Diet quality among adolescents in the public education system in a municipality in Southern Brazil: a cross-sectional study, 2019

Etiene Dias Alves[1] (iD), Caroline Cardozo Bortolotto[2] (iD), Nathalia Brandão Peter[3] (iD), Cristina Corrêa Kaufmann[4] (iD), Gicele Costa Mintem[1] (iD), Renata Moraes Bielemann[1] (iD), Ludmila Correa Muniz[1] (iD)

[1]Universidade Federal de Pelotas, Programa de Pós-Graduação em Nutrição e Alimentos, Pelotas, RS, Brazil
[2]Universidade Federal de Pelotas, Programa de Pós-Graduação em Epidemiologia, Pelotas, RS, Brazil
[3]Faculdade Anhanguera de Pelotas, Departamento de Nutrição, Pelotas, RS, Brazil
[4]Universidade Federal de Pelotas, Faculdade de Nutrição, Pelotas, RS, Brazil

ABSTRACT

Objective: To identify the factors associated with the diet quality among 9th grade students in the municipal education system of Pelotas, state of Rio Grande do Sul, Brazil. **Methods:** This was a cross-sectional study, conducted in 2019. Food information was collected using a food frequency questionnaire, and diet quality was assessed through an index developed by the authors. Diet was classified as low, intermediate or high quality. The association was assessed using multinomial logistic regression. **Results:** The 808 adolescents evaluated obtained a mean score of 16.0 points (deviation-standard=4.1) according to the developed index. The high diet quality was associated with tobacco experimentation [*odds ratio* (OR) 2.92; 95% confidence interval (95%CI) 1.74;4.92] and leisure-time physical activity (OR=1.65; 95%CI 1.15;2.38). **Conclusion:** We highlighted the importance of encouraging physical activity practice, monitoring risk behaviors among adolescents and promoting the consumption of healthy food.

Keywords: Feeding Behavior; Adolescents; Students; Cross-Sectional Studies.

INTRODUCTION

Adolescence, which corresponds to the age group 10 to 19 years,[1] is considered a complex stage of individual adaptation to physical, psychological and environmental changes.[1] This is a period of great importance for the formation and consolidation of healthy habits and attitudes, including eating, which may influence the current and future health status.[2] The literature has been consistent with the role of adequate nutrition, in quantity and quality, for the prevention of diseases such as diabetes *mellitus*, hypertension and cardiovascular diseases, which have been identified at an early age, such as adolescence.[3,4]

The National Adolescent School-based Health Survey (PeNSE), conducted in 2015, when investigating the food consumption among 9th grade students at public and private elementary schools nationwide, observed less frequent consumption of natural (such as fruits and vegetables) or minimally processed foods, associated with high consumption of unhealthy foods with low nutritional quality (such as goodies and soft drink), as verified in other studies.[5] Poor eating habits are closely related to unfavorable health outcomes[3,4] and gain greater relevance in view of the increased prevalence of overweight among Brazilian adolescents.[6]

Given the repercussions of food on nutritional status and the incidence of diseases, researchers have sought to develop indices to evaluate the population diet quality, both at the individual and population levels.[7,8] These indices were developed and adapted to different population groups over the years, taking into account the dietary recommendations for each country and the characteristics of each stage of life. The Healthy Eating Index (HEI), developed by the United States Department of Agriculture and adapted by Fisberg et al.[9] for use in Brazil, uses information from 24-hour dietary recalls.

The evaluation of the diet quality among adolescent students is a relevant theme, given that food is associated, in an articulated way, with current and future health indicators, since the

Study contribuition	
Main results	The individuals taking part in the study had low score, indicating inadequate consumption of healthy food, which, associate with other factors, may result in health problems in the future.
Implications for services	Given the increase in obesity, and it is even greater among young adults, the evaluation of diet quality among adolescents is useful for describing and planning health interventions and strategies for food education based on dietary patterns.
Perspectives	Actions aimed at promoting young people health should focus on the set of factors that impact the general health status and favor the prevention of noncommunicable diseases, supported by tools that help to understand the role of food.

eating habits acquired during adolescence may have repercussions on adulthood. This research aims to support healthy eating promotion and prevention of diseases and nutritional problems.[10] There are few studies that evaluate diet quality in this age group,[11,12] mainly from the perspective of using a simple index in the South region of the country,[10,11] in the school setting.

