RELATO DE CASO

Eating habits and intake of macro-and micronutrients among adolescents in the city of Ribeirão Preto (SP)

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Conflict of interest: none

ABSTRACT

Objective: to know the intake of macro and micronutrients among a group of adolescents in the city of Ribeirão Preto (SP). **Methods:** observational study in which it is observed the intake and eating habits of adolescents, through the food frequency questionnaire validated for adolescents and the food record of 3 days. **Results:** the participants were 130 adolescents, of whom 81 (62.3%) were female and 49 (37.6%) male, with a mean age 196.8 ± 11 months. Food items with the highest intake were rice, beans, candies, bread, sugar and milk. The percentage of energy from macronutrients were 56.4% for the group of carbohydrate, 15.3% protein and 28.3% lipid. Regarding minerals, it was observed a low intake than the recommended for calcium, adequate intake of iron and zinc and, notably, excessive sodium intake. **Conclusions:** The results showed that adolescents consume a large amount of simple sugars, saturated fats, trans fats, cholesterol and sodium, which, in excess, can cause harm to the health of individuals in full stage of development. Therefore, the evident need to implement food education programs targeted to adolescents and their families, in order to change consumer's habits, specially the reduction of sodium present in processed foods as well as those prepared in restaurants, decrease of sugar consumption and increase of eating vegetables and foods with calcium.

Key-words: Food habits – Food consumption – Micronutrients – Eating

INTRODUCTION

The second decade of life is differentiated by being a phase of intense growth when healthy eating should be consolidated, since the reinforcement of appropriate eating habits plays a fundamental role of guaranteeing the full growth and potential development of adolescents. Physical transformations lead to increased nutritional requirements due to the modifications of body composition and the rapid growth of the different systems, especially the osteomuscular apparatus, with consequent increased requirements of proteins, iron, calcium, and zinc[1,2].

Adolescents are vulnerable from a nutritional

viewpoint because of their inappropriate eating habits which include a series of internal and external influences[3]. Particularly important among the internal influences, are the psychological necessities and characteristics, the body image, personal values and experiences, self-esteem, food preferences, and health in general[4]. Girls, dissatisfied with their body image, tend to follow diets with energy restriction and these habits, acquired during adolescence, may expose them to nutritional risks, even during adulthood[5,6].

Adolescents usually exclude meals from their eating schedule, especially breakfast, a fact that may lead to poorer school performance and tend to substitute more complex meals such as lunch with snacks. This forms the typical eating pattern of adolescents consisting of high energy foods of low nutritive values, richer in fats and carbohydrates than in vitamins, mineral salts and fibers[7,8].

The increase in bone mass during adolescence increases the daily requirements of calcium and the lack of this nutrient results in a high later risk of developing osteoporosis. Approximately half the bone structure of an individual is deposited during adolescence[6]. Thus, a constant supply of dietary calcium is necessary during this phase of human development, especially with the intake of milk and dairy products in order to guarantee maximum bone mass within the individual genetic programming and the protection of this accumulated mass during advanced age[9].

Sodium is an essential micronutrient for the organism, with an important role in the distribution of cellular fluids, the transmission of nervous impulses, and the maintenance of homeostasis. However, the relationship between excessive sodium consumption and cardiovascular disease is classically recognized, with arterial hypertension being one of the main risks faced by adolescents whose diets have high sodium concentrations[10].

The objective of the present study was to determine the intake of macro and micronutrients in a group of adolescents enrolled in public middle schools in the region covered by a basic health care unit in the city of Ribeirão Preto (SP).

SUBJECTS AND METHODS

This was a descriptive study in which the food intake and eating habits of adolescents were observed. The studied population consisted of all middle school students enrolled in two state schools in the region covered by the Vila Lobato Social Community Medical Center (Centro Médico Social Comunitário Vila Lobato) in the city of Ribeirão Preto. The Center is a basic health unit linked to the Faculty of Medicine of Ribeirão Preto, University of São Paulo (FMRPUSP) under an agreement with the University Hospital of FMRPUSP (HCFMRPUSP) and with the Health Secretary Office of the municipality of Ribeirão Preto, which offers medical care in pediatrics, hebiatry, gynecology and obstetrics, internal medicine, nursing, home care, and vaccination to the population of the covered region. Exclusion criteria were: age of less than 13 years or more than 20 years, pregnancy, and presence of chronic diseases that compromise the nutritional status.

