Self-rated diet quality according to adolescents: ISACamp-Nutri results

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Abstract *The aim was to estimate the prevalence of categories of self-rated diet quality according to adolescents, identify the reasons for not considering the diet very good/good as well as calculate the global Revised Brazilian Healthy Eating Index Revised (BHEI-r) score and component scores according to the self-assessment categories. A cross-sectional population-based study with two-stage stratified cluster sampling was conducted in Campinas-SP. A total of 891 adolescents were analyzed. The proportions of very good/good, fair and poor/very poor self-rated diet quality were 57.3%, 34.6% and 8.1%, respectively. Fair/poor/very poor self-rated diet quality was associated with the consumption of candy/sweets, snacks/cookies, whole grains (10-14 years) and fast food (15-19 years). Among those classified as having poor diet quality (1st tertile of BHEI-r scores), 52.5% considered their diet to be very good/good and only 13.1% considered their diet to be poor/very poor. The BHEI-r score was significantly lower among those who thought their diet was poor (50.0 points) compared to those who thought their diet was very good/good (55.4 points). Those who considered their diet to be poor had lower intakes of fruit and whole grains as well as higher intakes of solid fats and sugars. The findings reveal incoherence between self-rated diet quality and the observed unsatisfactory diet scores.*

Key words *Adolescent, Feeding Behavior, Health Surveys*

Introduction

Monitoring the diet quality of adolescents is essential in the current scenario of profound changes in the eating habits, nutritional status and health status of this population[1,2]. Adolescents constitute a vulnerable group to the adoption of unhealthy habits that can continue into adulthood, such as eating habits, a sedentary lifestyle, weight control, the influence of advertising as well as the use of tobacco, alcohol and street drugs[3,4].

Data from the Family Budget Survey (FBS) reveal a reduction in the acquisition of *in natura* or minimally processed foods between 1987 and 2009, such as rice, beans, milk, eggs, vegetable, roots and tubers as well as a reduction in the acquisition of culinary ingredients used for preparing meals, such as vegetable oils, sugar and wheat flour. Such reductions were accompanied by an increase in the acquisition ready-to-eat products, such as sweetened beverages, cookies, chips, candy/sweets and processed meats[5].

Unfavorable changes in eating habits combined with a sedentary lifestyle are among the main reasons for the epidemic of chronic non-communicable diseases[4,6]. In Brazil, the Vigitel telephone survey revealed a 7.4%, 47.1% and 36.4% increase in the prevalence of overweight, obesity and Grade III obesity between 2006 and 2013 in the adult population (18 years or older)[7]. The Cardiovascular Risk Study in Adolescents 12 to 17 years of age (ERICA, 2013-2014) detected rates of overweight, obesity and arterial hypertension of 17.1%, 8.4% and 9.6%, respectively; moreover, hypertension was found in 28.4% of those with obesity and 15.4% of those with overweight[8].

Adolescence is considered an important phase of the development of prevention and health promotions actions stressing the importance of diet[3,4]. Diet quality can be evaluated using quantitative methods, such as the Revised Brazilian Healthy Eating Index (BHEI-r), which considers a set of dietary components, such as fruit, vegetables, whole grains, milk, saturated fat and sodium[9]. Studies involving the BHEI-r have revealed an inadequate diet among adolescents, with the low intake of fruit, vegetables and whole grains as well as the high intake of solid fats, sodium and added sugar[10-12].

But how do adolescents rate the quality of their diet? Few studies in the literature have analyzed diet quality considering a quantitative dietary intake method and self-assessments.

Therefore, the aims of the present study were to estimate the prevalence of categories of self-rated diet quality according to adolescents, identify the reasons for not considering the diet very good/good as well as calculate the global BHEI-r and component scores according to the self-assessment categories. This study was conducted to address the relationship between dietary intake and the subjective assessment of diet quality.

Materials and methods

Study design and population

A population-based cross-sectional study was conducted with data from the 2014-15 *Inquérito de Saúde de Campinas* (ISACamp [Campinas Health Survey]) and 2014-16 *Inquérito de Consumo Alimentar e Estado Nutricional* (ISA-Camp-Nutri [Dietary Consumption and Nutritional Status Survey]). The surveys collected data from community-dwelling adolescents (10 to 19 years), adults (20 to 59 years) and seniors (≥ 60 years) residing in urban areas in the city of Campinas, state of São Paulo. In the present study, the adolescent population was analyzed.

2014-15 ISACamp

The sample from the 2014-15 ISACamp survey was determined based on two-stage (census sector and residence) probabilistic cluster sampling. In the first stage, 70 census sectors were systematically selected with probability proportional to size given by the number of residences. The sectors were ordered based the mean income of the heads of households. Next, 14 sectors were selected from each of the five administrative districts of the city.

