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Evaluation of the diet quality of overweight children and adolescents attended in the ambulatory of nutrition of a public hospital in Recife-PE

Avaliação da qualidade da dieta de crianças e adolescentes com excesso de peso atendidos no ambulatório de nutrição de um hospital público do Recife-PE

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Abstract

Objectives: To evaluate the diet quality of overweight children and adolescents attended in the ambulatory of nutrition of a public hospital in Recife, state of Pernambuco, Brazil. *Methods:* Cross-sectional study with children and adolescents diagnosed with overweight, outpatients in the nutrition clinic of a public hospital in Recife. From March to September 2015, sociodemographic, behavior, anthropometric and dietary variables were collected. The quality of the diet was evaluated through the adapted Healthy Eating Index (adHEI) and Inflammatory Factor (IF). Statistical analyses were performed in the Statistical Package for the Social Sciences (SPSS), version 20.0, and statistical significance was confirmed when $p < 0.05$. *Results:* Of the 30 patients studied, there was greater percentage of adolescents (66.7%) and male individuals (63.3%). No evaluated patient presented a good quality diet. The adHEI has been associated with sex, consultation with nutritionist, physical activity, family meals, meals in front of the TV and neck circumference. IF was associated only with fiber consumption. *Conclusion:* A high proportion of pro-inflammatory diet was evidenced among overweight patients, and none of them had a good diet.

Keywords: Child Obesity. Anthropometry. Food Consumption. Inflammation.

Resumo

Objetivos: Avaliar a qualidade da dieta de crianças e adolescentes com excesso de peso atendidos no ambulatório de nutrição de um hospital público de Recife, Pernambuco. *Métodos:* Estudo transversal, com crianças e adolescentes com diagnóstico de excesso de peso, atendidos no ambulatório de nutrição de um hospital público de Recife. No período de março a setembro de 2015, foram coletadas variáveis sociodemográficas, comportamentais, antropométricas e dietéticas. A qualidade da dieta foi avaliada através do Índice de Alimentação Saudável Adaptado (IASad) e do Fator Inflamatório (FI). As análises estatísticas foram feitas no programa *Statistical Package for the Social Sciences* (SPSS), versão 20.0, sendo confirmada significância estatística quando $p < 0,05$. *Resultados:* Dos 30 pacientes estudados, houve maior percentagem de adolescentes (66,7%) e do sexo masculino (63,3%). Nenhum paciente avaliado apresentou dieta de boa qualidade. O IASad se associou com sexo, consulta com nutricionista, atividade física, refeições com a família, refeições na frente da TV e circunferência do pescoço. Já o FI se associou apenas com o consumo de fibras. *Conclusões:* Evidenciou-se elevada proporção de dieta pró-inflamatória entre os pacientes com excesso de peso, verificando-se que nenhum deles obteve uma dieta de boa qualidade.

Palavras-chave: Obesidade Infantil. Antropometria. Consumo Alimentar. Inflamação.

Introduction

Prevalence of overweight children has increased in all Brazilian regions and economic classes. One of the main factors that have contributed to this problem is the adoption of improper eating habits which, when associated with physical inactivity and increased body fat, is heavily associated with chronic diseases.[1] Evidences suggest that dietary macronutrients can play a key role in the regulation of inflammatory processes, causing oxidative stress and, consequently, triggering a low-intensity inflammatory process.[2]

To assess diet quality, Mota et al.[3] adapted and validated for the Brazilian population the healthy eating index (HEI), adjusting the recommended portions of the food groups as defined in the *Guia Alimentar para a População Brasileira*[4] (Dietary Guidelines for the Brazilian Population) and in the Adapted Food Pyramid,[5] giving origin to the adapted HEI (adHEI).

Other methodologies propose an assessment of the inflammatory potential of foods, such as the inflammatory factor (IF), which was formulated based on the effects of more than 20 nutritional factors. Each food is scored with a value that represents the pro- or anti-inflammatory potential of a total of foods.[6]

An appropriate and healthy diet in childhood is vital for the individual's growth and development and is one of the factors that prevent some diseases in adulthood, because it is at this stage that eating habits are established.[3] Thus, assessing the diet quality enables to obtain information for early interventions. The aim of this study was to assess the diet quality of overweight children and adolescents who were monitored nutritionally at the outpatient care unit of a public hospital in Recife-PE.