In the first stage of the study, the schools were visited, in order to present the project and to invite the students to participate. The adolescents parents' or tutors' who accepted to participate in the study gave written informed consent of their participation. Next, a nutritionist held an individual interview lasting approximately 30 minutes in a room made available by the school during school hours. During this interview, the food frequency questionnaire validated for adolescents was applied and the students were instructed on how to fill out the 3-day food record. In the second stage of the study, the records were reviewed and collected by the interviewer[11].

Two types of investigation were performed in the food assessment: 1) food frequency and 2) 3-day record. A semi-quantitative food frequency questionnaire validated for adolescents was used for the first investigation11, concerning mean food consumption during the preceding six months and consisting of 76 food items divided into nine groups: 1) sweets, salty snacks and sweet treats; 2) salty foods and preparations; 3) milk and dairy products; 4) cereals, breads and tubercles; 5) vegetables; 6) fruits; 7) meats and eggs; 8) beans; 9) drinks. Seven options of frequency of consumption were available:

never; less than once a month; one to three times a month; once a day; two or more times a day. A document with food photographs was used to help the respondents to provide correct information about the size of the portions reported.

The second type of investigation consisted of a three-day record kept on two days during the week and on one weekend day, with the adolescent recording the food of the whole day consumed at home and outside. Specific guidelines were provided before the filling out of the record regarding the type of information to be described and food photographs were used to help with the size of the utensils and the home measures.

For the qualitative analysis of the foods using the food frequency the food groups were compared to those recommended by the Food Guide for the Brazilian Population[12], containing orientation directed at the Brazilian population older than two years (children, adolescents, adults and the elderly). The Virtual Nutri® software[13] was used to calculate the nutritive value of the foods consumed and recorded during the three days, with the data for the foods obtained from the Brazilian Table of Food Composition[14] (TACO) being inserted in its data bank. The foods that were not contemplated in the TACO were obtained from a North American table of the chemical composition of foods of the United States Department of Agriculture and inserted into the Virtual Nutri® software.

Records with a consumption of less than 500 kcal or more than 5000 kcal were not considered for the analysis of calorie intake. These limits were established because these types of consumption were considered to be implausible and to be possibly under or overestimated, without reflecting reality[15]. The study was approved by the Research Ethics Committee of the University Hospital, Faculty of Medicine of Ribeirão Preto, USP, and the parents or people responsible for the students gave written informed consent for their participation.

A data bank was constructed with the filled out questionnaires using the Epi Info software, version 3.5.1. The food frequency questionnaires were inserted into an Excel spreadsheet. The three-day records were analyzed with the Virtual Nutri® software[13]. Regarding food intake, the total values and their adequacy for macro and micronutrients were calculated according to the recommendations of the Dietary Reference Intakes (DRI).

RESULTS

Eighty-six of the 521 students, enrolled in the two schools, were excluded when they could not be located after three consecutive visits and 304 refused to participate in the study, in addition to a pregnant girl. Thus, 130 adolescents were left, 81 girls (62.3%) and 49 boys (37.6%) who filled out the questionnaire completely. The mean age of the subjects was 196.8 ± 11 months, i.e., approximately 16 years and 5 months.

According to the food frequency questionnaire, the food items with the higher mean consumption estimated as daily portions were rice, beans, hard candy, bread, sugar and milk. It was also possible to determine that, according to the recommendations of the Food Guide for the Brazilian Population (2006), there was appropriate consumption of only the food groups “vegetables” and “beans”, whereas the consumption of the “sweets” and “fats” groups was found to be higher than recommended.