The objective of this study was to identify the factors associated with the diet quality among 9th grade students in the municipal education system of Pelotas, state of Rio Grande do Sul, Brazil.

METHODS

This was a school-based cross-sectional study, conducted in 2019, with 9th grade students in

municipal elementary schools in the urban area of Pelotas, state of Rio Grande do Sul, linked to the School Health Program (PSE). It is noteworthy that the study is part of a broader research, which evaluated the nutritional status and other health indicators of all students enrolled in the 1st to 9th year in the urban municipal elementary schools of Pelotas.

The municipality has a population of approximately 342,000 inhabitants, 16% (52,485) of whom are adolescents.[13] Currently, Pelotas has 51 primary healthcare centers (38 located in the urban area and 13 in the rural area), the gross domestic product *per capita* of the city is estimated at BRL 17,353.15 and its municipal human development index (MHDI) is 0.739.[13]

During the study period, there were 40 municipal elementary schools (EMEF) in the urban area of Pelotas. Of these, 30 offered complete elementary education, 25 of which were linked to the PSE. According to the Municipal Department of Education and Sports of Pelotas, in 2019, the 25 aforementioned schools offered elementary education to 11,658 students, 951 of whom were enrolled in the 9th grade and all of them were eligible for the study.

The population cutout in the 9th grade students, can be justified by the fact that it is the minimum schooling necessary to answer the self-administered questionnaire, in addition to the fact that students enrolled in that grade level are at the age close to the reference age recommended by the World Health Organization (WHO),[14] which is 13 to 15 years old. To start data collection, we prioritized schools linked to the PSE because they use a free and informed consent form in order for the students to participate in the Health Promotion and Disease Prevention Programs, which enables their anthropometric evaluation. Moreover, data collection was restricted to those schools because of the suspension of face-to-face teaching at the beginning of the 2020 school year due to the COVID-19 pandemic, making it impossible to complete fieldwork in the other selected schools. Students aged 19 years and older were

excluded from the analyses, because this study was restricted to adolescents. Students who had some physical or mental disability and were unable to complete the questionnaire were not included in the study. The research team was informed about existing disabilities by the school coordination. The students who were not found in the classroom after 3 attempts, on different days and times, by the research team were considered losses.

For the collection of food information, the Food Consumption Marker Form of the Food and Nutrition Surveillance System (SISVAN) was used,[15] related to the consumption of ten food items, in the last week, of which five were considered healthy – fresh fruit or fruit salad (fruits); cooked vegetables and vegetables; raw salad (raw vegetables); beans; milk/yogurt – and the other five that were considered unhealthy – French fries, potato packets and fried snacks (fried snacks); filled or sweet crackers/biscuits, candies and chocolates (processed sweets); savory crackers/biscuits or salted packet snacks (processed snacks); hamburger and charcuteries; soft drink.

Diet quality among students was evaluated using an index developed by the authors, after data collection, based on a methodology proposed in a previous study conducted with another age group, in the same municipality, and another study adopted a similar instrument.[16,17] Initially, the weekly frequency of consumption of each food/food group was grouped into four categories: (i) did not eat in the last week; (ii) ate 1-3 days/week; (iii) ate 4-6 days/week; and (iv) ate every day. For each of these categories, a variable score was assigned, from 0 to 3 (Box 1). Taking into account that there is no recommendation on the frequency of food intake, we determined that the higher scores would be attributed to the highest weekly frequency of healthy food consumption, as long as the highest frequency, possibly, represent the highest consumption of these foods. Thus, an increasing score was attributed to healthy foods/food groups (did not eat = 0 point; ate every day = 3 points), while a