The minimum sample size was defined as 1,000 adolescents, taking into account the estimate of a 50% proportion (p = 0.50), which corresponds to maximum variability for the frequency of the events studied, with a 95% confidence level (z = 1.96), 4 to 5% sampling error and a design effect of 2. Expecting an 80% response rate, 2898 residences were randomly selected for interviews with adolescents. All residents in each home between the ages of 10 and 19 years were interviewed.

The ISACamp questionnaire was organized into 12 themes, such as morbidities, use of healthcare services, preventive practices, health-related behavior, use of medications, demographic/socioeconomic characteristics, etc. The data were

collected by trained interviewers with the aid of an electronic device (tablet).

2014-16 ISACamp-Nutri

The ISACamp-Nutri survey was developed as part of ISACamp. When the participation of the ISACamp survey was completed, a second visit was made to the homes for the administration of an instrument composed of the 24-hour recall (24hR), Food Frequency Questionnaire, which was qualitative (no specification of portion size), and questions addressing body image, weight loss practices, self-rated diet quality, the reading of nutritional labels, etc.

The questionnaire was previously tested in a pilot study and administered by trained, supervised interviewers. Each interview lasted an average of 30 minutes (95%CI: 28.6 to 31.3). A total of 95.0% of the interviews were held with the adolescents themselves and 63.4% were obtained on the first of four attempts. The interviewers were in the field on different days of the week, including Saturdays and Sundays. For the 24hR, 89.0% represented food consumption between Monday and Friday.

The decision was made to begin the interview with the 24hR using the following statement: "Please, tell me what you ate and drank yesterday from the time you woke up until the time you went to sleep"[13]. The 24hR was conducted using the "multiple-pass method" proposed by the US Department of Agriculture, the aim of which is to stimulate the respondent's memory and increase the precision of the information. This is achieved through a structured interview conducted in five steps: *Quicklist* - obtainment of a spontaneous list of all foods and beverages ingested on the previous day; *Forgotten foods* - use of a list of frequently forgotten foods; *Time and eating occasion* - recording of time, name of the meal and place of consumption; *Detail cycle* - return to the first record of the day for greater detailing on each item, including preparation technique, composition of preparations, type of food and respective quantities; *Final probe* - identification of some food that was not mentioned (sip or bite) and review of anything that generated doubt[14].

The 24hR was determined with the aid of a photographic manual. The foods/meals were recorded in units and household measurements and subsequently converted to grams or milliliters with the aid of tables[15,16], food labels and consumer services. The data were entered into the Nutrition Data System for Research (NDS-R)

program, version 2015 (Nutrition Coordinating Center, University of Minnesota) by trained, supervised nutritionists. The consistence of all recall logs was verified. The ISACamp-Nutri questionnaire was entered "blindly" to EpiData version 3.1 (EpiData Assoc., Odense, Denmark) and the entered data was verified for consistence.

Variables used in study

To meet the objectives of the study, the following variables were considered:

Self-rated diet quality: obtained from the following question "How would you rate the quality of your diet?", to which the response options were very good, good, fair, poor and very poor. The answers were grouped as follows: very good/good, fair and poor/very poor. Those who did not consider their diet very good or good were asked "Why do you think that you do not have a diet of good quality?", for which there were 12 response categories. The interviewee marked one or more categories based on the interviewee's spontaneous response.

Revised Brazilian Healthy Eating Index (BHEI-r): Calculated with information for a 24hR, the BHEI-r consisted of 12 components, nine classified in terms of adequacy (total fruits; whole fruits; total vegetables and legumes; dark green-orange vegetables and legumes; total grains; whole grains; dairy; meat, eggs and legumes; oils) and three classified in terms of moderation (sodium; saturated fat; AA_fat [energy percentage stemming from solid fats, alcohol and added sugar]). The adequacy components received a score ranging from zero (not consumed) to five or ten (consumption that meets or exceeds the recommended intake). The moderation components were scored from zero (consumption that surpasses the maximum recommended limit) to 10 or 20 (meets established intake values). Intermediate intake values are calculated proportionally. The global BHEI-r was the sum of the 12 components and ranged from zero (worst diet quality) to 100 points (best quality)[9].

The followed variables were also investigated:

Demographic and socioeconomic characteristics: sex (male or female), age group (10 to 14 or 15 to 19 years), self-declared race/skin color (white or non-white), schooling of head of family (0 to 8, 9 to 11 or ≥ 12 years of study) and whether the adolescent attended school (no or yes [differentiated as public or private]).

