. About 24% of children avoid breakfast, then only 43% of respondents consume fresh fruit daily, and only 21% eat vegetables, while snacks are consumed by 28.5%, sweet soft drinks by 39% of children, and

added salt by 15.6% of children. It is important to point out that only 23.4% of children think about health when choosing food, and only 37.2% of respondents want changes in their own diet (30.31).

The presented habits and quality of nutrition of school children can be related to the occurrence of dyslipidemia and other health disorders.

Within the JUSAD study of school children aged 10 years in 13 centers during 1998, comprising 2989 boys and 2845 girls, elevated values of total cholesterol (>5.2 mmol/l) were found in 11.94% of boys and 13.53% girls, low HDL-cholesterol values (< 1.2 mmol/l) in 23.59% of boys and 27.45% of girls, elevated LDL-cholesterol values (> 3.01 mmol/l) in 27.87% of boys and 31.11% of girls, and elevated triglycerides (>0.92 mmol/l) in 21.95% of boys and 27.45% of girls (19).

Observing the distribution of risky values of lipid parameters, in school-age children aged 10-18 years in North Bačka District, elevated total cholesterol values were found in 11.9%, namely, in 10.7% of boys and 13.2% of girls, then low HDL-cholesterol in 16.0%, i.e. in 17.7% of boys and 14.2% of girls. Analysis of the correlation between risky values of lipid parameters and nutritional characteristics of school children in the North Bačka District found a statistically significant correlation between the number of meals consumed and elevated triglyceride levels ($p < 0.05$), and highly statistically significant with low HDL-cholesterol, $p < 0.01$). Elevated triglycerides are statistically significantly correlated with frequent consumption of sweet soft drinks ($p < 0.05$), and low HDL-cholesterol with eating salty snacks ($p < 0.05$), while elevated LDL-cholesterol was statistically significantly correlated with the choice of food consumed ($p < 0.05$) (30).

Consumption of saturated fatty acids and cholesterol greatly affects the level of cholesterol in the blood in adults as well as children. Comparing the share of saturated fatty acids in energy value in different countries, it was found that Finland has the highest level (17.7%), followed by the Netherlands (15.5%), USA (13.5%), Ghana (10.5%), Italy (10.4%), while the lowest was found in the Philippines (9.3%), and the highest level of cholesterol in the blood of boys aged 7-9 years of 4.9 mmol/l is found in Finland, followed by the Netherlands (4.49 mmol/l), USA (4.13 mmol/l), Italy (4.11 mmol/l), Philippines (3.8 mmol/l). Relative to the consumption of saturated fatty acids, the obtained data are similar to those from Italy, in terms of

cholesterol intake data are similar to those in the USA and Finland, and total cholesterol in boys' blood is lower than in the Netherlands and higher than in the USA (32).

The school-age period is the time when eating habits and lifestyle are acquired but also change under the influence of various factors such as school environment, parents and family environment, desire for ideal body weight and poor own assessment of ideal constitution, consuming higher energy density food and greater portions outside the home, strong food marketing and consumption of foods of unknown nutritional composition due to undeclared products, the level of knowledge of children and parents about the importance of proper nutrition and lifestyle, the presence of traditional eating habits, socio-economic status, family status, availability of various groceries and products on the market, food prices, as well as many other factors. Therefore, school age and the school environment are the most acceptable for education on proper nutrition and its promotion and lifestyle, as in this way, in addition to school children, parents, educators, as well as the community as a whole, participate (33,34,35,36,37).

Research in the United States indicates that the increase in the number of obese children is correlated with changes in children's nutrition in terms of consuming more meals in restaurants, constant availability of food and larger food portions, consuming snacks and sweet soft drinks with irregular meal timing during the day such as omitting of certain meals (35).

The WHO study 'Health Behavior in School-aged Children (HBSC Study)' conducted in 2001/2002 in 35 world countries, in 162,306 children aged 11, 13 and 15, confirmed that children consume very little fruit and vegetables. Only 30% of boys and 37% of girls consume fruit every day, and only 28% of boys and 34% of girls eat vegetables. In 16 countries in Europe, 25% of children and young people consume fruit once a week or less. This number increases with age (38).

Sweet soft drinks are consumed daily by 40% of respondents in Israel, Malta, the Netherlands, Slovenia and Scotland, and about 10-20% in Greece and Ukraine. Also, about 1/3 of students consume sweets and chocolates once or several times a day. In addition, the irregular meal timing is noticeable, as only 69% of boys and 60% of girls have breakfast every day. The established eating habits of school children can be correlated with the present numerous health problems of this population. Dissatisfaction with their own appearance and weight (body image) was confirmed by 36% of girls and 22% of boys in this study, which greatly affects the habits and quality of nutrition of the school population, so about 7-9.2% of children adhere to some

dietary recommendations. School age is a period when children are prone to various diets that are not recommended by professionals as they lead to the occurrence of malnutrition and a number of health disorders (38).

In addition to adequate energy and nutrient intake, proper meal timing is also important. In school children, a correlation between serum cholesterol levels and breakfast consumption was found. Children who avoid breakfast usually have higher cholesterol levels than those who have breakfast, and in the group of children who consume breakfast, the lowest serum cholesterol levels are found in those who eat cereals for breakfast (39).

Given the combined presence of multiple risk factors in children and adults with potential nutritional risk factors that increase the possibility of developing earlier atherosclerosis in increasingly young age groups, the WHO has proclaimed 21 goals for the 21st century (25).

In the 21st century goals for the European region, as the eighth goal the WHO stated the reduction of morbidity, disability and premature death rates from leading chronic non-communicable diseases. A special goal has been set to reduce mortality from cardiovascular diseases in people under the age of 65 by at least 40%, especially in countries with a high rate. This goal can be achieved in all European countries by implementing health promotion and disease prevention programs for the entire community. Statistical indicators such as mortality, incidence and prevalence of non-communicable diseases by age structure, patient costs due to widespread non-communicable diseases, prevalence of major risk factors in the population such as hypertension, hypercholesterolemia, insufficient physical activity, smoking and inadequate nutrition, can be used to monitor the effectiveness of the taken preventive measures (40).

Epidemiological studies have shown that small changes in risk factors at the population level in terms of changes in dietary habits, lifestyle, decrease in blood pressure and blood cholesterol and obesity can contribute to the prevention of about 80% of coronary heart disease and about 90% of type II diabetes.

The presented results of monitoring the quality of family nutrition of school children in our environment indicate that it is inadequate, with the presence of a large number of nutritional risk factors. Under the 11th goal (Healthier living), the WHO states that by 2015 the population in the European region should adopt the habits of a proper lifestyle, especially in the field of nutrition and physical activity, with the provision and availability of healthy and high biological value foods. As early as in 1992, all WHO member states signed and adopted the World

Declaration and Plan of Action for Nutrition in Rome at the International Conference on Nutrition, which binds all countries to make maximum efforts to achieve the set goals at the national level. According to the WHO recommendation, it would be necessary to promote proper nutrition and physical activity with special emphasis in the Health Promoting Schools (40, 41). To this end, it would be necessary to undertake activities in our country to improve the nutrition and health of the population at the national level. Therefore, it would be necessary to take preventive measures in children with identified risk and further monitor them, as well as take preventive measures at the level of the entire school population, as the effects of measures taken at this age are the most effective (42,43,44).

The analysis of the quality of nutrition of children and youth in 23 European countries, which included about 80 different studies at the local, regional or national level, indicated great variability between individual countries and within the same country. The results of the 1998 JUSAD study were also taken into account in this analysis. The validity of the data obtained by the survey and interpretation of the results must be taken with a grain of salt due to the possibility of errors in recording the amount of food consumed (45,46).

A similar statement can be made for the analysis of the quality of nutrition of school children in the JUSAD study. Therefore, in the future, in addition to improving school children nutrition, it would be necessary to standardize methods of monitoring the quality of nutrition at the national level within the action plan and national nutrition strategy (33,41).

As insufficient fruit and vegetable consumption is one of the ten leading risk factors, in 2003 the WHO and the Food and Agriculture Organization (FAO) launched an initiative to promote fruit and vegetables in the nutrition of the population, especially school children, in the workplace and women (Fruit and Vegetable Promotion Initiative) to prevent CNCDs, primarily CVD and malignancies (43). This initiative is part of the activities of the Global Strategy on Diet, Physical Activity and Health, which was adopted in 2004 and binds all member states to develop and implement a strategy at the national level (47).

Based on the results of this study, it can be concluded that one or more risk factors are present in our environment at an early school age which can be associated with improper diet and inadequate lifestyle. The combined presence of several factors with a longer period of action increases the possibility of developing more severe forms and the earlier occurrence of atherosclerosis in all young age categories.

CONCLUSIONS AND RECOMMENDATIONS

The family-based diet of school children is characterized by a relatively high content of fat, saturated fatty acids, sugar, salt, and low consumption of vegetables, fruits, dietary fiber and some minerals and vitamins, which can be a potential nutritional risk factor for atherosclerosis.

The determined quality of family nutrition of school children, in addition to the influence of other environmental factors, can be associated with malnutrition, high incidence of obesity, hyperlipoproteinemia, hypertension, atherosclerosis and cardiovascular diseases.

Considering the established quality of family nutrition, in the future, it would be necessary to provide an optimal additional school meal with the aim of correcting the qualitative deficits of family nutrition and improving the health of school children.

In order to timely undertake adequate nutritional intervention and prevention programs as recommended by the WHO, it is necessary to continuously monitor the quality of school nutrition, develop dietary recommendations and implement the National Strategy and Action Plan for Food and Nutrition, especially for vulnerable categories. Engaging the entire community with multidisciplinary activity and monitoring and evaluating the achieved results of improving nutrition and the health side are the basis for the implementation of the program and action plan.