Box 1 – Score used to calculate the diet quality index proposed for this study

Index components	Score by consumotion category
Healthy[a] Fresh fruit or fruit salad (fruit); cooked greens and vegetables; raw salad (raw vegetables); beans; milk/yogurt.	0 = did not eat in the last week 1 = ate 1-3 days/week 2 = ate 4-6 days/week 3 = ate every day
Unhealthy[b] French fries, potato packets and fried snacks (fried snacks), filled or sweet crackers/biscuits, candies and chocolates (processed sweets), savory crackers/biscuits or salted packet snacks (processed snacks), hamburger and charcuteries; soft drink.	0 = ate every day 2 = ate 1-3 days/week 1 = ate 4-6 days/week 3 = did not eat in the last week

a) The highest mean score indicates the highest consumption frequency; b) The highest mean score indicates the lowest consumption frequency.
Source: Adapted from Gomes et al.[16]

decreasing score was attributed to unhealthy foods (did not eat = 3 points; ate every day = 0 point), given that it is recommended to reduce the consumption of these foods.

The total index score could range from 0 to 30 points, in which a higher score suggested a higher weekly frequency of healthy food consumption and a lower weekly frequency of unhealthy food consumption. Subsequently, this score was divided into tertiles: 1st tertile (the lowest score) – low quality; 2nd tertile – intermediate quality; and 3rd tertile (the highest score) – high diet quality.

The independent sociodemographic variables studied were sex (male; female), age group (in full years: 13 to 14; 15; 16 to 19), race/skin color (informed by the adolescent and later dichotomized: White or Black/Brown/Asian/Indigenous) and maternal schooling (informed by the adolescent in number of years of study their mother completed and was promoted: <8; 8-11; ≥12).

Regarding behavioral variables, we evaluated shared family mealtime (no; yes) by asking the following question *Do you usually have lunch or dinner with the people who live with you?*, while tobacco experimentation (no; yes) was obtained by asking the question *Have you ever smoked, or even had one or two puffs?*, and alcohol experimentation (no; yes) asking the question

Have you ever tried alcohol in your life? The weekly leisure-time physical activity was measured based on a list of 12 physical activities recommended for adolescents, their respective frequency and duration. Adolescents who achieved at least 300 minutes of leisure-time physical activity in the week prior to the interview were considered active, according to current recommendations.[18]

The schools were visited on random dates, from April to December 2019, according to the availability of the work team and school calendar, on a day previously agreed with the school administrators. Students were identified and invited to participate in the classroom. Data collection was performed using a self-administered questionnaire.

The data were double-typed using the EpiData program, version 3.1 (Epidata Association, Odense, Denmark), while statistical analysis was performed using Stata Statistical package version 16.0 (Stata Corp., College Station, United States). Initially, the sample was described in absolute (N) and relative (%) numbers, according to socioeconomic, demographic and behavioral characteristics of the adolescents. The mean score of each component was compared according to the tertiles for diet quality, through the analysis of variance (oneway). Multinomial logistic regression was used to evaluate the association of diet quality classification (low; intermediate; high)

with the independent variables, and the results were described in crude and adjusted *odds ratio* (OR) for possible confounding factors, with the respective 95% confidence intervals (95%CI). We used 'low diet quality' as a reference category. The adjusted analysis was performed in a hierarchical manner, at two levels: at the first level, sociodemographic variables were included; and behavioral variables were included at the second level. At each level, the p-value was checked, removing the variables with the highest p-value, one by one, from the analysis model. The variables associated with the outcome with p-value <0.20 (tobacco experimentation and leisure-time physical activity) were maintained in the analysis to control possible confounding effects. Linear trend (Wald test) and heterogeneity (Parm test) tests were used according to the nature of the variables. A significance level of 5% was adopted in the associations.

The study project was approved by the Research Ethics Committee of the Faculty of Nursing of the Universidade Federal de Pelotas (CEP_FEN/UFPel): Opinion No. 2,843,572, issued on August 24, 2018. After data collection, all participants were informed about the objectives of the study, and only those whose parents/guardians signed the Free and Informed Consent Form, answered the questionnaire. The research was authorized by the Municipal Department of Education and Sports of Pelotas.