Health-related behavior and perception of quantity ingested: would like to change weight

(no, yes, gain weight or yes, lose weight), habit of reading food labels (no or yes/sometimes), perception of eating more than one should (no or yes) and frequency of having breakfast (seven or < seven days a week). Regarding the practice of physical activity during leisure time, the adolescents were categorized as either active or insufficiently active/inactive. To be classified as active, adolescents aged 10 to 17 years needed to practice physical activity at least 60 minutes a day at least five days a week and those 18 to 19 years needed to perform physical activity at least 150 minutes a week distributed among at least three days[17].

Data analysis

The Rao-Scott test with a 5% significance level was used to investigate associations between variables (demographic characteristics, socioeconomic characteristics, health-related variables and perception of quantity ingested vs. self-rated diet quality; sex and age group vs. reasons for not considering diet very good/good). The same test was used to investigate associations between the tertiles of the BHEI-r scores and self-rated diet quality. Next, the mean global BHEI-r and component scores were calculated according to the categories of self-rated diet quality using multiple linear regression with a 5% significance level. The analyses were executed in the svy module of Stata version 14.0, which considers weights and sampling design.

Ethical considerations

The ISACamp and ISACamp-Nutri surveys received approval from the Human Research Ethics Committee of Campinas State University and the Brazilian National Research Ethics Committee (CEP/CONEP system). The present study received approval from the Human Research Ethics Committee of Campinas State University.

Results

Among the 1,023 adolescents included in the ISACamp survey, 109 did not participate in the ISACamp-Nutri suvey, corresponding to a 10.9% dropout rate. Among the 914 who answered the nutrition questionnaire, 11 declined to fill out the 24hR and another 12 were excluded for having diets with an energy value lower than 600 kcal/day (n = 10) or higher than 6,000 kcal/dia. Therefore, 891 adolescents aged 10 to 19 years

made up the final sample. Mean age was 14.6 years (95%CI: 14.4 to 14.8).

The majority of the sample was composed of males (52.0%), individuals aged 15 to 19 years (52.6%), with self-declared white skin color (55.5%), who studied at public schools (63.4%) and resided in homes in which the head of the household had up to eight years of schooling (53.3%). Regarding health-related behavior, most adolescents did not wish to change their weight (59.1%), were inactive during leisure time (58.8%), did not have the habit of reading food labels (68.6%) and had breakfast every day. Most (64.5%) also stated not eating more than they should (Table 1).

The frequencies of self-rated diet quality categories were 57.3% for very good/good (VG/G), 34.6% for fair (F) and 8.1% for poor/very poor (P/VP). Age group, desire to change weight, eating more than one should and having breakfast were associated with self-rated diet quality. The VG/G category was more prevalent among adolescents who were satisfied with their weight, those who thought that they did not eat in excess and those who had breakfast every day (Table 1).

Table 2 displays the reasons why the adolescents did not assess their diet quality as VG/G. Not eating or eating few fruits and vegetables (raw or cooked) as well as drinking/drinking a lot of soda pop were the most frequently mentioned reasons. No difference between sexes was found. However, in the analysis by age group, younger adolescents (10 to 14 years) reported the consumption of candy/sweets, chips/cookies and whole grains, whereas older individuals (15 to 19 years) reported the consumption of fast food as the reasons for a fair or P/VP diet.

BHEI-r scores were categorized in tertiles based on frequency (T1: 21.0 to 50.4 points; T2: 50.5 to 60.0 points; T3: 60.0 to 80.7 points). Among those with the poorest diet (T1), 52.5% perceived their diet as VG/G, 34.4% perceived their diet as F and only 13.1% perceived their diet as P/VP. Among those classified in T2, 57.2% perceived their diet as VG/G and 35.7% perceived their diet as F. Among those classified in T3, 62.1% perceived their diet as VG/G and 4.1% perceived their diet as P/VP (Figure 1).

The mean global BHEI-r score was estimated to be 54.7 in the overall sample. Adolescents who perceived their diet as P/VP had the worst diet quality, with lower intakes of whole grains (threshold of statistical significance), total fruits (natural juice) and whole fruits as well higher intakes of saturated fat and AA_fat (solid fats, al-

Table 1. Frequencies of self-rated diet quality according to sociodemographic characteristics, health-related behavior and perception of quantity ingested among adolescents aged 10 to 19 years. ISACamp-Nutri 2014-16.