The presented potential nutritional risk factors in school children, as well as the high frequency of risk values of lipid parameters, obesity and hypertension along with the presence of other associated atherogenic risk factors and high mortality and morbidity from CVD, indicate the need to take preventive measures at an early age, with parallel high-risk strategies and population strategies in the form of promoting proper nutrition and health in accordance with population nutrition goals and WHO prevention recommendations - Global Strategy on Diet, Physical Activity and Health and the adopted Second Action Plan for Food and Nutrition Policy in Europe for 2007- 2012, as well as with the European Commission Strategy on Nutrition, Overweight and Obesity-related Health Issues (47,48,49,50,51,52,53).

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Table 1.

Food groups consumption and contribution (%) to the daily energy intake in family nutrition of school children in all centers in JUSAD study during 1998 and 2003 year

Food groups	1998. year			2003. year (average for booth gender)		
	g/day	% energy value	kg/year	g/day	% energy value	kg/year
Milk and dairy products	316,42	10,19	115,49	282,23	9,80	103,01
Meat, eggs and products	197,49	15,08	72,08	203,29	17,32	74,20
Fish and products	26,87	1,04	9,81	32,21	1,35	11,76
Bread and cereals	364,78	33,79	133,14	329,26	31,74	120,18
Vegetable and products	307,19	4,51	112,12	221,69	3,40	80,92
Fruit and fruits products	403,20	7,85	147,17	435,76	8,20	159,05
Sugar and sweets	69,07	8,35	25,21	68,27	9,55	24,92
Fat and oil	49,45	13,35	18,05	37,46	9,61	13,67
Nuts, seeds and kernel products	14,08	2,81	5,14	27,11	5,57	9,89
Legumes	15,76	1,64	5,75	25,69	2,81	9,37
Drinks - alcohol, tea, coffee	53,69	1,28	19,60	31,48	0,50	11,48
Spices, herbs	6,11	0,10	2,23	7,82	0,15	2,85
TOTAL	1824,11	100,00	665,799	1702,27	100,00	621,33

Table 2.

Food groups consumption and contribution (%) to the daily energy intake in family nutrition of school children age 15 year according to gender during 2003 year in JUSAD study

Food groups	g/day		% daily energy intake	
	Boys	Girls	Boys	Girls
Milk and dairy products	309,28	255,05	10,08	9,45
Meat, eggs and products	211,70	195,85	17,26	17,39
Fish and products	31,61	33,15	2,16	1,49
Bread and cereals	352,13	307,08	32,46	30,86
Vegetable and products	219,10	226,49	3,16	3,69
Fruit and fruits products	446,25	426,07	7,99	8,46
Sugar and sweets	72,24	64,50	9,62	9,46
Fat and oil	38,58	36,55	9,41	9,86
Nuts, seeds and kernel products	26,73	27,76	5,23	5,97
Legumes	27,74	23,67	2,89	2,71
Drinks - alcohol, tea, coffee	30,04	33,33	0,5	0,51
Spices, herbs	7,80	7,91	0,14	0,17
TOTAL	1773,19	1639,41		

Table 3.

Energy and macronutrients intake in family nutrition of school children in all centers in JUSAD study during 1998 and 2003 year (daily intake and per 1000 kcal = Nutrient density index) and % contribution to total energy intake (%TEI)

Energy / nutrients	1998. year			2003.year (average for booth gender)		
	Daily intake	/ 1000 kcal	% TEI	Daily intake	/ 1000 kcal	% TEI
Energy (kcal)	2981,96	-	-	2881,2	-	-
Total fat (g)	128,53	43,10	40,08	129,1	44,82	39,67
- animal (A) (g)	74,87	25,11	23,35	75,47	26,20	23,18
- plant (P) (g)	53,66	17,99	16,73	53,66	18,63	16,48
Total protein (g)	107,42	36,02	14,76	109,9	38,17	14,89
- animal (A) (g)	58,16	19,50	7,99	59,08	20,50	8,00
- plant (P) (g)	49,26	16,52	6,77	50,90	17,67	6,89
Carbohydrates (g)	328,45	110,15	45,16	335,50	116,44	45,44
Saturated Fatty acids (SFA) (g)	36,38	12,20	11,35	37,59	13,04	12,13
Polyunsaturated f.a (PUFA) (g)	24,90	8,35	7,76	22,02	7,64	7,10
Monounsaturated (MUFA) (g)	31,30	10,49	9,76	32,94	11,43	10,63
Cholesterol (mg)	226,69	76,01	-	229,4	79,61	-
Dietary fribre (g)	16,46	5,51	-	16,07	5,57	-
- soluble (g)	8,00	2,68	-	7,62	2,64	-
- unsoluble (g)	8,46	2,83	-	8,45	2,93	-
	PUFA/SFA=0,68; A/P fat = 1,39; A/P protein = 1,18			PUFA/SFA = 0,58; A/P fat = 1,4; A/P proteins = 1,16		

*%TEI, % contribution to total energy intake

Table 4. Energy and macronutrients intake in family nutrition of school children age 15 year in all centers in JUSAD study during 2003 year (daily intake and per1000 kcal = Nutrient density index) and % contribution to total energy intake (%TEI)

	Boys			Girls		
	Daily intake	x/1000 kcal	%TEI	Daily intake	x/1000 kcal	%TEI
Energy (kcal))	3019,39	-	-	2755,0	-	-
Total fat (g)	134,27	44,47	39,39	124,64	45,24	40,01
- animal (A) (g)	79,64	26,38	23,36	71,56	25,98	22,97
- plant (P) (g)	54,62	18,09	16,02	53,08	19,27	17,04
Total protein (g)	115,31	38,19	14,91	105,10	38,15	14,87
- animal (A) (g)	61,99	20,53	8,02	56,40	20,47	7,98
- plant (P) (g)	53,32	17,66	6,90	48,70	17,68	6,89
Carbohydrates (g)	353,34	117,02	45,70	318,89	115,75	45,12
SFA(g)	39,41	13,05	12,14	35,92	13,04	12,12
PUFA (g)	21,95	7,27	6,76	22,29	8,09	7,52
MUFA (g)	33,76	11,18	10,39	32,34	11,74	10,19
Cholesterol (mg)	241,0	79,82	-	218,7	79,38	-
Dietary fibre (g)	16,37	5,42	-	15,87	5,82	-
- soluble (g)	7,73	2,56	-	7,56	2,74	-
- unsoluble (g)	8,64	2,86	-	8,31	3,02	-
Relations	PUFA/SFA =0,55 A/P fat = 1,4 A/P protein= 1,16			PUFA/SFA =0,62 A/P fat = 1,35 A/P protein = 1,16		

Figure 1. Contribution of different food groups to total energy intake (%TEI) in family nutrition of school children in all centers in JUSAD study during 1998 and 2003 year

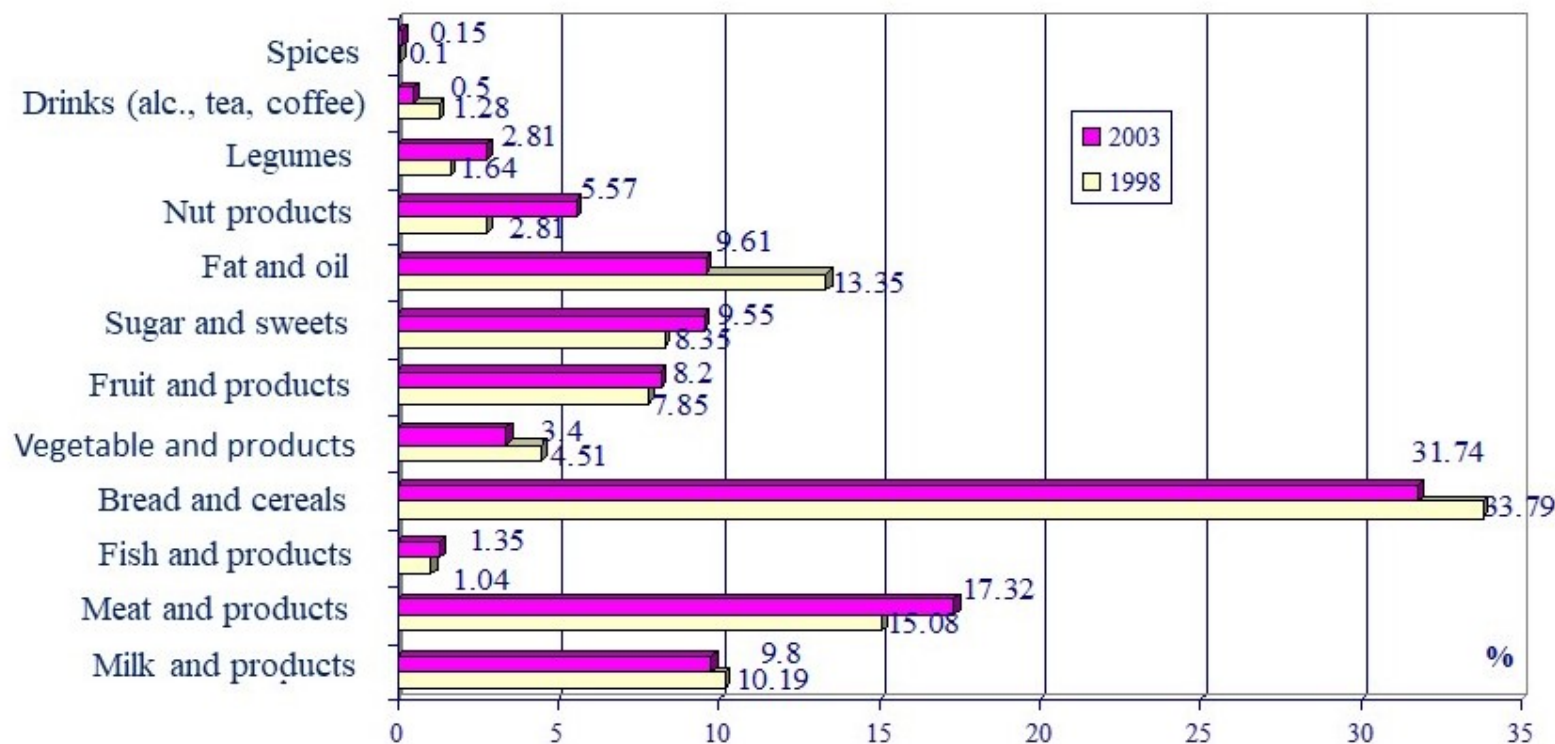


Figure 2. Contribution of different food groups to total energy intake (%TEI) in family nutrition of school children age 15 year in all centers in JUSAD study during 2003 year