After the analysis of the three-day records with the Virtual Nutri® software, it was possible to determine the mean nutrient intake, as shown in Table 1.

Table 2 presents the distribution of dietary nutrient intake compared to the levels recommended by the DRI. The mean energy percentages obtained from macronutrients were 56.4% for the carbohydrate group, 15.3% for proteins, and 28.3% for lipids. The Food Guide for the Brazilian Population (2006) recommends for adolescents regarding carbohydrates a calorie intake of 55% to 75% of the total energy value. For lipids, the recommendation is 15% to 30% and for proteins 10% to 15%. Thus, it can be seen that the adolescents showed an appropriate mean consumption according to the proposed distribution, with protein intake slightly higher than recommended.

Regarding the minerals, a lower than recommended intake was observed for calcium, the intake of iron and zinc was adequate and sodium consumption was excessive.

DISCUSSION

The present results indicate that this group of adolescents ingests, on average, 68% (1928/2800) of the daily calories recommended for their age range, distributed in the lower limit for carbohydrates, in medium amounts for fats, and in the upper limit for proteins. As a consequence of this imbalance among macronutrients, due to inappropriate food practices, it can be seen that the intake of the major micronutrients is also impaired, with repercussions on growth and on the development of specialized functions during adolescence[16]. Thus, it can be seen that Brazilian adolescents, like those of many other countries, ingest fewer healthy foods[17].

Rice and beans, considered to be the classical combination of the Brazilian diet, were the most consumed foods, a positive finding that should continue to be stimulated, since beans have good nutritive value and contain high levels of fibers, proteins, iron and folic acid, representing an important source of iron and proteins for low income adolescents18. Another observation that deserves comment concerns “hard candy” and “sugar” among the most consumed foods, with a daily consumption of 1.7 portions of “hard candy” being detected. The portion of the “hard candy” item described in the food frequency questionnaire corresponds to 2 units and the calorie intake calculated for 1.7 daily portions corresponds to 59 kcal. The consumption accumulated within one week may contribute approximately 400 kcal and 1700 kcal within one month, considering that the calorie source would be only simple sugar. Nutrient-poor foods are believed to represent more than 30% of the daily intake in the United States in view of the consumption of soda, hard candy, desserts and sugar added to food[19]. A study conducted on 387 individuals aged 12 to 18 years in Rio de Janeiro detected similar results[20]. The extensive consumption of foods with high energy density has also been detected by other authors, who observed that more than 70% of the individuals studied reported intake of these foods[21,22].

Regarding the micronutrients, the present study showed that mean calcium intake by the adolescents reached only 41% of the recommended amount which, according to the Food Guide for the Brazilian Population, should be obtained by consuming three daily portions of milk. Since this is the main food source of calcium, the very low adequacy detected in the daily records can be explained, with a lower intake than recommended by the Guide reported in the food frequency questionnaire, i.e., a mean milk consumption of two daily portions.

A low calcium intake was detected by Veiga et al[23] when they analyzed the data of the 2008/2009 National Food Survey regarding the intake of this micronutrient by Brazilian adolescents. In a study conducted on 507 students in the city of Ouro Preto (MG), the mean calcium intake was 703 mg/day[24], as also observed by Oliveira et al[25] among adolescents in the city of Chapecó (SC), by Leal et al[26] in the municipality of Ilhabela (SP), and by Nogueira-de-Almeida et al[27] in Ribeirão Preto (SP). Among Indian adolescents, Shafiee et al[28] detected a mean calcium intake of less than 70% of daily recommendations, a factor considered to predispose to impairment of health conditions among adolescents, such as growth, cognitive development and work capacity. A low calcium intake was also detected among populations of developed countries, as observed in adolescents in the city of Granada, Spain; Seiquer et al[29] assessed calcium consumption among 21 adolescents aged 11 to 14 years, which was 88% of the recommended amount for Spanish adolescents, with milk being the main source, followed by yogurt, ice cream and creams. Bailey et al[30] detected a mean calcium intake of 876 mg/day among American adolescents.