Variables	Total n (%)	Self-rated diet quality			p-value*
		Very good/ good n=509 (%)	Fair n=311 (%)	Poor/very poor n=71 (%)	
Sex					
Male	463 (52.0)	59.3	33.8	6.9	0.345
Female	428 (48.0)	55.1	35.5	9.4	
Total	891 (100.0)	57.3	34.6	8.1	
Age group					
10 to 14 years	422 (47.4)	59.0	35.2	5.8	0.043
15 to 19 years	469 (52.6)	55.8	34.0	10.2	
Race/skin color					
White	487 (55.5)	59.6	33.0	7.4	0.270
Non-white	400 (44.5)	54.8	36.3	8.9	
Attends school					
No	178 (19.7)	55.7	32.5	11.8	0.440
Yes, public	570 (63.4)	57.5	35.0	7.5	
Yes, private	138 (16.9)	59.6	34.0	6.4	
Schooling of head of household					
0 to 8 years	469 (53.3)	59.2	33.0	7.8	0.817
9 to 11 years	257 (28.9)	55.2	36.5	8.3	
12 or more years	150 (17.8)	55.5	35.1	9.4	
Desire to change weight					
No	528 (59.1)	65.5	30.5	4.0	<0.001
Yes, gain	115 (12.9)	51.4	35.5	13.1	
Yes, lose	245 (28.0)	42.6	42.9	14.5	
Practice of physical activity during leisure					
Active/insufficiently active	366 (41.2)	56.6	36.1	7.3	0.571
Inactive	525 (58.8)	57.8	33.5	8.7	
Habit of reading food labels					
No	613 (68.6)	57.6	34.6	7.8	0.898
Yes/sometimes	278 (31.4)	56.7	34.6	8.7	
Eating more than should					
No	576 (64.5)	61.5	33.3	5.2	<0.001
Yes	313 (35.5)	50.0	36.9	13.1	
Breakfast					
7 times/week	569 (63.8)	62.2	33.4	4.4	<0.001
< 7 times/week	322 (36.2)	48.7	36.6	14.6	

n: number of individuals in unweighted sample; %: percentage of weighted sample; *Rao-Scott test.

cohol and added sugar) compared to those who perceived their diet as VG/G (Table 3).

Discussion

This study identified that 42.7% of the adolescents self-rated the quality of their diet as fair or poor/very poor as a result of the greater consumption of candy/sweets, chips, cookies, whole grains and fast food. Only 13.1% of those classified as have the worst BHEI-r scores rated their diet as poor, whereas 52.5% and 34.4% rated their diet as good and fair, respectively. The overall quality of the diet was quite poor, even among those who thought that their diet was

Table 2. Reasons for not considering quality of diet very good/good among adolescents aged 10 to 19 years. ISACamp-Nutri 2014-16.

Variables	Total		Sex				p-value*
			Male		Female		
	n	%	n	%	n	%	
Does not eat/eats few fruits	174	46.2	88	48.1	86	44.4	0.486
Does not eat/eats few vegetables	187	49.6	92	50.6	95	48.6	0.706
Does not drink/drinks little milk	43	11.0	21	11.0	22	11.0	0.991
Does not eat/eats few whole grains	57	14.2	29	14.5	28	13.9	0.844
Eats/eats a lot of pasta and bread	28	7.5	10	5.2	18	9.8	0.120
Eats/eats a lot of red meat	13	3.6	6	3.4	7	3.9	0.810
Drinks/drinks a lot of soda pop	78	20.4	42	22.2	36	18.6	0.439
Eats/eats a lot of chips and cookies	36	9.5	22	12.0	14	7.1	0.086
Eats/eats a lot of candy/sweets	73	19.0	32	16.8	41	21.1	0.308
Eats/eats a lot of ready-to-eat/fast food	27	7.5	9	5.5	18	9.3	0.248
Eats/eats a lot of fried foods	69	18.5	30	16.8	39	20.1	0.410

Variables	Age group (in years)				p-value*
	10 to 14		15 to 19		
	n	%	n	%	
Does not eat/eats few fruits	77	44.9	97	47.3	0.641
Does not eat/eats few vegetables	91	53.2	96	46.6	0.148
Does not drink/drinks little milk	18	10.2	25	11.7	0.654
Does not eat/eats few whole grains	34	18.8	23	10.4	0.010
Eats/eats a lot of pasta and bread	14	8.9	14	6.4	0.427
Eats/eats a lot of red meat	7	4.4	6	3.0	0.526
Drinks/drinks a lot of soda pop	34	19.8	44	20.8	0.815
Eats/eats a lot of chips and cookies	24	14.2	12	5.6	0.005
Eats/eats a lot of candy/sweets	44	25.2	29	13.9	0.010
Eats/eats a lot of ready-to-eat/fast food	6	3.3	21	10.9	0.005
Eats/eats a lot of fried foods	36	21.3	33	16.1	0.236

n: number of individuals in unweighted sample; %: percentage of weighted sample; *Rao-Scott test.

good or very good (55.4 points on a scale of zero to 100). A poor/very poor rating was associated with poor diet quality, a lower intake of fruits and whole grains and a greater intake of fat and sugar.