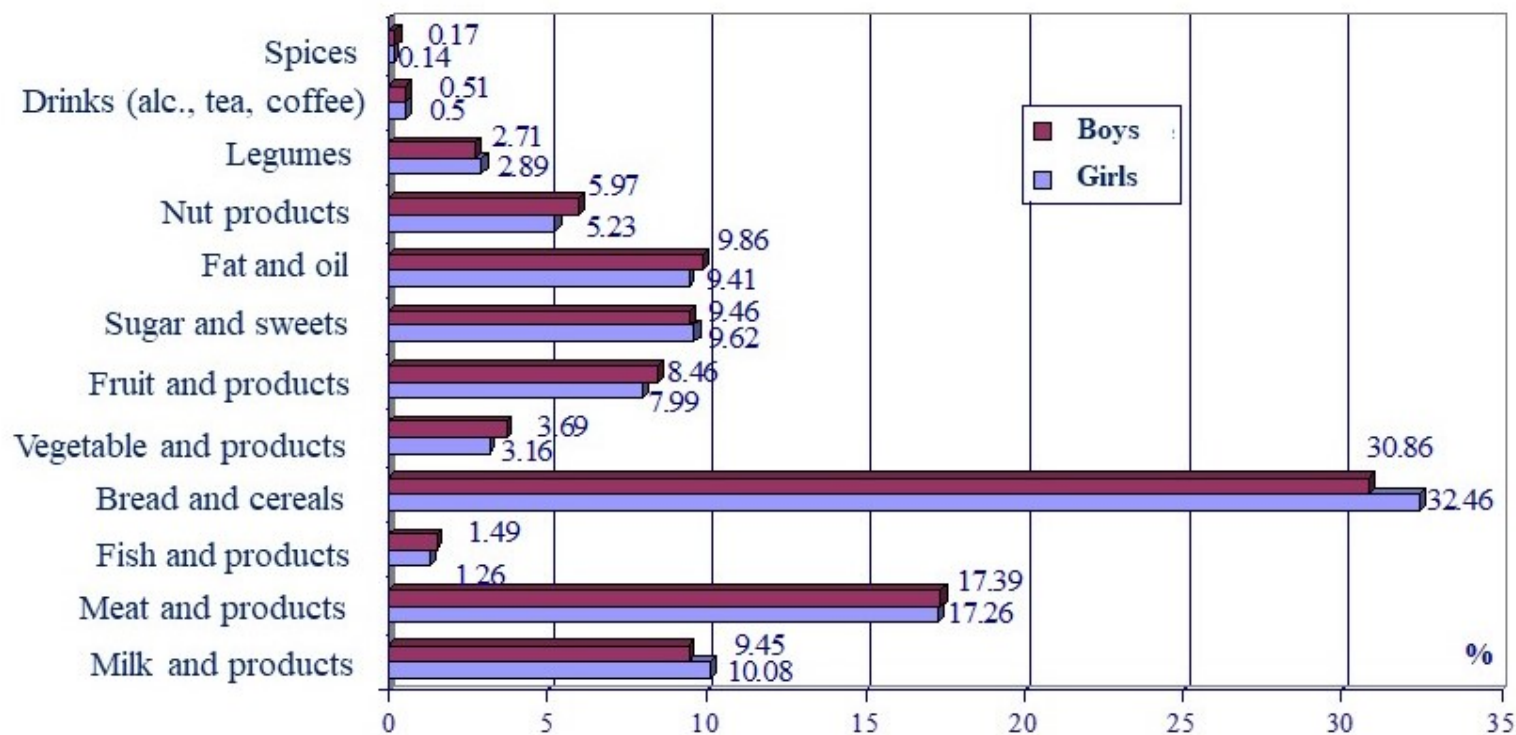


Figure 3. Contribution of different food groups to total energy intake (%TEI) in family nutrition of school children in all centers in JUSAD study during 1998 and 2003 year according to the recommendations

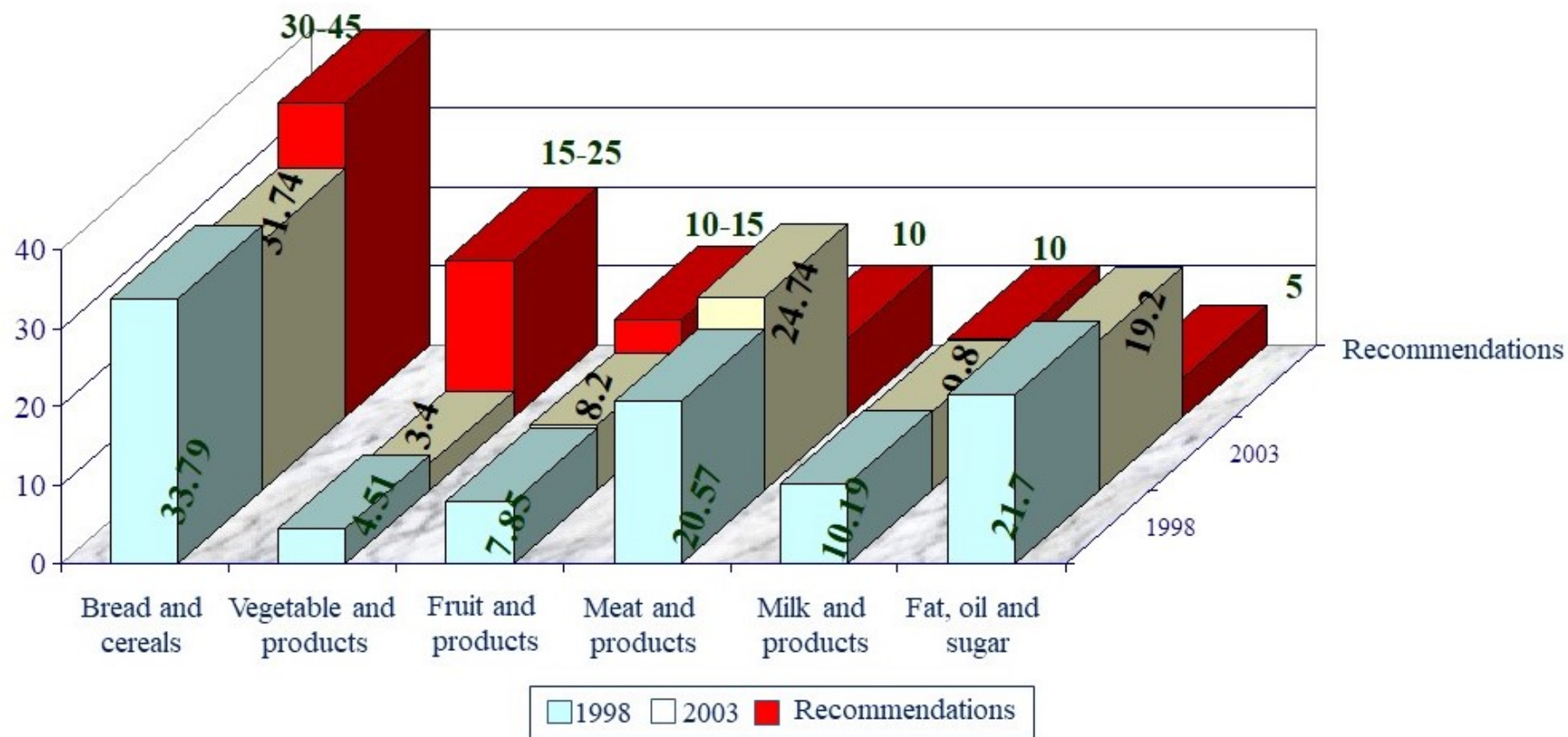


Figure 4. Nutritive risk factors in family nutrition of school children age 10 year in all centers in JUSAD study during 1998

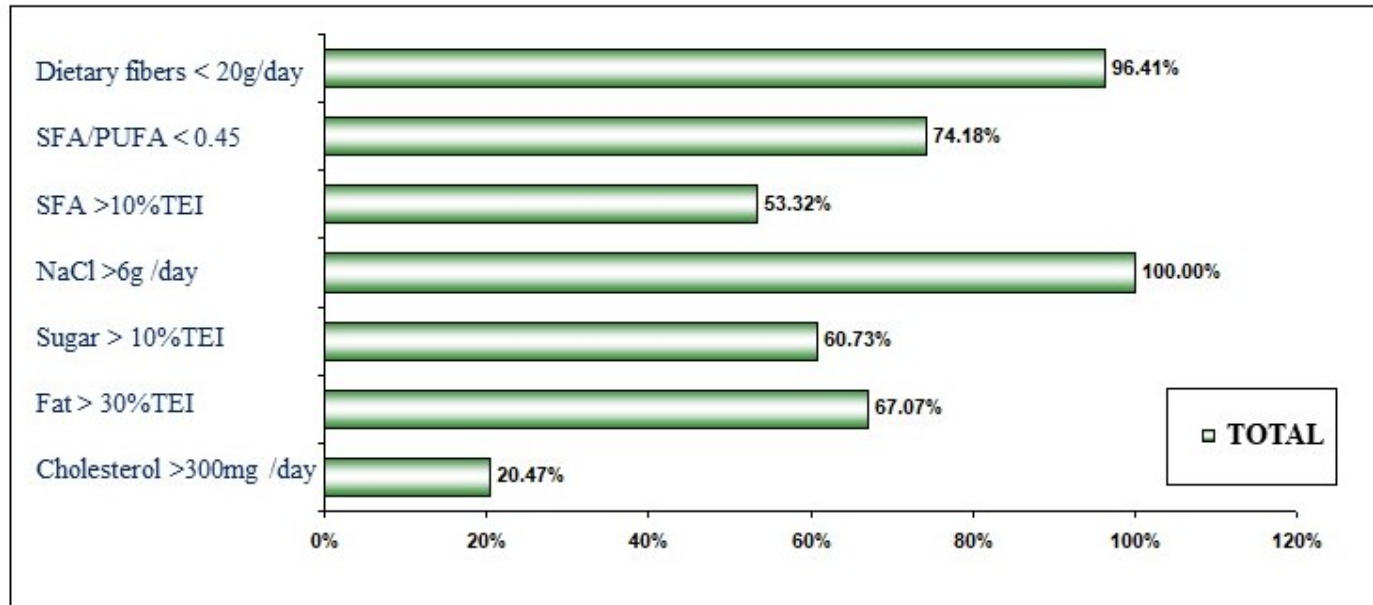


Table 5.