RESULTS

Of the 951 adolescent students eligible for the study, 808 were evaluated. The losses and refusals corresponded to 15% (143), most of them were famale (56.0%) and adolescents aged 15 years (37.3%).

The sociodemographic and behavioral characteristics of these students are shown in Table 1. Most of the sample were female (51.6%), aged 13 to 15 years (80.5%) and of White race/skin color (61.3%). Regarding maternal education, about 75% of the adolescents had mothers with at least eight complete years of schooling.

Regarding behavioral characteristics, 85.4% of the adolescents reported eating family meal, while 18.2% and 73.6% had already tried tobacco and alcohol, respectively. More than half of the adolescents (54.2%) were classified as inactive.

The mean index score was 16.0 – in the range of values from 3 to 30 points. The mean score of each component (food group/combination), by index category, can be observed in Table 2. For each component, the score could range from 0 to 3 points. Regarding the low diet quality category, it can be seen the lowest averages for healthy (indicating a lower consumption) and unhealthy foods (indicating a higher consumption). It is worth highlighting the difference between the consumption of cooked vegetables and vegetables, among the categories of diet quality, in which the average consumption ranges from 0.75 point, in low quality, to 1.31 in intermediate quality and reaches 2.10 in high quality. In the high diet quality group, raw vegetables (average of 1.91 point) and milk/yogurt (average of 1.95 point) had a lower consumption frequency. With regard to unhealthy foods, fried snacks (average of 2.31 points) were the most frequently consumed among adolescents in the high diet quality group, while processed sweets (average of 1.92 point) were less frequently consumed among the adolescents in this group.

Tables 3 and 4 show the crude and adjusted OR for the independent variables, according to diet quality categories – intermediate and high, respectively. Only the variables 'tobacco experimentation' (p<0.001) and 'leisure-time physical activity' (p=0.012) were associated with high diet quality. After adjusting for possible confounding factors, those who reported having tried tobacco were 2.9 times more likely (95%CI 1.74;4,92; p<0.001) to be classified in the high diet quality group than those who had not tried tobacco. Adolescents who were considered active during leisure time were 65.0% (95%CI 1.15;2.38; p-value=0.007) more likely to be classified in the high diet quality group. The other variables studied remained statistically unassociated with the outcome.

Table 1 – Description of the sociodemographic and behavioral characteristics of adolescents (n=808) in the municipal education system of the urban area of Pelotas, state of Rio Grande do Sul, Brazil, 2019

Characteristics	N[a]	%
Sex		
Male	391	48.4
Female	417	51.6
Age group (in full years)		
13-14	314	38.9
15	336	41.6
16-19	158	19.5
Race/skin color		
White	488	61.3
Black/Asian/Brown/Indigenous	308	38.7
Maternal schooling (in complete years)		
<8	153	24.4
8-11	106	16.9
≥12	368	58.7
Eat family meal		
No	117	14.6
Yes	684	85.4
Tobacco experimentation		
No	637	81.8
Yes	142	18.2
Alcohol experimentation		
No	208	26.4
Yes	581	73.6
Leisure-time physical activity		
Inactive	436	54.2
Active[b]	369	45.8

a) For the variable 'maternal schooling', the maximum number of ignored information was n=181; b) ≥300 minutes a week.

Table 2 – Mean and standard deviation of each component and categories of the diet quality index among adolescents (n=808) in the municipal education system of the urban area of Pelotas, state of Rio Grande do Sul, Brazil, 2019