One of the strengths of the present study is the use of information from a population-based sample of a specific survey addressing food consumption. The procedures for the collection, quantification and entry of the data on food consumption were standardized. The Nutrition Data System for Research program used to enter the intake data enables reducing the occurrence of typographical errors and included a large variety of foods and culinary techniques. This study also has limitations that should be considered. The cross-sectional design does not enable the establishment of cause-and-effect relationships and the administration of a single 24-hour recall does not represent the habitual consumption of the participants. However, when administered to a representative sample of the population on different days of the week and months of the year, it is possible to estimate the mean intake of the population being evaluated[10].

A total of 57.3%, 34.6% and 8.1% of the adolescents considered their diet quality to be very good/good, fair and poor/very poor, respectively. Analyzing a sample of students aged 14 to 19 years in the city of Cuiabá (state of Mato Grosso, Brazil), Rodrigues et al.[18] found that 56.0% (64.0% of the boys and 50.0% of the girls) self-rated their diet quality as great or good and the other 44.0% rated their diet a fair, poor or very bad. A significant difference was also found among the distribution of the BHEI-r scores in tertiles and the self-assessment; among those with the
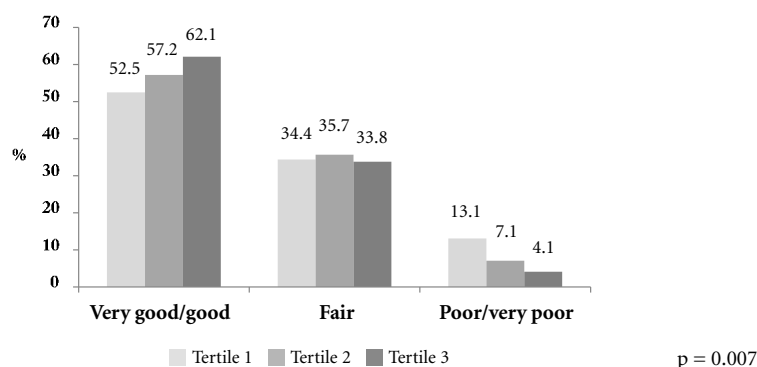
Figure 1. Prevalence of self-rated diet quality according to tertiles of BHEI-r scores among adolescents aged 10 to 19 years. ISACamp-Nutri 2014-16.

poorest diet quality, only 13.1% rated their diet as poor, whereas 52.5% rated their diet as good. The majority of adolescents (62.1%) knew how to identify a diet of good quality. A greater difficulty was found in identifying a diet as poor. The indecision in classifying a diet as adequate or not has been attributed to the difficulty in evaluating diet as a whole and establishing weights for healthy and unhealthy foods[19].

The analysis stratified by sex revealed no differences with regard to the reasons for considering one's diet as fair or poor. However, this evaluation was associated with the consumption of the chips, whole grains, cookies and candies among adolescents aged 10 to 14 tears and fast food among those aged 15 to 19 years. A qualitative study involving adolescents aged 10 to 14 years in the state of Pernambuco-PE, found that knowledge on healthy eating was related to the non-consumption of foods rich in fat, sugar and salt[20]. In a study conducted in Cuiabá (state of Mato Grosso), a diet self-rated as good was more frequent among adolescents who reported having knowledge on an adequate diet (odds ratio = 4.9 among boys and 1.8 among girls)[18]. Using a focus group with students aged 10 to 19 years, Toral et al.[19] found that the adoption of a healthy diet reinforces the need to avoid sweets, fast food and highly processed foods. The Brazilian National Schoolchildren Health Survey (PeNSE, 2015) found no significant differences in the prevalence of ultra-processed foods, such as processed meats, chips and crackers (30.5% *versus* 33.7%), fast food (14.1% *versus* 16.7%) and sweets (40.5% *versus* 40.6%) among the

13-to-15-year-old and 16-to-17-year-old age groups, respectively[1]. These results underscore the importance of developing dietary and nutritional education actions in the school setting that promote the formation of healthy habits, cooking habits and autonomy in food choices among adolescents[20,21].

The mean BHEI-r score (measure of diet quality) was 54.7 in the overall sample. Previous studies conducted in 2008 and 2009 report total BHEI-r scores of 50.3 for adolescents aged 12 to 19 years residing in the city of São Paulo-SP and 48.6 for those aged 10 to 19 years residing in the city of Campinas-SP[10,11]. Evaluating the lifestyle of the population of São Paulo, Ferrari et al.[22] found that only 14.6% of adolescents had an adequate diet, which was defined as the last tertile of BHEI-r scores. A cohort study showed that the adoption of a diet of better quality between 15 and 25 years of age was associated with less weight gain during the transition from adolescence to adulthood[23].