Dietary intake of micronutrients in family nutrition of school children age 10 year in all centers in JUSAD study during 1998

Nutrient	X/day	X/1000 kcal	RDA 10 year
MINERALS			
Calcium (mg)	1210,32	405,88	800
Phosphorus (mg)	1656,08	555,37	800
Iron (mg)	20,41	6,85	10
Sodium (mg)	5042,05	1690,85	-
Potassium (mg)	4357,99	1461,45	-
Magnesium (mg)	416,5	139,79	170
Zinc (mg)	13,06	4,38	10
Iodine (µg)	159,88	53,62	120
VITAMINS			
Vitamin A (µgRE)	471,36	158,07	700
Vitamin D (µg)	4,34	1,45	10
Vitamin E (µgµ-TE)	28,06	9,41	7
Vitamin C (mg)	125,17	41,98	45
Vitamin B1 (mg)	2,67	0,89	1,0
Vitamin B2 (mg)	2,64	0,88	1,2
Vitamin B6 (mg)	2,41	0,81	1,4
Niacin (mg)	33,95	11,38	13
Vitamin B12 (µg)	4,99	1,67	1,4
Folic acid (µg)	252,83	84,79	100
Vitamin K (µg)	37,45	12,56	30
Index Na/K = 1,16			

Table 6. Dietary intake of micronutrients in family nutrition of school children age 15 in all centers in JUSAD study during 2003.year

Nutrient	Schoolchildren average intake	Boys	/1000 kcal	RDA Boys 15-18 years	Girls	/1000 kcal	RDA Girls 15-18 years
M i n e r a l s							
Ca (mg)	1120,66	1197,12	396,47	1200	1046,65	379,90	1200
Mg (mg)	391,48	403,08	133,49	400	382,20	138,72	300
Fe (mg)	20,01	21,02	6,96	12	19,08	6,92	15
Zn (mg)	15,11	15,03	4,97	15	15,33	5,56	12
Iodine (µg)	190,52	198,92	65,88	150	182,98	66,41	150
P (mg)	1701,92	1782,66	590,40	1200	1628,28	591,02	1200
Sodium (mg)	5473,72	5724,62	1895,95		5246,52	1904,3	
Potassium (mg)	3786,57	3884,82	1286,62		3711,94	1347,3	
V i t a m i n s							
Vit. A (µg RE)	454,66	471,34	156,10	1000	440,35	159,83	800
Vit. D (µg)	4,73	5,02	1,66	10	4,44	1,61	10
Vit. E (µgα-TE)	26,54	26,56	8,79	10	26,76	9,71	8
Vit. K (µg)	192,64	187,04	61,94	65	200,45	72,75	55
Vit. C (mg)	134,75	132,35	43,83	60	138,55	50,29	60
Vit. B₁ (mg)	2,68	2,84	0,93	1.5	2,53	0,91	1,1
Vit. B₂ (mg)	2,56	2,71	0,89	1.8	2,42	0,87	1,3
Niacin (mg NE)	28,22	29,37	9,72	20	27,20	9,87	15
Vit. B₆ (mg)	2,29	2,37	0,78	2,0	2,23	0,80	1,5
Folic acid. (µg)	261,78	270,65	89,63	200	254,34	92,31	180
Vit. B₁₂ (µg)	5,48	5,82	1,92	2,0	5,15	1,87	2,0

Figure 5. Nutritive risk factors in family nutrition of school children age 15 year according to gender in all centers in JUSAD study during 2003

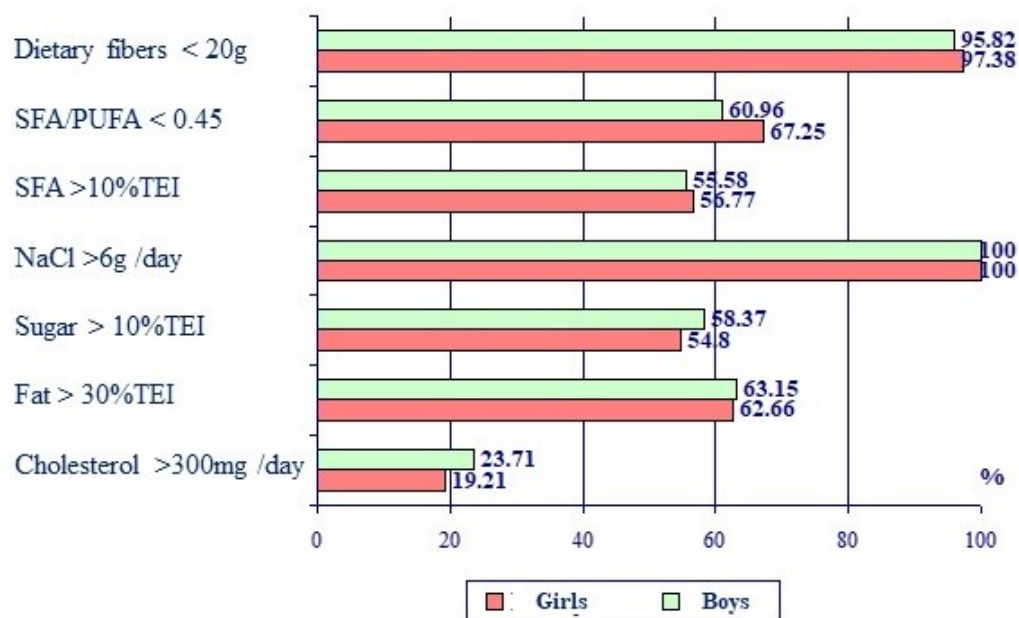


Figure 6. Frequency of inadequate intake of energy, protein and some nutrients in family nutrition according to RDA for children age 7-10 year (< 90% RDA) in all centers in JUSAD study during 1998 year

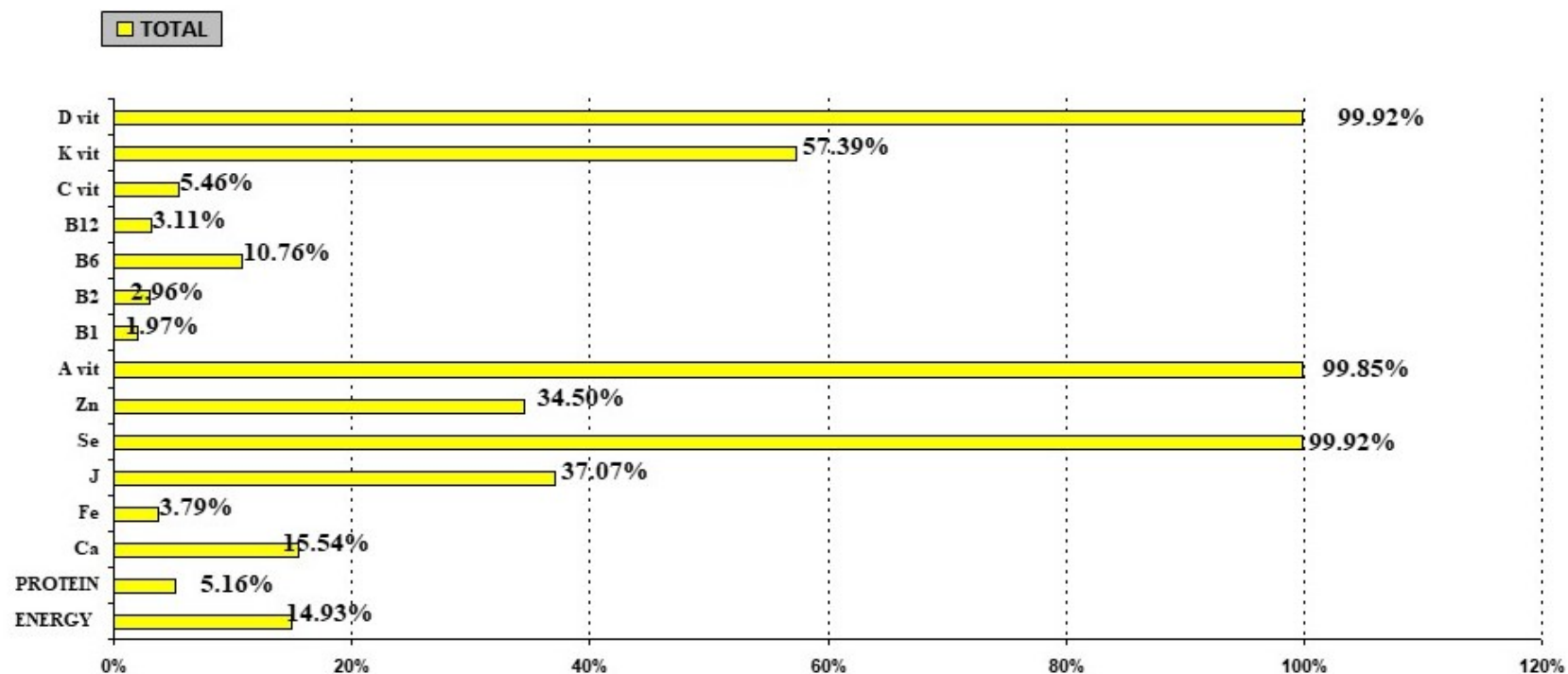


Figure 7. Frequency of inadequate intake of energy, protein and some nutrients in family nutrition of schoolchildren age 15 year according to RDA (< 90% RDA) in all centers in JUSAD study during 2003 year according to gender