Method

It is a cross-sectional study carried out with children and adolescents with previous diagnosis of overweight or obesity, who were outpatients in the nutrition care unit of a public hospital located in Recife, Pernambuco, from March to September 2015. The survey began upon approval of the Research Ethics Committee, in accordance to the Resolution nº 466/2012, with protocol nº 40396814.1.0000.5200.

The sample was selected by convenience and included all outpatients of both sexes, aged 6 to 18 years, who were receiving nutritional care in the nutrition ambulatory to treat overweight or obesity during the study period. The patients that were not included in the survey were those who could not provide information during data collection and undergo the anthropometric evaluation. Upon signature of the consent and/or agreement forms, sociodemographic, behavior, anthropometric and dietary variables were collected. The economic classification was defined according to the *Critério de Classificação Econômica do Brasil*[7] (Criteria for Brazilian Economic Classification). The behavior variables were collected during consultation with the dietitian, such as the habit of having meals with the family members or in front of the television, skipping breakfast and physical activity. To determine the physical activity, the participant who practiced exercises or any kind of physical activity of any intensity at least 30 minutes per day and three times a week were considered physically active, and those who spent more than two hours per day in sedentary activities were considered physically inactive.[8]

The body weight and height were recorded as recommended by the Ministry of Health,[9] using an electronic scale (*Balmak*®). Height was measured using a stadiometer coupled to the scale with graduated centimeters and tenths scale. The body mass index per age (BMI/A) with ≥ +1 score-z was indicative of overweight.[10] The waist circumference (WC) was measured following the

techniques proposed by the Ministry of Health[9] and the cutoff values that were used were those defined by Brannsether et al.,[11] per age and gender. The neck circumference (NC) was measured in accordance with the methodology and cutoff levels suggested by Nafiu et al.,[12] per age and gender. Such procedures were conducted with a non-extensible measuring tape, *Cescorf*® brand, 200cm of length. Based on the WC and height measures, the waist-to-height ratio (WHR) was calculated, and cutoff values were set as equal to or greater than 0.5. [13]

The dietary evaluation was based on habitual food consumption. The nutrients were calculated using *Nutwin*®, version 1.6.[14] For the foods that were not available in the *Nutwin*® database, the information was extracted from the *Tabela de Composição de Alimentos*[15] (Brazilian Table of Foods Composition) and included later. For the quantitative evaluation, the macronutrients intake was expressed in percentage of the total energy value per day (%TEV/day). For adequacy, the recommendations of the *Sociedade Brasileira de Pediatria* (SBP)[16] (Brazilian Pedriatics Society) were adopted.

The diet quality was assessed through the adHEI.[3] The foods were grouped according to the *Dietary Guide*.[4] Afterwards, the reported foods were converted into portions by the energy value in calories according to their respective group, as determined by Philippi et al.[5] The scores were obtained through 12 components that could be scored from 0 to 10, where the maximum score 10 was indicated when the portions recommended by the food pyramid or when the nutrients were in accordance with recommendations. The minimum score 0 indicated the group of foods that were not consumed or the nutrient that did not meet the established value.

When the quantities of the portions were not defined by the maximum and minimum scores, a proportional value was calculated. For example, when a patient ingested 32.6% of the ingested calories of total fat, the score of this component was calculated by the following equation: [(44.9-31.0)/(0-10)=(44.9-32.6)/(0-x)]. That is, the minimum score defined (44.9%) minus the maximum score limit defined (31.0%) on the minimum score defined (0) minus the maximum score defined (10) is equal to the limit of the minimum score defined (44.9%) minus the amount ingested (32.6%) on the minimum score defined (0) minus the ingested score value.

With respect to diet variety, there were eight mandatory items (cereal grains / breads / tubers / roots, fruits, vegetables, legumes / oil seeds, milk / dairy products, meats / eggs, sugars / sweets, oils / fats), but they were only scored when they belonged to distinct groups of foods. When there was intake of the eight foods, a maximum score of 10 points was attributed; between four and seven different items per day, score 5 was attributed; less than four, the minimum score (zero) was attributed.[3] In the total sum, when the final score of adHEI was higher than 100, the diet was considered of good quality; from 71 to 100, the diet requires changes; and less than 71 suggested a poor-quality diet.[3]

For analysis of the IF of the diets, it was used the list proposed by Reinagel,[6] with more than 1,600 foods and their respective IF. In this list, an IF = 0 (zero) indicates a neutral food; negative values indicate a pro-inflammatory food; and positive values, an anti-inflammatory food. Each food eaten received a score, and the sum of the scores indicated the dietary IF of each individual. To obtain the indexes, the foods were converted into mass units in gram (g) and proportional calculations were made. In the final sum, the diet was classified as strongly, mildly or slightly anti-inflammatory or pro-inflammatory.