The adolescents who considered their diet to be poor actually did have a poor overall diet, with the low intake of fruits (*in natura* and juices) and whole grains as well as greater intake of solid fats and sugar. In the study by Rodrigues et al.[18], the segment that rated their diet as poor had a greater frequency of lower scores (below the 75th percentile) on the BHEI-r as well as the fruit, vegetable, milk, oils and sodium components; the authors identified no association between saturated fat and empty calories (fats, solids and free sugar). Toral et al.[19] found that the majority of adolescents who reported not eating healthily wanted

Table 3. Means and beta coefficients of total BHEI-r and component scores according to categories of self-rated diet quality adolescents aged 10 to 19 years, ISACamp-Nutri 2014-16.

Total BHEI-r and components	Means			Adjusted beta coefficients (p-value)	
	VG/G (1)	F (2)	P/VP (3)	(2)/(1)	(3)/(1)
Total grains	4.83	4.82	4.82	-0.005 (0.916)	-0.008 (0.916)
Whole grains	0.15	0.15	0.04	0.003 (0.932)	-0.11 (0.051)
Total vegetables	3.98	3.83	3.54	-0.15 (0.244)	-0.44 (0.087)
Dark green and orange vegetables	3.34	3.29	2.65	-0.05 (0.731)	-0.69 (0.057)
Total fruits	1.19	1.16	0.68	-0.03 (0.784)	-0.51 (0.034)
Whole fruits	1.16	0.99	0.59	-0.17 (0.294)	-0.57 (0.005)
Dairy	4.88	4.74	5.32	-0.14 (0.490)	0.44 (0.346)
Meats, eggs and legumes	8.84	8.85	8.46	0.008 (0.961)	-0.38 (0.260)
Oils	8.53	8.30	8.15	-0.23 (0.292)	-0.38 (0.389)
Sodium	2.28	2.45	2.69	0.17 (0.330)	0.41 (0.209)
Saturated fat	6.52	6.60	5.26	0.08 (0.695)	-1.26 (0.041)
AA_fat	9.64	9.32	7.73	-0.32 (0.479)	-1.91 (0.024)
Total BHEI-r	55.4	54.6	50.0	-0.84 (0.241)	-5.41 (<0.001)

(1): Reference category used for comparison. Adjusted for sex, age, desire to change weight, eating more than should and having breakfast.

to change their diet, citing the taste of healthy foods, gluttony and the practicality of ready-to-eat foods as barriers to the adoption of changes.

A study that analyzed the programming of two Brazilian broadcast television networks found that 91.6% of the advertising of food products to children did not exhibit warning messages regarding the risks of the excessive consumption of saturated fat, trans fat, sugar and salt, 25.0% related the consumption of the product to health benefits, 25.0% stated that the product could replace natural sources of dietary fiber and nutrients and half of the advertising associated the product with a healthy lifestyle[24].

Among students in the city of Cuiabá-MT, a diet self-rated as good was associated with the greater intake of vegetables, fruit, dairy, oils (including oils from seeds and fish) and a lower intake of sodium[18]. Toral et al.[19] found that the perception of a diet as healthy was attributed to the influence of parents regarding the adoption of adequate eating habits since early childhood. A cross-sectional study conducted in the United States detected a better diet quality among individuals whose parents consumed more fruit and vegetables, did not have meals while watching television and did not have sweetened beverages available in the home[25]. Perdersen et al.[26] emphasized that the eating habits of parents exerted a

greater influence on the adoption of a healthy diet among adolescents than their counseling.

Rodrigues et al.[18] identified a greater frequency of a self-rated diet as poor (fair, poor and very poor) among those who did not eat the three main meals of the day and those who were physically inactive. A qualitative study showed that adolescents associated healthy eating with having regular meals and, although they considered breakfast to be the most important meal of the day, their omission of this meal was justified by not liking it, not having time or an appetite and waking up too early[20]. A study conducted with university students in Mexico found that skipping breakfast was associated with a low-quality diet in terms of macronutrients and micronutrients[27].