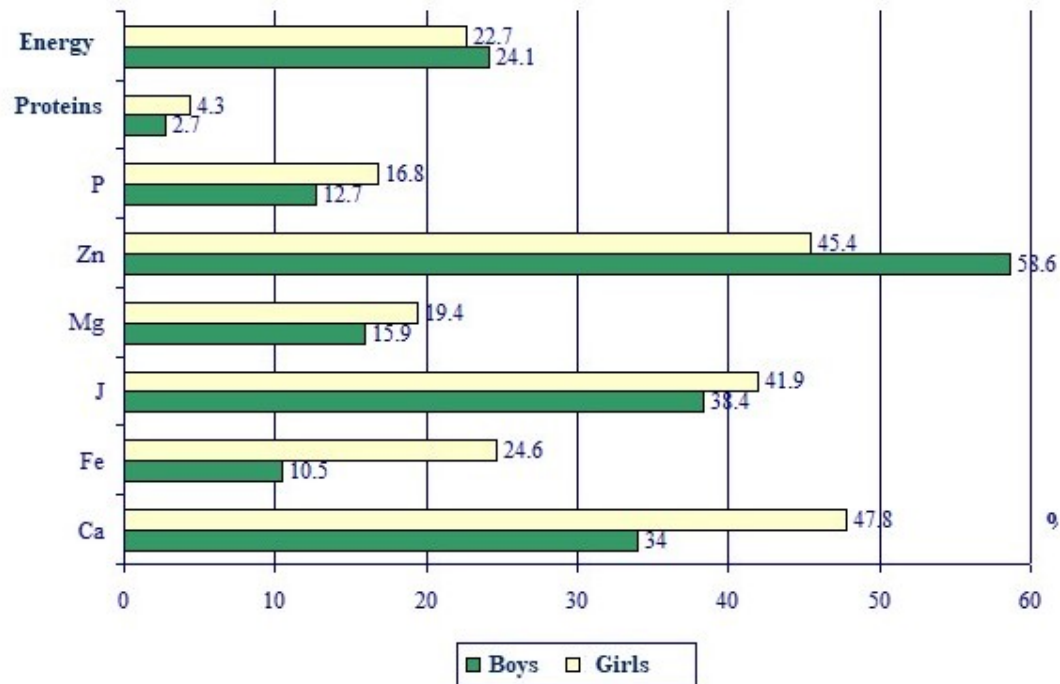


Figure 8. Frequency of inadequate intake of vitamins in family nutrition of schoolchildren age 15 year according to RDA (< 90% RDA) in all centers in JUSAD study during 2003 year according to gender

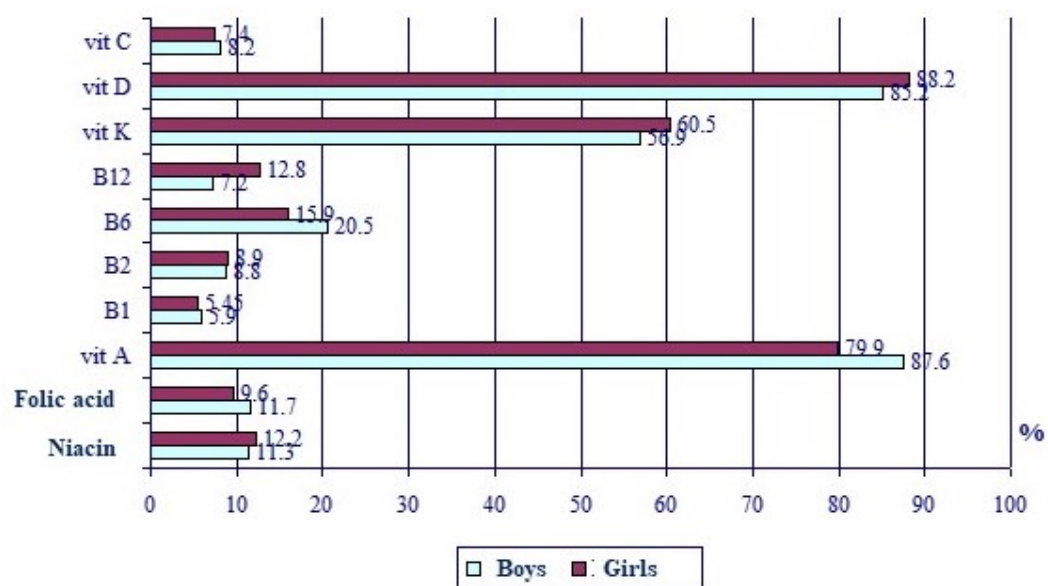


Tabela 7. Contribution of different food groups to macro and micronutrients intake in schoolchildren in family nutrition of schoolchildren age 10 y in all centers in JUSAD study during 1998 year

Nutrients	1	2	3	4	5	6	7	8	9	10	11	12
Protein (A)	26,85	62,26	8,52	2,31	-	4,15	-	-	-	-	-	-
Protein (P)	-	-	-	0,08	63,46	0,06	10,20	3,92	0,39	7,15	5,55	5,11
Fat (A)	29,88	43,95	1,43	24,59	-	11,18	-	-	-	-	-	-
Fat (P)	-	-	-	47,36	-	0,15	1,64	1,91	0,23	0,47	14,71	0,00
Carbohydrates	3,99	0,38	0,00	0,20	53,19	13,87	28,80	16,48	0,14	2,48	0,58	0,72
Cholesterol	31,22	55,72	3,89	8,63	0,00	0,54	0,00	0,00	0,00	0,00	0,00	0,00
SFA	35,89	21,47	0,25	24,69	6,29	7,94	0,29	0,55	0,05	0,08	2,50	0,00
PUFA	2,65	10,27	0,56	63,70	2,36	0,43	1,20	0,82	0,30	0,79	16,93	0,00
MUFA	18,01	32,90	0,55	37,90	0,57	3,96	0,41	0,26	0,04	0,05	5,34	0,00
Mg	11,01	8,20	1,43	0,23	20,25	2,38	13,18	9,48	2,43	6,86	8,46	16,09
Fe	1,74	16,85	1,57	0,40	44,88	2,14	11,48	5,59	1,32	5,38	2,82	5,85
Zn	21,49	24,79	0,00	0,67	20,12	0,48	5,28	2,08	0,39	3,40	20,51	0,78
Ca	43,59	1,94	2,24	0,20	28,78	4,14	7,86	3,61	0,50	2,38	2,30	2,46
P	22,91	20,88	3,99	0,37	24,80	3,42	6,21	3,26	0,42	4,20	4,85	4,70
Cu	0,00	5,29	0,03	0,23	12,15	64,61	6,75	5,07	0,24	2,24	2,90	0,50
Mn	0,00	3,84	0,00	0,03	34,83	30,52	13,42	8,84	0,00	0,00	7,80	0,72
J	20,96	0,32	0,13	2,54	0,00	0,21	2,21	0,21	73,00	0,00	0,42	0,00

Se	0,79	2,27	0,00	0,00	6,89	0,00	0,11	81,97	0,00	0,26	7,71	0,00
Vit. A	19,28	27,25	0,12	4,27	2,10	0,22	35,55	6,94	4,13	0,13	0,00	0,00
Vit. D	54,19	8,94	25,59	9,44	1,85	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Vit. E	1,44	1,38	0,48	63,60	14,82	1,18	2,79	3,05	0,01	1,25	10,00	0,00
Vit. C	1,84	14,42	0,00	0,01	0,03	0,09	51,67	31,25	0,51	0,00	0,17	0,00
Vit. B₁	4,80	19,02	0,76	1,00	51,13	1,71	8,51	5,01	2,45	2,81	2,82	0,00
Vit. B₂	2432	19,66	1,58	0,44	33,31	2,70	6,20	6,02	3,12	0,98	0,91	0,75
Niacin	1,75	30,26	1,99	0,72	32,17	0,89	7,58	3,27	0,57	1,17	228	17,35
Vit. B₆	12,97	30,03	1,03	0,37	8,86	0,38	18,75	21,03	0,13	3,58	2,80	0,06
Folic acid	11,20	4,36	0,24	0,10	46,40	0,54	20,59	11,36	0,00	0,00	5,22	0,00
Vit. K	29,55	0,00	0,00	0,00	0,01	2,15	66,73	0,00	0,00	0,00	0,00	1,56
DFS	0,00	0,00	0,00	0,00	16,23	0,40	29,44	36,48	2,77	8,64	6,04	0,00
DFI	0,00	0,00	0,00	0,00	3,88	0,00	33,04	44,72	0,00	15,67	2,68	0,00

Notes: 1. Milk and dairy products, 2. Meat, eggs, products 3. Fish and products, 4. Fat and oil, 5. Bread and cereals, 6. Sugar and sweets, 7. Vegetable and products, 8. Fruit and products, 9. Spices, herbs 10. Legumes, 11. Nuts, seeds 12. Drinks (alcohol, tea, coffee); SFA – saturated fatty acids, PUFA – polyunsaturated fatty acids, MUFA – monounsaturated fatty acids, DFS – dietary fibre soluble, DFI – dietary fibre insoluble