The statistical analyses were made with the Statistical Package for the Social Sciences (SPSS) version 20.0 for Windows and Epi-Info version 7.0. The continuous variables were tested for normality by the Kolmogorov-Smirnov test and expressed as means and standard deviation. In the description of proportions, the normal distribution was approximated by the confidence interval ($_{95\%}$CI), and significant differences were evident when the respective $_{95\%}$CI overlapped. The Fisher's exact test was used to compare the proportions, and the Student's t-test was used for the means of the adHEI components by age. The adopted significance level was 5%.

Results

The characterization of the population studied can be seen in Table 1. The sample was comprised of 30 patients, aged 7.8 ± 0.9 years (children) and 12.6 ± 2.5 years (adolescents). There was a higher percentage of adolescents (66.7%) and male individuals (63.3%). Regarding body weight, 40% of the individuals were overweight and 60% were obese. Table 2 shows that most of the individuals studied did not have meals with their family (66.7%), but in front of the television (76.7%), skipped breakfast (66.7%) and were rated as physically inactive (73.3%).

Table 1. Characterization of the sample according to sociodemographic and anthropometric variables. Recife-PE, 2015.

Variables	n = 30	%	$_{95\%}$CI
Sex			
Male	19	63.3	43.86 – 80.07
Female	11	36.7	19.93 – 56.14
Age			
Children (6-9 years)	10	33.3	17.29 – 52.81
Adolescents (10-18 years)	20	66.7	47.19 – 82.71
Economic classification			
Class A/B	4	13.3	3.75 – 30.72
Class C/D	26	86.7	69.28 – 96.24
BMI/Age			
Overweight	12	40	22.66 – 59.40
Obesity	18	60	40.60 – 77.34
Neck circumference			
At risk	19	63.3	43.86 – 80.07
No risk	11	36.7	19.93 – 56.14
Waist circumference			
Overweight	1	3.3	0.08 – 17.22
Obesity	29	96.7	82.78 – 99.92
Waist-to-Height Ratio			
At risk	27	90	73.47 – 97.89
No risk	3	10	2.11 – 26.53

Table 2. Characterization of the sample according to behavior variables. Recife-PE, 2015.

Variables	n = 30	%	$_{95\%}$CI
Consultation with dietitian			
First time	15	50	31.30 – 68.70
Return visit	15	50	31.30 – 68.70
Physical activity			
Active	8	26.7	12.28 – 45.89
Inactive	22	73.3	54.11 – 87.72
Meals with family			
Yes	10	33.3	17.29 – 52.81
No	20	66.7	47.19 – 82.71
Meals in front of television			
Yes	23	76.7	57.72 – 90.07
No	7	23.3	9.93 – 42.28
Skip breakfast			
Yes	20	66.7	47.19 – 82.71
No	10	33.3	17.29 – 52.81

Table 3 shows the mean score attributed to each of the 12 components of the adHEI mean according to age. Based on the assessed components, it can be seen that the children had a higher score compared to the adolescents regarding legumes intake (10.0 *versus* 8.2, p=0.039). On the other hand, the adolescents had higher scores for sugars and sweets than the children (3.2 *versus* 0.6, p=0.001). Although there was no significant statistical difference between the children's and adolescents' diets, whose average score was 71.8 ± 5.6 and 72.3 ± 11.2, respectively, both diets require improvements. No patient assessed had a score higher than 100, which represents a good-quality diet.

Table 3. Mean score of adHEI for each component, according to the age of the children and adolescents receiving nutritional care in the outpatient nutrition ambulatory, Recife-PE, 2015.