In a study conducted in Melbourne, Australia, 82.0% of university students reported that taste was a very or extremely important attribute in the choice of foods, which was associated with a poor diet quality, less frequency intake of fruits and vegetables and more frequent intake of sweets, cookies, pizza, French fries, soft drinks and meals outside the home[28]. A qualitative study with adolescents in Ecuador observed enthusiasm when expressing the flavor of sweet and fatty foods, whereas vegetables were related to negative, unpleasant sensory characteristics[29]. Moreover, the concern adolescents have of being

teased by classmates as a nerd, weird, poor or "health nut" constituted an important barrier to the incorporation of healthy foods in the diet[29-31]. Using a focus group with 203 American adolescents, Croll et al.[30] found that the time dedicating to preparing meals, the judgment of peers, the scarcity of healthy options at school and the lack of concern with one's diet were cited as barriers to an adequate diet.

Messages of nutritional recommendations are widely disseminated in the media and by health professionals and adolescents generally recognize the foods they should eat and those they should avoid[18-20,30]. With the increase in the prevalence of chronic non-communicable diseases, information devoid of a scientific, social and cultural context has generated dietary fears with regard to certain items, such as gluten, milk, grains, butter and eggs[32]. According to the Food Guide for the Brazilian Population published in 2014, the recommendations for a healthy diet include the consumption of varied and predominately *in natura* foods, limiting processed foods, avoiding ultra-processed foods, developing and sharing cooking skills, eating regularly and attentively, avoiding fast food restaurants and being critical of information on diet from commercial advertising[21].

Conclusion

The findings of the present study reveal incoherence in self-rated diet quality, as demonstrated by the unsatisfactory BHEI-r scores even among adolescents who classified their diet as very good or good. The understanding of these incoherencies could contribute to the delineation of dietary education strategies for the prevention of chronic non-communicable diseases.

Collaborations

SDL Carvalho performed the literature review, analyzed the data and wrote the manuscript. MBA Barros and AA Barros Filho interpreted the data, revised the manuscript critically for intellectual content and approved the version for publication. D Assumpção proposed the article, performed the literature review, analyzed the data and wrote the manuscript.

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References

1. Instituto Brasileiro de Geografia e Estatística (IBGE). *Pesquisa Nacional de Saúde do Escolar 2015*. Rio de Janeiro: IBGE; 2016.

2. NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. *Lancet* 2017; 390(10113):2627-2642.

3. Sawyer SM, Afifi RA, Bearinger LH, Blakemore SJ, Dick B, Ezeh AC, Patton GC. Adolescence: a foundation for future health. *Lancet* 2012; 379(9826):1630-1640.

4. Patton GC, Sawyer SM, Santelli JS, Ross DA, Afifi R, Allen NB, Arora M, Azzopardi P, Baldwin W, Bonell C, Kakuma R, Kennedy E, Mahon J, McGovern T, Mokdad AH, Patel V, Petroni S, Reavley N, Taiwo K, Waldfogel J, Wickremarathne D, Barroso C, Bhutta Z, Fatusi AO, Mattoo A, Diers J, Fang J, Ferguson J, Ssewamala F, Viner RM. Our future: a Lancet commission on adolescent health and wellbeing. *Lancet* 2016; 387(10036):2423-2478.

5. Martins APB, Levy RB, Claro RM, Moubarac JC, Monteiro CA. Participação crescente de produtos ultraprocessados na dieta brasileira (1987-2009). *Rev Saúde Pública* 2013; 47(4):656-665.

6. Cecchini M, Sassi F, Lauer JA, Lee YY, Guajardo-Barron V, Chisholm D. Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness. *Lancet* 2010; 376(9754):1775-1784.

7. Malta DC, Santos MAS, Andrade SSCA, Oliveira TP, Stopa SR, Oliveira MM. Tendência temporal dos indicadores de excesso de peso em adultos nas capitais brasileiras, 2006-2013. *Cien Saude Colet* 2016; 21(4):1061-1069.

8. Bloch KV, Klein CH, Szklo M, Kuschnir MCC, Abreu GA, Barufaldi LA, Veiga GV, Schaan B, Silva TLN. ERICA: prevalências de hipertensão arterial e obesidade em adolescentes brasileiros. *Rev Saúde Pública* 2016; 50(Supl. 1):9s.

9. Previdelli AN, Andrade SC, Pires MM, Ferreira SRG, Fisberg RM, Marchioni DM. Índice de Qualidade da Dieta Revisado para população brasileira. *Rev Saúde Pública* 2011; 45(4):794-798.

10. Assumpção D, Domene SMA, Fisberg RM, Barros MBA. Social and demographic inequalities in diet quality in a population-based study. *Rev Nutr* 2016; 29(2):151-162.

11. Andrade SC, Previdelli NA, Cesar CLG, Marchioni DML, Fisberg RM. Trends in diet quality among adolescents, adults and older adults: A population-based study. *Prev Med Rep* 2016; 4:391-396.