Table 8. Contribution of different food groups to macro and micronutrients intake in schoolchildren in family nutrition of schoolchildren age 15 y in all centers in JUSAD study during 2003 year

Nutrient	1	2	3	4	5	6	7	8	9	10	11	12
Protein (A)	24,29	60,91	10,26	4,35	-	0,20	-	-	-	-	-	-
Protein (P)	-	-	-	0,07	56,64	6,19	7,28	4,29	0,87	0,49	12,72	11,45
Fat (A)	27,61	50,60	1,81	19,48	-	0,50	-	-	-	-	-	-
Fat (P)	-	-	-	27,59	19,83	20,21	1,54	2,14	0,00	0,35	0,79	27,54
Carbohydrates	3,82	0,50	0,00	0,29	52,09	13,07	6,14	18,12	0,35	0,25	4,15	1,23
Cholesterol	28,50	57,30	5,89	7,16	0,00	1,14	0,00	0,00	0,00	0,00	0,00	0,00
SFA	32,86	26,90	0,45	17,82	5,23	11,02	0,31	0,60	0,00	0,04	0,12	4,63
PUFA	2,90	13,97	1,12	39,71	4,65	0,67	1,38	1,20	0,00	0,51	1,32	32,56
MUFA	16,18	39,31	0,94	25,95	1,30	5,14	0,41	0,70	0,00	0,06	0,07	9,99
Mg	10,39	8,50	1,61	0,45	22,14	3,82	10,10	11,09	3,04	3,21	12,23	13,44
Fe	1,58	18,95	2,11	0,66	39,34	4,31	8,49	5,80	1,11	1,95	9,91	5,79
Zn	16,71	18,33	0,00	1,08	16,78	0,63	3,31	1,81	0,16	0,44	4,91	35,82
Ca	42,86	2,13	3,70	0,24	24,68	6,01	6,37	4,85	0,52	0,71	4,39	3,53
P	20,61	19,90	5,03	0,57	22,35	4,69	4,39	3,58	0,83	0,50	7,19	10,37
Cu	0,00	3,80	0,06	0,29	11,56	58,12	4,52	11,02	0,29	0,20	4,00	6,13
Mn	0,00	4,17	0,00	0,03	29,45	28,10	9,20	13,65	0,35	0,00	0,00	15,06
J	19,37	0,26	0,10	4,44	0,07	0,59	1,31	0,01	0,00	73,08	0,00	0,78
Se	1,71	7,79	0,00	0,00	16,75	0,00	0,22	19,24	0,00	0,00	1,06	53,24

Vit. A	17,74	33,94	0,11	3,75	2,28	0,32	27,79	7,20	0,00	6,65	0,20	0,00
Vit. D	41,18	13,28	33,93	7,85	3,75	0,00	0,00	0,00	0,00	0,01	0,00	0,00
Vit. E	1,26	1,34	0,72	44,94	13,35	2,03	2,15	3,66	0,00	0,01	1,98	28,58
Vit. C	1,47	15,55	0,00	0,00	1,22	0,07	32,10	48,62	0,00	0,74	0,00	0,23
Vit. B₁	4,15	23,02	0,88	1,87	41,84	3,24	5,94	5,06	0,00	3,25	4,97	5,78
Vit. B₂	21,89	23,62	2,18	0,81	27,41	4,32	4,75	6,79	0,16	4,26	1,76	2,06
Niacin	1,76	35,03	3,17	1,70	31,63	1,73	6,61	4,37	3,65	0,90	2,34	7,10
Vit. B₆	11,25	30,44	1,24	0,78	8,74	2,62	14,03	21,29	0,03	0,10	5,77	3,71
Folic acid	9,69	5,57	0,42	0,15	42,39	0,76	16,43	12,65	0,00	0,00	0,00	11,95
Vit. K	4,53	0,00	0,00	0,00	0,00	0,39	94,38	0,00	0,70	0,00	0,00	0,00
DVR	0,01	0,00	0,00	0,00	19,18	0,49	19,54	33,58	0,00	4,11	13,36	9,73
DVN	0,00	0,00	0,00	0,00	0,63	0,00	18,82	46,06	0,00	0,00	24,18	4,31

Notes: 1. Milk and dairy products, 2. Meat, eggs, products 3. Fish and products, 4. Fat and oil, 5. Bread and cereals 6. Sugar and sweets, 7. Vegetable and products, 8. Fruit and products, 9. Spices, herbs 10. Legumes, 11. Nuts, seeds 12. Drinks (alcohol, tea , coffee); SFA – saturated fatty acids, PUFA – polyunsaturated fatty acids , MUFA – monounsaturated fatty acids, DFS – dietary fibre soluble, DFI – dietary fibre insoluble

Table 9. Food groups consumption (gr) in family nutrition of school children age 10 year in all centers in JUSAD study during 1998

Food group	Beograd	Užice	Požarevac	Priština	Podgorica	Kraljevo	Despotovac	Knjaževac	Zaječar	Arilje	Gradiška	Niš	Subotica
Milk and dairy products	288,05	229,72	313,48	379,14	307,30	322,95	195,10	257,25	369,96	283,41	267,74	359,76	253,83
Meat, eggs, products	173,90	142,26	219,05	175,25	139,58	184,80	165,73	151,24	238,22	155,01	169,12	180,38	175,16
Fish and products	27,19	17,35	42,23	27,75	33,83	18,98	28,88	13,28	38,51	18,47	18,95	22,03	15,92
Bread and cereals	300,83	29,08	393,84	375,31	308,19	375,23	413,68	492,97	414,30	261,39	371,83	361,36	254,77
Vegetable and products	243,36	21,72	266,69	299,09	238,45	292,90	212,19	322,17	457,99	214,40	196,74	286,84	211,51
Fruit and products	321,97	31,44	403,34	475,06	317,91	224,82	310,26	365,01	655,72	326,45	150,26	289,19	279,75
Sugar and sweets	48,56	5,46	59,50	60,74	46,06	91,89	54,65	74,04	92,17	50,95	77,11	72,75	46,66
Fat and oil	40,66	41,45	51,13	37,53	33,37	75,01	41,41	53,72	55,24	35,31	6960	40,51	34,84
Nuts, seeds	14,44	1489	15,04	22,73	11,07	11,52	14,25	10,96	17,26	12,48	9,18	11,93	9,81
Legumes	14,74	17,97	17,31	15,11	11,21	15,37	20,45	15,26	16,91	13,78	23,15	15,56	10,98
Drinks (alcohol, tea , coffee	49,12	30,68	59,85	36,53	33,18	57,20	75,07	139,55	43,54	37,47	1,11	89,31	40,17
Spices, herbs	5,64	5,57	6,62	5,61	4,32	5,49	9,08	6,55	4,69	4,95	8,56	8,35	5,83

Table 10. Food groups consumption (gr) in family nutrition of school children age 15 year in all centers in JUSAD study during 2003

Food group	Subotica	Beograd	Užice	Požare-vac	Zaječar	Arilje	Despotovac	Bor	Knjaževac	Kraljevo
Milk and dairy products	332,06	317,15	249,95	319,97	286,46	257,17	201,99	265,97	237,05	282,21
Meat, eggs, products	194,95	168,94	140,13	176,59	207,90	151,81	187,37	167,73	246,90	177,23
Fish and products	26,74	27,09	22,63	42,10	38,94	40,75	20,87	31,06	36,08	28,76
Bread and cereals	296,53	279,05	303,07	321,83	333,52	309,02	312,04	305,93	383,54	236,09
Vegetable and products	204,02	207,99	224,33	209,35	220,70	262,46	236,74	201,71	239,32	280,98
Fruit and products	350,40	481,29	270,61	314,06	381,82	296,40	363,25	337,82	615,14	452,08
Sugar and sweets	56,60	53,46	73,95	44,46	64,52	69,26	65,07	74,79	82,29	100,67
Fat and oil	29,47	28,11	36,40	36,55	48,29	50,07	37,33	41,57	40,93	36,44
Nuts, seeds	18,62	20,82	17,03	15,70	13,53	17,89	15,52	22,15	46,43	19,80
Legumes	13,21	19,94	16,01	18,82	20,67	17,83	27,53	24,65	44,19	10,65
Drinks (alchocol, tea, coffee)	29,60	10,99	76,57	45,42	43,87	31,02	45,36	17,12	26,24	26,86
Spices, herbs	8,23	9,80	4,22	7,86	7,45	8,96	8,41	10,54	6,78	6,35

Table 11. Food groups consumption and contribution (%) to the daily energy intake in family nutrition of school children age 10 year in all centers in JUSAD study during 1998

Food Group	Beograd	Užice	Požarevac	Priština	Podgorica	Kralje-vo	Despotovac	Knjaževac	Zaječar	Arilje	Gradiška	Niš	Subotica	Svi centri ukupno
Number of families	85	74	63	32	70	104	38	90	302	27	37	30	367	1319
Food Group														
Milk and dairy products	10,88	10,01	9,75	11,08	11,97	11,34	7,34	8,16	10,07	13,81	9,58	11,54	9,97	10,19
Meat, eggs, products	15,83	12,95	16,15	13,36	12,31	12,53	13,40	9,63	15,64	13,50	11,56	13,96	18,89	15,08
Fish and products	1,26	0,89	1,63	1,08	1,53	0,65	1,21	0,51	1,19	1,00	0,77	0,87	0,91	1,04
Bread and cereals	33,52	34,20	35,46	35,65	36,11	32,98	42,09	41,62	31,09	32,30	36,80	35,19	32,32	33,79
Vegetable and products	4,11	4,00	3,76	4,25	4,99	3,97	2,92	4,44	4,95	3,99	3,76	4,34	4,95	4,51
Fruit and products	7,67	7,97	7,19	9,75	8,45	4,06	6,33	6,72	10,54	8,17	3,33	6,05	7,14	7,85
Sugar and sweets	7,41	9,06	6,81	7,25	7,32	10,10	7,16	8,01	8,97	8,13	9,47	10,34	7,76	8,35
Fat and oil	12,56	13,59	13,48	10,30	11,58	19,19	12,31	13,74	12,33	12,95	20,29	11,70	12,57	13,35
Nuts, seeds	3,47	3,75	2,94	4,66	2,87	2,15	3,10	2,01	2,85	3,21	1,92	2,52	2,64	2,81
Legumes	1,85	2,33	1,78	1,61	1,52	1,47	2,27	1,43	1,46	1,92	2,43	1,75	1,55	1,64
Drinks (alcohol, tea, coffee)	1,32	1,12	0,98	0,92	1,31	1,50	1,77	3,61	0,93	0,95	0,03	1,61	1,17	1,28
Spices, herbs	0,12	0,12	0,08	0,09	0,04	0,07	0,10	0,13	0,08	0,06	0,04	0,13	0,12	0,10