Components of adHEI	Score[1]	Scoring criteria		Children Mean (SD)	Adolescents Mean (SD)	p*
		Max. 10 points	Min. 0 points			
Cereals, breads, tubers and roots	0 - 10	5 - 9 portions	0 portions	8.9 (1.7)	8.2 (2.1)	0.377
Vegetables	0 - 10	4 - 5 portions	0 portions	0.6 (0.7)	0.5 (0.9)	0.901
Fruits	0 - 10	3 - 5 portions	0 portions	7.6 (3.1)	6.5 (4.3)	0.460
Legumes	0 - 10	1 portions	0 portions	10.0 (0.0)	8.2 (3.7)	0.039*
Meats	0 - 10	1 - 2 portions	0 portions	6.8 (3.0)	6.7 (2.8)	0.925
Dairy products	0 - 10	3 portions	0 portions	6.2 (3.8)	4.1 (3.5)	0.147
Oils and fats	0 - 10	1 - 2 portions	0 portions	2.3 (3.4)	2.0 (3.8)	0.841
Sugars and sweets	0 - 10	1 - 2 portions	0 portions	0.6 (1.1)	3.2 (2.8)	0.001*
Total fat (%)	0 - 10	<30	>45	9.9 (0.5)	10.0 (0.5)	0.362
Saturated fat (%)	0 - 10	<10	>15	7.0 (4.8)	10.0 (1.2)	0.074
Cholesterol (mg)	0 - 10	<300	>450	7.0 (4.2)	7.8 (4.0)	0.632
Diet variety (different foods/day)	0 - 10	>8	<3	5.0 (2.3)	5.0 (1.6)	1.000
Final adHEI score				71.8 (5.6)	72.2 (11.2)	0.899

[1]Individuals with food intake between the maximum and minimum limit received proportional scores; * $p<0.05$(Student's t-test)

Table 4 describes the distribution of the diet quality according to the sociodemographic and behavior variables. There was a significant difference between the sexes regarding adHEI, where the boys exhibited a better diet quality than the girls (56.6% *versus* 10.0%, respectively, $p = 0.000$). Of 33.4% of the individuals who were rated as having a poor-quality diet, 26.7% had visited a dietitian for the first time, showing a significant difference ($p = 0.017$) when compared to those who had already been monitored in the ambulatory. No physically active patient had their diet rated as of poor quality ($p = 0.005$). The majority of the individuals who reported having their meals in front of the television (76.6%, $p = 0.010$), rather than with their family members (66.7%, $p = 0.041$), had a diet requiring adjustments. With respect to IF, 90% of the patients had a pro-inflammatory diet, but there were no statistically significant differences between the variables analyzed.

Table 4. Association of diet quality indexes (adHEI and IF) with sociodemographic and behavior variables of children and adolescents receiving nutritional care in the outpatient nutrition ambulatory, Recife-PE, 2015.

Variables	adHEI			FI[2]		
	Poor quality n (%)	Requires diet adjustments n (%)	p*	Anti-inflammatory n (%)	Pro-inflammatory n (%)	p*
Age						
Children	3 (10.0)	7 (23.4)	0.783	1 (3.3)	9 (30.0)	1.000
Adolescents	7 (23.4)	13 (43.2)		2 (6.7)	18 (60.0)	
Sex						
Male	2 (6.7)	17 (56.6)	0.000*	2 (6.7)	17 (56.7)	0.899
Female	8 (26.7)	3 (10.0)		1 (3.3)	10 (33.3)	
Economic classification						
Class A/B	0 (0.0)	4 (13.3)	0.060	1 (3.3)	3 (10.0)	0.342
Class C/D	10 (33.3)	16 (53.4)		2 (6.7)	24 (80.0)	
Consultation with dietitian						
First visit	8 (26.7)	7 (23.4)	0.017*	1 (3.3)	14 (46.7)	0.539
Return visit	2 (6.7)	13 (43.2)		2 (6.7)	13 (43.3)	
Physical activity						
Active	0 (0.0)	8 (26.7)	0.005*	1 (3.3)	7 (23.4)	0.787
Inactive	10 (33.3)	12 (40.0)		2 (6.7)	20 (66.6)	
Meals with family						
Yes	1 (3.3)	9 (30.0)	0.041*	1 (3.3)	9 (30.0)	1.000
No	9 (30.0)	11 (36.7)		2 (6.7)	18 (60.0)	
Meals in front of the television						
Yes	10 (33.3)	13 (43.3)	0.010*	2 (6.7)	21 (70.0)	0.677
No	0 (0.0)	7 (23.4)		1 (3.3)	6 (20.0)	

*p<0.05 (Fisher's exact test); [1] AdHEI: adapted Healthy Eating Index; [2] IF: Inflammatory factor

Table 5 shows the distribution of diet quality according to anthropometric and dietary variables. Of 33.4% of individuals that had a poor-quality diet, 30.1% of them had a NC that was indicative of cardiovascular risk, having a significant difference (p = 0.023). No significant differences were found with respect to the adequacy of macronutrients and the qualitative analysis of the diet, except for dietary fibers. Of 90% of the patients that usually ate a pro-inflammatory diet, 70% had an inadequate intake of dietary fiber, showing a significant difference (p = 0.005) when compared to the 20% of patients that consumed it at appropriate levels.