12. Banfield EC, Liu Y, Davis JS, Chang S, Frazier-Wood AC. Poor adherence to U.S. dietary guidelines for children and adolescents in the NHANES population. *J Acad Nutr Diet* 2016; 116(1):21-27.

13. Domene SMA. Avaliação do consumo alimentar. In: Taddei JAAC, Lang RMF, Longo-Silva G, Toloni MHA. *Nutrição em saúde pública*. Rio de Janeiro: Rubio; 2011. p.41-54.

14. Steinfeldt L, Anand J, Murayi T. Food reporting patterns in the USDA Automated Multiple-Pass Method. *Procedia Food Sci* 2013; 2:145-156.

15. Fisberg RM, Villar BS. *Manual de receitas e medidas caseiras para cálculo de inquéritos alimentares*. São Paulo: Signus; 2002.

16. Pinheiro ABV, Lacerda EMA, Benzecry EH, Gomes MCS, Costa VM. *Tabela para avaliação de consumo alimentar em medidas caseiras*. 5ª ed. São Paulo: Atheneu; 2004.

17. World Health Organization (WHO). *Global recommendations on physical activity for health*. Geneva: WHO; 2010.

18. Rodrigues PRM, Gonçalves-Silva RMV, Ferreira MG, Pereira RA. Viabilidade do uso de pergunta simplificada na avaliação da qualidade da dieta de adolescentes. *Cien Saude Colet* 2017; 22(5):1565-1578.

19. Toral N, Conti MA, Slater B. A alimentação saudável na ótica dos adolescentes: percepções e barreiras à sua implantação e características esperadas em materiais educativos. *Cad Saúde Pública* 2009; 25(11):2386-2394.

20. Silva DCA, Frazão IS, Osório MM, Vasconcelos MGL. Percepção de adolescentes sobre a prática de alimentação saudável. *Cien Saude Colet* 2015; 20(11):3299-3308.

21. Brasil. Ministério da Saúde (MS). Secretaria de Atenção à Saúde. Departamento de Atenção Básica. *Guia Alimentar para a População Brasileira*. Brasília: MS; 2014.

22. Ferrari TK, Cesar CLG, Alves MCGP, Barros MBA, Goldbaum M, Fisberg RM. Estilo de vida saudável em São Paulo, Brasil. *Cad Saúde Pública* 2017; 33(1):e00188015.

23. Hu T, Jacobs DR, Larson NI, Cutler GJ, Laska MN, Neumark-Sztainer D. Higher Diet Quality in Adolescence and Dietary Improvements Are Related to Less Weight Gain During the Transition From Adolescence to Adulthood. *J Pediatr* 2016; 178:188-193.

24. Henriques P, Sally EO, Burlandy L, Beiler RM. Regulamentação da propaganda de alimentos infantis como estratégia para a promoção da saúde. *Cien Saude Colet* 2012; 17(2):481-490.

25. Santiago-Torres M, Adams AK, Carrel AL, LaRowe TL, Schoeller DA. Home Food Availability, Parental Dietary Intake, and Familial Eating Habits Influence the Diet Quality of Urban Hispanic Children. *Child Obes* 2014; 10(5):408-415.

26. Pedersen S, Grønhøj A, Thøgersen J. Following family or friends. Social norms in adolescent healthy eating. *Appetite* 2015; 86:54-60.

27. Hall L, Tejada-Tayabas LM, Monárrez-Espino J. Breakfast Skipping, Anxiety, Exercise, and Soda Consumption are Associated with Diet Quality in Mexican College Students. *Ecol Food Nutr* 2017; 56(3):218-237.

28. Kourouniotis S, Keast RSJ, Riddell LJ, Lacy K, Thorpe MG, Cicerale S. The importance of taste on dietary choice, behaviour and intake in a group of young adults. *Appetite* 2016; 103:1-7.

29. Verstraeten R, Van Royen K, Ochoa-Avilés A, Penafiel D, Holdsworth M, Donoso S, Maes L, Kolsteren P. A Conceptual Framework for Healthy Eating Behavior in Ecuadorian Adolescents: A Qualitative Study. *PLoS One* 2014; 9(1):e87183.

30. Croll JK, Neumark-Sztainer D, Story M. Healthy Eating: What Does It Mean to Adolescents? *JNE* 2001; 33(4):193-198.

31. Stead M, McDermott L, MacKintosh AM, Adamson A. Why healthy eating is bad for young people's health: Identity, belonging and food. *Soc Sci Med* 2011; 72(7):1131-1139.

32. Garcia RWD. Reflexos da globalização na cultura alimentar: considerações sobre as mudanças na alimentação urbana. *Rev Nutr* 2003; 16(4):483-492.