Table 12 Food groups consumption and contribution (%) to the daily energy intake in family nutrition of school children age 15 year in all centers in JUSAD study during 2003

Food group	Subotica	Beograd	Užice	Požarevac	Zaječar	Arilje	Despotovac	Bor	Knjaževac	Kraljevo	Svi centri ukupno
Number of families	301	32	49	60	58	36	21	93	299	11	960
Food Group											
Milk and dairy products	11,26	12,16	10,14	11,80	10,61	9,84	9,02	10,40	8,02	11,02	9,80
Meat, eggs, products	18,77	16,00	14,30	15,56	17,27	13,11	16,62	16,08	17,65	17,43	17,32
Fish and products	1,40	1,32	1,18	1,82	1,62	1,71	1,04	1,36	1,19	1,29	1,35
Bread and cereals	32,15	31,21	34,82	35,07	32,56	31,88	33,30	31,60	30,70	25,55	31,74
Vegetable and products	4,13	3,46	3,47	3,66	3,36	4,13	3,51	2,93	2,87	3,79	3,40
Fruit and products	7,67	10,21	6,34	7,06	7,36	8,17	7,45	7,29	9,18	9,58	8,20
Sugar and sweets	9,12	8,82	9,79	7,10	8,01	10,03	9,42	10,77	10,04	13,90	9,55
Fat and oil	8,88	8,53	11,91	11,12	12,95	14,32	11,92	11,18	8,16	10,80	9,61
Nuts, seeds	4,32	5,01	4,23	3,73	2,80	3,97	3,58	4,94	7,77	4,78	5,57
Legumes	1,64	2,52	2,10	2,35	2,32	2,08	3,35	2,90	3,94	1,36	2,81
Drinks (alcohol, tea, coffee)	0,51	0,21	1,66	0,62	1,00	0,62	0,68	0,38	0,32	0,45	0,50
Spices, herbs	0,16	0,53	0,06	0,12	0,12	0,15	0,10	0,15	0,15	0,05	0,15

Table 13. Energy and macronutrients intake in family nutrition of school children age 10 year in all centers in JUSAD study during 1998 year and % contribution to total energy intake (%TEI)

Nutrient	Beograd	Užice	Požarevac	Priština	Podgorica	Kraljevo	Despotovac	Knjaževac	Zaječar	Arilje	Gradiška	Niš	Subotica	Svi centri ukupno
Number of families	85	74	63	32	70	104	38	90	302	27	37	30	367	1319
MAKRONUTRIENTS														
Fat (%TEI)	38,96	37,74	39,03	36,00	36,08	41,96	35,67	34,48	37,83	38,68	40,65	37,88	39,59	40,08
- animal (%TEI)	21,99	20,57	21,71	18,34	19,11	25,37	18,93	17,73	23,12	21,57	23,31	19,16	24,32	23,35
- plant (%TEI)	16,97	17,17	17,32	17,66	16,96	16,59	16,74	16,75	14,71	17,11	17,34	18,72	15,27	16,73
Protein (%TEI)	14,90	13,82	14,85	14,44	15,01	13,50	14,22	13,19	13,76	14,78	12,46	14,49	16,64	14,76
- animal (%TEI)	8,28	7,12	8,34	7,58	8,20	7,19	6,81	5,35	7,61	8,53	6,35	7,76	8,42	7,99
- plant (%TEI)	6,62	6,69	6,52	6,86	6,81	6,31	7,41	7,84	6,16	6,25	6,11	6,73	6,22	6,77
Carbohydrates (% TEI)	46,14	48,45	46,12	49,46	48,91	44,54	50,11	52,33	48,40	46,54	46,90	47,63	46,78	45,16
SFA (%TEI)	11,72	11,45	10,97	10,70	10,62	12,93	10,14	10,33	11,52	12,64	12,08	8,74	11,17	11,35
PUFA (%TEI)	8,20	8,33	8,59	8,14	7,50	8,89	7,97	7,41	7,14	8,28	9,83	5,89	7,52	7,76
MUFA (%TEI)	9,84	9,91	9,55	8,80	8,20	11,45	9,21	8,73	9,81	10,19	11,36	7,78	9,94	9,76
Total energy intake (kcal)	2472,68	2393,29	3050,80	2910,45	2319,52	3235,30	2786,99	3288,61	3601,48	2284,61	2864,80	2815,18	2197,87	2981,96

Table 14. Energy and macronutrients intake in family nutrition of school children age 15 year in all centers in JUSAD study during 2003 year and % contribution to total energy intake (%TEI)

Nutrient	Subotica	Beograd	Užice	Požarevac	Zaječar	Arilje	Despotovac	Bor	Knjaževac	Kraljevo	Svi centri ukupno
Number of families	301	32	49	60	58	36	21	93	299	11	960
MACRONUTRIENT											
Fat (%TEI)	39,33	39,05	39,09	38,46	39,84	38,91	39,30	41,21	39,73	42,23	39,67
- animal (%TEI)	23,90	21,33	22,06	22,95	24,51	22,36	21,62	24,13	22,56	25,53	23,18
- plant (%TEI)	15,43	17,72	17,03	15,51	15,34	16,55	17,68	17,08	17,17	16,70	16,48
Protein (%TEI)	14,99	14,87	14,55	15,42	15,31	13,99	14,67	14,22	15,01	14,10	14,89
- animal (%TEI)	8,61	8,07	7,15	8,80	8,81	7,69	7,96	7,50	7,54	8,52	8,00
- plant (%TEI)	6,38	6,80	7,40	6,63	6,50	6,30	6,71	6,73	7,46	5,58	6,89
Carbohydrates (% TEI)	45,68	46,08	46,36	46,11	44,85	47,10	46,03	44,57	45,27	43,67	45,44
SFA (%TEI)	11,82	12,49	11,49	12,39	12,54	12,24	11,38	12,75	12,14	13,07	12,13
PUFA (%TEI)	6,89	7,21	7,36	7,47	7,58	6,46	8,40	7,57	6,94	7,53	7,10
MUFA (%TEI)	10,15	10,63	9,07	10,60	10,82	11,18	10,04	10,78	11,02	10,57	10,63
Total energy intake (kcal)	2528,30	2480,16	2377,74	2498,00	2797,32	2681,75	2569,61	2651,81	3552,38	2461,62	288,2

Table 15 . Energy and macronutrients intake in family nutrition of school children age 15 year in all centers in JUSAD study during 1998 year and % contribution to total energy intake (%TEI)

Nutrient/EV	Beograd	Užice	Požarevac	Priština	Podgorica	Kraljevo	Despotovac	Knjaževac	Zaječar	Arilje	Gradiška	Niš	Subotica
Fat (%TEI)	108,37	101,63	133,54	118,33	93,86	152,19	110,33	125,07	153,46	99,45	134,46	123,49	97,82
- animal (%TEI)	61,17	55,39	74,29	60,28	49,73	92,00	58,54	64,32	93,80	55,46	77,11	60,31	60,10
- plant (%TEI)	47,20	46,24	59,25	58,05	44,13	60,19	51,79	60,75	59,67	43,99	57,35	58,93	37,72
Protein (%TEI)	93,99	84,41	115,29	107,67	88,59	111,07	99,73	108,54	126,61	86,19	93,56	103,48	82,51
- animal (%TEI)	52,25	43,52	64,71	56,53	48,40	59,12	47,76	44,02	69,98	49,75	47,62	55,40	47,65
- plant (%TEI)	41,74	40,89	50,59	51,14	40,19	51,95	51,97	64,52	56,63	36,44	45,83	48,08	3486
Carbohydrates (% TEI)	291,08	295,94	357,95	369,51	288,64	366,43	351,60	430,59	445,36	271,46	351,85	340,13	256,58
SFA (%TEI)	31,18	29,48	36,00	33,48	26,50	45,00	30,40	26,52	44,62	31,06	38,21	26,46	26,41
PUFA (%TEI)	21,82	21,45	28,18	25,48	18,73	31,26	23,89	26,20	27,66	20,34	31,11	17,82	17,77
MUFA (%TEI)	26,18	25,51	31,34	27,55	20,43	39,85	27,59	30,89	37,98	25,03	35,94	23,54	23,50
Cholesterol (mg)/day	201,02	175,66	238,83	211,97	183,29	256,15	184,48	195,64	269,04	198,35	214,50	181,88	181,72
Dietary fibre (g)/day	13,46	14,35	14,85	19,30	12,49	12,63	14,12	16,39	25,83	12,40	10,74	10,65	10,67
- soluble (g)/day	6,45	6,66	7,03	9,57	5,83	5,47	7,14	8,44	12,99	5,22	4,83	4,96	4,97
- unsoluble (g)/day	7,01	7,69	7,82	9,73	6,66	6,16	6,98	7,95	12,84	6,18	5,91	5,69	5,70
Total energy intake (kcal)	2473,68	2393,26	3050,80	2910,45	2319,52	3235,30	2786,99	3288,61	3601,48	2284,61	2942,22	2915,73	2197,87