Table 5. Association of diet quality indexes (adHEI and IF) with anthropometric and dietary variables of children and adolescents receiving nutritional care in an outpatient nutrition ambulatory, Recife-PE, 2015.

Variables	adHEI[1]		p*	IF[2]		p*
	Poor quality n (%)	Requires improvements n (%)		Anti-inflammatory n (%)	Pró-inflammatory n (%)	
BMI/Age						
Overweight	2 (6.7)	10 (33.3)	0.104	1 (3.3)	11 (36.7)	0.802
Obesity	8 (26.7)	10 (33.3)		2 (6.7)	16 (53.3)	
Neck circumference						
At risk	9 (30.1)	10 (33.3)	0.023*	2 (6.7)	17 (56.7)	0.899
No risk	1 (3.3)	10 (33.3)		1 (3.3)	10 (33.3)	
Waist circumference						
Overweight	0 (0.0)	1 (3.3)	0.363	0 (0.0)	1 (3.3)	0.643
Obesity	10 (33.3)	19 (63.4)		3 (10.0)	26 (86.7)	
Waist-to-Height Ratio						
At risk	10 (33.3)	17 (56.7)	0.107	3 (10.0)	24 (80.0)	0.414
No risk	0 (0.0)	3 (10.0)		0 (0.0)	3 (10.0)	
Dietary Fiber						
Adequate	2 (6.7)	7 (23.3)	0.388	3 (10.0)	6 (20.0)	0.005*
Inadequate	8 (26.7)	13 (43.3)		0 (0.0)	21 (70.0)	

continue

Variables	adHEI[1]		p*	IF[2]		p*
	Poor quality n (%)	Requires improvements n (%)		Anti-inflammatory n (%)	Pró-inflammatory n (%)	
Carbohydrate						
Adequate	9 (30.0)	20 (66.7)	0.132	3 (10.0)	26 (86.7)	0.643
Inadequate	1 (3.3)	0 (0.0)		0 (0.0)	1 (3.3)	
Protein						
Adequate	10 (33.3)	19 (63.4)	0.363	3 (10.0)	26 (86.7)	0.643
Inadequate	0 (0.0)	1 (3.3)		0 (0.0)	1 (3.3)	
Lipid						
Adequate	8 (26.7)	14 (46.6)	0.553	1 (3.3)	21 (70.0)	0.124
Inadequate	2 (6.7)	6 (20.0)		2 (6.7)	6 (20.0)	

*p<0.05 (Fisher's exact test); [1] adHEI: Adapted Healthy Eating Index; [2] IF: Inflammatory factor

Discussion

There are few studies in the national and international literature that evaluate the diet of overweight children and adolescents, and this is the first study that associates two indexes (adHEI and IF) with sociodemographic, behavior, anthropometric and dietary variables.

In this study, it was found an association between the adHEI and meals eaten in front of the television and/or with family. Several studies have associated positively the habit of eating meals in front of the television, rather than doing it at the dining table with family members, with physical inactivity, obesity in childhood and adolescence [17-19] and a poor-quality diet. [20] The mechanisms that link eating foods in front of the television with poor diets may be associated with the exposure to food advertisements, as well as changes in the perception of satiation due to distraction caused by television images.[18] This finding is worrying, since the American Academy of Pediatrics[21] recommends a maximum of two hours of television per day to prevent obesity and lack of exercise.

Skipping breakfast, a habit that was prevalent in this study and also in Momm & Höfelmann's,[18] is associated with unhealthy behaviors, poor eating habits and lack of physical activity.[22]

Unhealthy eating habits of overweight children and adolescents have been the topic of several studies.[18,22-23] In general, the population studied did not meet the recommended[4] quantity of the portions of the food groups, except for legumes. Such inadequacy may be due to wrong eating patterns of children and adolescents, which usually include items of food groups above recommendations (sugars and fats) or below (whole cereal grains, fruits, vegetables, milk and meat/eggs), associated with an intake of high-calorie foods. The legume that was most cited was bean, which, according to Philippi et al.,[5] is typical of the Brazilian eating pattern, a food that should be stimulated for being rich in dietary fibers, proteins, folic acid, constituting an important source of iron and proteins for the low-income population.