Index components	Score range	Diet quality scores			p-value[b]
		Low	Intermediate	High	
		Mean (SD[a])	Mean (SD[a])	Mean (SD[a])	
Healthy[c]					
Fruit	0 – 3	0.89 (0.84)	1.30 (0.86)	1.99 (0.90)	<0.001
Cooked greens or vegetables	0 – 3	0.75 (0.73)	1.31 (0.86)	2.10 (0.89)	<0.001
Raw vegetables	0 – 3	0.76 (0.81)	1.14 (0.93)	1.91 (0.99)	<0.001
Beans	0 – 3	1.36 (0.97)	1.81 (0.93)	2.20 (0.88)	<0.001
Milk/yogurt	0 – 3	1.21 (1.10)	1.52 (1.12)	1.95 (1.09)	<0.001
Unhealthy[d]					
Fried snacks	0 – 3	1.62 (0.79)	2.09 (0.58)	2.31 (0.61)	<0.001
Processed sweets	0 – 3	1.05 (0.81)	1.67 (0.79)	1.92 (0.72)	<0.001
Processed snacks	0 – 3	1.49 (0.88)	2.03 (0.73)	2.15 (0.71)	<0.001
Hamburger and charcuteries	0 – 3	1.46 (0.86)	1.78 (0.87)	2.18 (0.82)	<0.001
Soft drink	0 – 3	1.28 (0.89)	1.78 (0.80)	2.20 (0.71)	<0.001
Total	**0 – 30**	**11.8 (2.14)**	**16.4 (1.13)**	**20.9 (2.06)**	

a) SD: standard deviation; b) Wald test for linear trend; c) The highest mean score indicates the highest consumption frequency; d) The highest mean score indicates the lowest consumption frequency.

DISCUSSION

The total score of the diet quality index, presenting a low average among the adolescents included in the study, calls attention to the importance of young people feeding. Food is the basis for health promotion and protection, enabling growth and development with quality of life.

Low frequency of the consumption of raw vegetables and milk/yogurt, together with regular intake of sweet biscuits, is the main inadequacy in the diet of the adolescents evaluated. This finding corroborates the results of population-based studies, one of them was conducted in Cuiabá, capital city of the state of Mato Grosso, in 2011,[19] and the other one used data from 2012 PeNSE.[20] These studies show that adolescents have made bad food choices, replacing the consumption of natural or minimally processed foods with unhealthy foods, such as sweet biscuits, soft drink and fried snacks.[5] It is worth mentioning that the reduction of milk/yogurt consumption observed[21] may be associated with breakfast omission,[22] given that dairy products are more frequently consumed at breakfast. At the same time, we observed that milk has been replaced with sweetened beverages, among adolescents.[19,22]

The findings about bad eating habits have become worrisome. A nutritionally adequate diet is necessary to supply accelerated growth and changes in body composition which are characteristics of adolescence.[23] Poor eating habits contribute substantially to the increase in overweight (overweight and obesity),[19] a fact that has already affected 19.4% of the Brazilian adolescent population.[6]

Table 3 – Crude and adjusted analysis between intermediate diet quality and sociodemographic and behavioral variables of adolescents (n=808) in the municipal education system of the urban area of Pelotas, state of Rio Grande do Sul, Brazil, 2019

Characteristics	Intermediate diet quality[a]			
	Crude OR[b] (95%CI[c])	p-value[d]	Adjusted OR[b] (95%CI[c])	p-value[d]
Level 1				
Sex		0.450		0.450
Male	1.00		1.00	
Female	0.88 (0.64;1.22)		0.88 (0.64;1.22)	
Age group (in full years)		0.399		0.352
13-14	1.00		1.00	
15	0.83 (0.57;1.19)		0.82 (0.57;1.18)	
16-19	0.93 (0.60;1.44)		0.92 (0.59;1.42)	
Race/skin color		0.624		0.549
White	1.00		1.00	
Black/Asian/Brown/Indigenous	1.09 (0.78;1.52)		1.11 (0.79;1.56)	
Maternal schooling (in complete years)		0.401[d]		0.362[e]
<8	1.00		1.00	
8-11	0.92 (0.51;1.66)		0.89 (0.49;1.60)	
≥12	0.83 (0.53;1.30)		0.81 (0.51;1.28)	
Level 2				
Eat family meal		0.652		0.902
No	1.00		1.00	
Yes	1.11 (0.71;1.74)		1.03 (0.64;1.66)	
Tobacco experimentation		0.008		0.009
No	1.00		1.00	
Yes	1.74 (1.15;2.63)		1.73 (1.15;2.62)	
Alcohol experimentation		0.200		0.552
No	1.00		1.00	
Yes	0.78 (0.53;1.14)		0.89 (0.59;1.32)	
Leisure-time physica activity[f]		0.204		0.189
No	1.00		1.00	
Yes	1.24 (0.89;1.71)		1.25 (0.90;1.75)	