According to Nicklas et al[31] a possible explanation for the low calcium intake by adolescents is the exclusion of breakfast, the meal in which dairy foods should be ingested, considering that they are the major source of calcium.

Another nutrient that deserves special attention is sodium, which is the main causative agent of arterial hypertension among adolescents. In the present study, all adolescents were found to consume sodium in exceeding amounts, the maximum tolerated limit according to the DRIs. Several studies have demonstrated large sodium consumption

among adolescents due to the increased intake of industrialized products, which increasingly call the attention of this age range mainly through massive investments in publicity by the food industry[23,32].

Among adolescents in the 13 to 17 year age range studied by Marrero et al[33], mean daily sodium consumption was 7550 mg, with 73% of the participants exceeding the recommended levels of intake. Zhu et al[34] detected a mean daily sodium intake of 3280 mg among American adolescents, with 97% exceeding the recommendations of the American Heart Association. However, a comment is necessary regarding the consumption of this mineral. In addition to the possibility of under-reporting, the inadequacy of tables regarding industrialized products, the lack of standardization of recipes and the addition of table salt to the diet may also interfere with the real sodium intake.

A study that assessed sodium intake based on its urinary excretion among children and adolescents in the 6 to 17 year age range in the city of Porto Alegre (RS) estimated a consumption of 3.4 grams/person/day[35]). Population surveys conducted in developed countries have detected excessive sodium consumption ranging from 3.0 to 4.2 grams/person/day, as also observed in developing countries, where studies have shown excessive sodium consumption estimated at 3.4 to 5.6 grams/person/day[36,37]. Similar results were obtained by Souza et al[38] for the Brazilian population when they analyzed the data of the Family Budget Survey performed by the Brazilian Institute of Geography and Statistics in 2008.

The limitations of the present study are the small number of participants that not represent the population of the city and also the lack of complete and reliable answers of the questionnaires by the adolescents, with possible under or overestimates in order to mask their real food intake. However, this results show that the eating habits of adolescents undergo modifications with a greater presence of industrialized products such as sweets, soft drinks, sandwiches and processed foods that cause their diet to be richer in simple sugars, saturated fats, trans fats, cholesterol and sodium, items that, when consumed in excess, can be greatly harmful to the health and growth of individuals in the full phase of development. It should be pointed out that diseases related to nutrition, which used to be more common among adults, are increasingly affecting adolescents[39] because of their poor eating habits. It should also be remembered that most situations of micronutrient deficiency do not show clinical manifestations before being identified by laboratory tests or food surveys. This increases the responsibility of health professionals, regarding the expansion of the investigation of life style, including eating and all other healthy habits such as physical activity in order to counsel adolescents and sensitize them to the importance of measures that will contribute to the improvement of quality of life.

Thus, there is an evident need to intensify food education programs that will reach adolescents and their relatives, disseminating the positive and negative aspects of inadequate food consumption in order to modify eating habits, mainly by reducing the sodium content of processed foods and of foods served in restaurants[40,41], reducing sugar consumption and increasing the intake of vegetables and of calcium-rich foods.

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Table 1 - Mean consumption of daily portions obtained with the food frequency questionnaire

Food Groups	Mean
Cereals, tubercles and roots	5.4
Fruits	2.4
Vegetables	3.1
Beans	2.1
Milk and dairy products	1.9
Meat, fish and eggs	2.4
Sweets	4.7
Fat	1.8

Table2 - Distribution of mean dietary nutrient intake and of the quantities recommended by the DRI

Dietary nutrient/day	Intake	Recommendation
Energy (kcal)	1928	2800
Carbohydrate (% Energy)	56.4	55 to 75
Protein (g)	15.3	10 to 15
Lipids (g)	28.3	15 to 30
Calcium (mg)	532	1300
Iron (mg)	8.9	5.9 to 7.9
Sodium (mg)	1783.9	1500
Zinc (mg)	10.4	7.0 to 8.5

DRI – Dietary Reference Intakes