The NC is a new measure that has had satisfactory results in the evaluation of children and adolescents, and may be used as a marker for central obesity and cardiovascular risk.[12] In this study, it was found that the individuals having a poor-quality diet had a NC in the range of metabolic risk. It is known that a wrong eating habit since childhood tends to develop diseases related to cardiovascular disorders.[24]

In this study, 90% of the patients ate a pro-inflammatory diet and 70% of them exhibited an inadequate intake of dietary fibers. Miller et al.[25] concluded that an increase of dietary fibers can play a key role in reducing inflammation and the risk of metabolic diseases in overweight adolescents. One of the mechanisms could be the production of short-chain fatty acids by soluble fibers, which promote intestinal health and, consequently, protect against low-grade inflammation that causes adiposity. In addition, whole grains are rich in bioactive compounds that have anti-inflammatory properties. According to Geraldo & Alfenas,[26] although diets rich in fiber seem to be effective in reducing inflammatory processes, their role in reducing inflammation still needs to be better elucidated.

The results of this study showed that the children's and adolescents' diet, which received a mean score of 71.8 and 72.3 points, respectively, requires improvements. This finding was similar to the research conducted by Dutra et al.,[19] which found a mean score of 74.4 points. In the studies conducted by Santiago-Torres et al.[27] and Andrade et al.,[28] none of the studied individuals had a good quality diet too. These data reveal poor adherence to dietary guidelines, including low intake of fruits, vegetables, beans, whole grains, and excess of refined grains, added sugars and solid fats.

The associations found in the present study require careful interpretation due to their transversality, the reduced sample size, convenience sampling, and the use of adHEI and IF. Furthermore, the consumption of some foods might have been misreported by the patients and their parents, due to two main reasons: for not feeling comfortable in describing with details their eating habits to the dietitian, knowing that they were flawed; and for not paying attention to the

amount of foods eaten, a consequence of the mechanical way of eating. In cross-sectional studies, overweight individuals tend to restrict foods intake to lose weight, reporting at the time of data collection an energy intake that does not correspond to the reality.[29] This can also be a justification for the adequate intake of carbohydrate, protein and lipid reported (Table 5).

The main limitation of using the adHEI is that an excessive intake of some food groups is not scored differently, so it is not possible to distinguish beneficial excessive intakes from bad ones. But, one of the advantages of using this index is that it helps evaluate the diet quality instead of the amount of nutrients only. So, it was found that although the quantity of macronutrients in the diet was appropriate, no patient had a diet considered of good quality. Other possible limitation of the study is related to the dietary evaluation itself, using the habitual food intake method, which depends on the respondent's memory, and data collection is more time consuming.

Other aspect to be considered is that the IF methodology has not been validated yet for foods eaten in Brazil, and this might have interfered with the final result. It is worth noting that, during the IF calculation, although the individual reported a high intake of pro-inflammatory foods, but have also eaten in the same day foods with high anti-inflammatory levels, such as onion or acerola juice (+708.2 and +233.6 per 100g of the product, respectively), the final inflammatory potential resulted in an anti-inflammatory diet. According to González-Gil et al.,[30] fruits and vegetables are very rich in antioxidants and other anti-inflammatory plant chemicals, containing low fat levels and high content of water and fiber.

This finding confirms how important is that dietitians know not only the nutrients and recommended portions of foods, but their pro- and anti-inflammatory properties and the food constituents, so that they can build an appropriate and functional diet.

Conclusions

The present study showed a high proportion of pro-inflammatory diet among overweight patients, indicating that none of them had a good-quality diet. So, there is a need to enhance the diet quality of children and adolescents and to encourage regular practice of exercises, regular visits with dietitians, meals with family members, daily intake of quality foods and with anti-inflammatory properties. In addition, more studies must be conducted to validate and determine the IF of foods in Brazil.

Contributors

Araújo LM worked in all stages, from the study conception to the final revision of the manuscript; Barros MHS and Andrade MIS participated in the conception and analysis and data interpretation; Araújo EC participated in data collection and the conception of the paper; Santos CM and Dourado KF collaborated to the study design, in writing the paper and the final version.

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