a) Reference category = low diet quality; b) The OR: *odds ratio*; c) 95%CI: 95% Confidence Interval; d) Parm test for heterogeneity; e) Wald test for linear trend; f) ≥300 minutes a week.
Note: Adjusted for 'sex', 'age group', 'race/skin color', 'maternal schooling', 'eat family meal', 'and tobacco experimentation', 'alcohol experimentation' and 'leisure-time physical activity'.

Tablel 4 – Crude and adjusted analysis between high diet quality and sociodemographic and behavioral variables of adolescents (n=808) in the municipal education system of the urban area of Pelotas, state of Rio Grande do Sul, Brazil, 2019

Characteristics	High diet quality[a]			
	Crude OR[b] (95%CI[c])	p-value[d]	Adjusted OR[b] (95%CI[c])	p-value[d]
Level 1				
Sex		0.092		0.577
Male	1.00		1.00	
Female	0.74 (0.68;1.13)		0.90 (0.61;1.31)	
Age group (in full years)		0.254		0.427
13-14	1.00		1.00	
15	1.02 (0.69;1.50)		1.00 (0.68;1.48)	
16-19	0.70 (0.42;1.16)		0.69 (0.41;1.13)	
Race/skin color		0.385		0.549
White	1.00		1.00	
Black/Asian/Brown/Indigenous	1.17 (0.82;1.69)		1.24 (0.86;1.79)	
Maternal schooling (in complete years)		0.643[d]		0.445[e]
<8	1.00		1.00	
8-11	1.05 (0.56;1.96)		0.98 (0.52;1.86)	
≥12	0.91 (0.56;1.47)		0.84 (0.51;1.38)	
Level 2				
Eat family meal		0.315		0.979
No	1.00		1.00	
Yes	1.30 (0.78;2.15)		0.99 (0.58;1.69)	
Tobacco experimentation		<0.001		<0.001
No	1.00		1.00	
Yes	2.76 (1.66;4.59)		2.92 (1.74;4.92)	
Alcohol experimentation		0.027		0.138
No	1.00		1.00	
Yes	0.63 (0.42;0.95)		0.73 (0.47;1.11)	
Leisure-time physica activity[f]		0.012		0.007
No	1.00		1.00	
Yes	1.57 (1.10;2.23)		1.65 (1.15;2.38)	

a) Reference category = low diet quality; b) The OR: *odds ratio*; c) 95%CI: 95% Confidence Interval; d) Parm test for heterogeneity; e) Wald test for linear trend; f) ≥300 minutes a week.
Note: Adjusted for 'sex', 'age group', 'race/skin color', 'maternal schooling', 'eat family meal', 'and tobacco experimentation', 'alcohol experimentation' and 'leisure-time physical activity'.

The highest probability of classification in the high diet quality group, for adolescents who tried tobacco, can be considered unexpected, possibly by chance, given the recognized fragility of self-reported smoking among adolescents[24] and the limitation of the variable, which may have distorted the result found. The literature points out that adolescents who try tobacco, are likely to become smokers in adulthood, and that their smoking habit is related to inadequate food consumption, which is opposite to the association observed in the present study.[24-26]

However, the positive association between leisure-time physical activity and diet quality was consistent with the literature.[19,27] Playing sports can lead to the inclusion of other positive habits in the adolescents' lifestyle, resulting in health status improvement, helping to prevent future pathological consequences.[5,6] The association found highlights the need to support strategies to stimulate the adoption of healthy behaviors, and effective preventive health campaigns, especially in the school setting.