Table 16. Energy and macronutrients intake in family nutrition of school children age 10 year in all centers in JUSAD study during 2003 year and % contribution to total energy intake (%TEI)

Nutrient/EV	Subotica	Beograd	Užice	Požarevac	Zaječar	Arilje	Despotovac	Bor	Knjaževac	Kraljevo
Fat (%TEI)	112,51	110,20	104,59	108,15	124,07	117,48	113,58	123,35	159,66	117,35
- animal (%TEI)	68,37	60,20	59,02	64,54	76,92	67,51	62,48	72,24	90,65	70,94
- plant (%TEI)	44,14	50,00	45,57	43,61	48,15	49,97	51,10	51,11	69,01	46,41
Protein (%TEI)	97,26	95,15	88,28	98,36	108,98	95,79	96,13	96,57	136,81	88,88
- animal (%TEI)	55,88	51,66	43,39	56,10	62,70	52,66	52,15	50,89	68,78	53,72
- plant (%TEI)	41,38	43,49	44,89	42,26	46,28	43,13	43,98	45,68	68,03	35,16
Carbohydrates (% TEI)	296,45	294,96	281,38	294,10	319,34	322,52	301,74	302,59	412,71	275,24
SFA (%TEI)	32,14	33,32	29,38	33,29	37,4	35,32	31,47	36,37	46,38	34,62
PUFA (%TEI)	18,74	19,24	18,84	20,08	22,80	18,64	23,21	21,59	26,53	19,95
MUFA (%TEI)	27,62	28,36	23,21	28,48	32,57	32,26	27,75	30,74	42,13	27,99
Cholesterol (mg)/day	210,70	204,36	178,75	216,77	243,70	199,47	210,95	216,10	265,21	229,39
Dietary fibre (g)/day	12,91	16,01	13,33	12,90	14,72	14,97	16,10	14,48	21,14	14,63
- soluble (g)/day	6,25	7,86	6,09	6,24	6,93	7,10	7,58	6,98	9,87	6,71
- unsoluble (g)/day	6,66	8,15	7,24	6,66	7,79	7,87	8,52	7,50	11,27	7,92
Total energy intake (kcal)	2528,30	2480,16	2377,74	2498,00	2797,32	2681,75	2569,61	2651,81	3552,38	2461,62

Table 17. Macronutrients intake in family nutrition of school children age 10 year in all centers in JUSAD study during 1998 (per1000 kcal = Nutrient density index) and % contribution to total energy intake (%TEI)

Nutrient	Beograd	Užice	Požarevac	Priština	Podgorica	Kraljevo	Despotovac	Knjaževac	Zaječar	Arilje	Gradiška	Niš	Subotica
Fat (%TEI)	43,81	42,46	43,77	40,66	40,46	47,04	39,59	38,03	42,61	43,53	45,70	42,35	44,51
- animal (%TEI)	24,73	23,14	24,35	20,71	21,44	28,44	21,00	19,56	26,04	24,28	26,21	21,42	27,34
- plant (%TEI)	19,08	19,32	19,42	19,94	19,02	18,60	18,58	18,47	16,57	19,25	19,49	20,93	17,16
Protein (%TEI)	38,00	35,27	37,79	36,99	38,19	34,33	35,78	33,01	35,15	37,73	31,79	36,76	37,54
- animal (%TEI)	21,13	18,18	21,69	19,42	20,87	18,27	17,14	13,39	19,43	21,78	16,19	19,68	21,68
- plant (%TEI)	16,87	17,08	16,58	17,57	17,33	16,06	18,65	19,62	15,73	15,95	15,58	17,08	15,86
Carbohydrates (% TEI)	117,67	123,65	117,33	126,96	124,44	113,26	126,16	130,93	123,66	118,82	119,59	120,82	116,74
SFA (%TEI)	12,46	12,15	11,79	11,14	11,26	13,78	10,62	11,14	12,35	13,59	12,63	12,03	12,01
PUFA (%TEI)	8,72	8,84	9,24	8,48	7,96	9,57	8,35	7,99	7,65	8,90	10,29	8,10	8,08
MUFA (%TEI)	10,46	10,51	10,27	9,17	8,68	12,19	9,64	9,43	10,51	10,96	11,88	10,70	10,69
Cholesterol (mg)/day	80,34	72,41	78,28	70,55	77,89	78,41	64,45	59,70	74,46	86,82	70,93	82,68	82,68
Dietary fibre (g)/day	5,37	5,92	4,86	6,41	5,31	3,55	4,92	5,00	7,14	4,98	3,54	4,83	4,84
- soluble (g)/day	2,57	2,75	2,30	3,18	2,47	1,67	2,49	2,58	3,59	2,28	1,60	2,25	2,25
- unsoluble (g)/day	2,80	3,17	2,56	3,23	2,84	1,89	2,43	2,43	3,55	2,70	1,95	2,58	2,59

Table 18. Macronutrients intake in family nutrition of school children age 15 year in all centers in JUSAD study during 2003 per1000 kcal = Nutrient density index) and % contribution to total energy intake (%TEI)

Nutrienti	Subotica	Beograd	Užice	Požarevac	Zajčar	Arilje	Despotovac	Bor	Knjaževac	Kraljevo
Fat (%TEI)	44,50	44,43	43,98	43,30	44,71	43,70	44,20	46,51	44,95	47,67
- animal (%TEI)	27,04	24,27	24,82	25,84	27,50	25,17	24,31	27,24	25,52	28,82
- plant (%TEI)	17,46	20,16	19,16	17,46	17,21	18,63	19,89	19,27	19,43	18,85
Protein (%TEI)	38,47	38,37	37,13	39,38	38,95	35,72	37,42	36,42	38,41	35,11
- animal (%TEI)	22,10	20,83	18,25	22,46	22,41	19,64	20,30	19,19	19,36	21,82
- plant (%TEI)	16,37	17,54	18,88	16,92	16,54	16,08	17,12	17,23	19,15	14,29
Carbohydrates (% TEI)	117,25	118,93	118,34	117,74	114,16	120,27	117,43	114,11	116,18	111,81
SFA (%TEI)	12,71	13,43	12,36	13,33	13,49	13,17	12,25	13,72	13,05	14,06
PUFA (%TEI)	7,41	7,76	7,92	8,04	8,15	6,95	9,03	8,14	7,47	8,10
MUFA (%TEI)	10,93	11,44	7,76	11,40	11,64	12,03	10,80	11,59	11,86	11,37
Cholesterol (mg)/day	83,34	82,40	75,18	86,78	87,12	74,38	82,10	81,49	74,66	93,19
Dietary fibre (g)/day	5,10	6,46	5,60	5,17	5,26	5,59	6,26	5,46	5,85	5,95
- soluble (g)/day	2,47	3,17	2,56	2,50	2,48	2,65	2,95	2,63	2,78	2,73
- unsoluble (g)/day	2,63	3,29	3,04	2,67	2,78	2,94	3,31	2,83	3,17	3,22

Tabela 19. Nutritive risk factors (frequency of families) in family nutrition of school children age 10year in all centers in JUSAD study during 1998

JUSAD centre	Cholesterol > 300 mg	Fat > 30%TEI	Sugar > 10%TEI	SFA > 10%TEI	PUFA / SFA 0,45	Dietary fibre < 20 g
	%	%	%	%	%	%
Beograd	9,52	80,95	66,67	57,14	77,38	98,81
Užice	9,59	64,38	73,97	52,05	72,60	98,63
Požarevac	25,40	77,78	63,49	49,21	87,30	98,41
Priština	12,90	70,97	74,19	54,84	90,32	93,55
Podgorica	4,35	69,57	73,91	46,38	81,16	100,00
Kraljevo	28,00	94,17	71,84	80,58	90,29	100,00
Despotovac	10,81	56,76	56,76	37,84	76,68	94,59
Knjaževac	8,89	68,89	73,33	50,00	82,22	100,00
Zaječar	33,55	75,75	71,43	62,13	63,12	90,70
Arilje	7,41	74,07	81,48	74,07	74,07	100,00
Gradiška	11,11	91,67	75,00	66,67	86,11	100,00
Niš	10,71	71,43	75,00	60,71	75,00	100,00
Subotica	6,81	75,20	64,85	50,41	70,03	100,00
Total all centres	20,47	67,07	60,73	53,32	74,18	96,41

*In all families in JUSAD study consumption of NaCl was > 6 g/day

** total energy intake (%TEI)

Table 20. Nutritive risk factors (frequency of families) in family nutrition of school children age 15 year in all centers in JUSAD study during 2003

JUSAD centre	Cholesterol >300 mg	Fat > 30%TEI	Sugar > 10% TEI	SFA > 10%TEI	PUFA / SFA 0,45	Dietary fibre < 20 g
	%	%	%	%	%	%
Subotica	15,67	65,33	60,67	57,00	66,67	99,00
Beograd	6,67	70,00	60,00	70,00	66,67	93,33
Užice	6,12	65,31	67,35	61,22	67,35	100,00
Požarevac	13,33	71,67	66,67	68,33	61,67	100,00
Zaječar	24,14	70,69	58,62	53,45	63,79	96,55
Arilje	11,11	72,22	66,67	58,33	55,56	100,00
Despotovac	14,29	66,67	57,14	61,90	85,71	100,00
Bor	20,43	59,14	48,39	54,84	60,22	95,70
Knjaževac	33,77	66,89	62,91	63,25	61,92	92,72
Kraljevo	18,18	72,73	45,45	63,64	54,55	100,00
Total all centres	21,56	64,17	56,04	56,25	63,96	96,56

*In all families in JUSAD study consumption of NaCl was > 6 g/day

** total energy intake (%TEI)