Given that there are few studies that have evaluated diet quality among adolescents in the school setting, we consider this fact as one of the positive points that can be highlighted in this study. Schools are favorable environments for educational interventions and strategies aimed at promoting better living conditions and health.[23] The schools taking part in this study are linked to the PSE, a program that is part of the Strategic Action Plan to Tackle Chronic Noncommunicable Diseases (NCDs) in Brazil – 2011-2022, whose objective is to promote food security and healthy eating for schoolchildren. Through the PSE it is possible to offer, on the school menu, foods that include basic foodstuffs, since these meals are based on adequate and healthy eating.[5] However, some adversities may be encountered, given that eating outside the school setting occurs in the social environment, especially family meal, and comes across the ease of acquiring processed foods and the effect of television food advertising. The low percentage of

losses and refusals compared to that of equivalent studies, stands out as a positive point,[28,29] which reinforces the representativeness of the sample evaluated.

The study has some limitations. The first one is related the use of SISVAN Food Consumption Markers Form,[15] regarding the consumption in the previous week of ten foods/food items. Although it is an instrument that is easy for the interviewees to apply and understand, the short previous period considered may not reflect the long-term eating habits. However, we chose to use this instrument, given that it was a school-based study, in which the students completed a self-administered questionnaire, making it impossible to apply 24-hour dietary recall surveys. It should also be taken into consideration that given the nature of the instrument applied, in which some foods/food items are grouped, there may have been loss of specific information about each food, and possible underestimation of the consumption of the index components. The use of an index that was not validated for the target population also represents fragility of the study. Nevertheless, the experience with similar indices, also developed based on a reduced form aimed at other age groups from the same municipality, proved to be satisfactory for screening purposes, enabling the identification of groups with greater or lesser vulnerability related to diet, in addition to foods or food groups that most contribute to diet quality. Notwithstanding, the impossibility of using a cutoff point for the high diet quality definition makes it impossible to compare its prevalence with that found in other studies.

In conclusion, it could be seen low average in the diet quality index for adolescents developed for this study, which revealed low consumption of raw vegetables and dairy foods, even among adolescents classified in the high diet quality group.

It is acknowledged that food choices are based not only on individual choices, but they also suffer economic and social interference, being relevant

to encourage public practices and policies aimed at more equitable distribution of income, in order to expand food access, and through these initiatives, human rights and right to health can be respected, protected and promoted. Moreover, it is worth highlighting that risk behaviors, such as smoking, which was associated with the outcome, may become social and public health problems. It is important that these behaviors can be treated through health education actions, articulating education and society in favor of current and future adolescent health.

AUTHORS' CONTRIBUTION

Muniz LC, Kaufmann CC, Bielemann RM and Mintem GC collaborated with the study conception and design. Alves ED collaborated with data collection, drafting and interpretation of the results. Bortolotto CB performed the statistical analysis. Bortolotto CB and Peter NB collaborated with the interpretation of the results and critical reviewing of the manuscript content. All authors have approved the final version of the manuscript and declared themselves to be responsible for all aspects of the work, including ensuring its accuracy and integrity.

CONFLICTS OF INTEREST

The authors declared that there is no conflict of interest.

ASSOCIATED ACADEMIC WORK

Article derived from the master's degree dissertation entitled 'Diet quality among adolescents in the public education system in a municipality in Southern Brazil: a cross-sectional study, 2019', submitted by Etiene Dias Alves to the Postgraduate Program in Nutrition and Food of the Universidade Federal de Pelotas, in 2020.

REFERENCES

1. Müller AL, Lima Duarte da Silva CR, Vargas DM. Percepções de Aspectos Psicossociais no Cuidado em Saúde de Adolescente com Obesidade Grave. Rev. Psicol. Saúde. 2019; 11(3):125-38. Disponível em: <http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S2177-093X2019000300009&lng=pt&nrm=iso>. doi: 10.20435/pssa.v11i3.596

2. Mellendick K, Shanahan L, Wideman L, Calkins S, Keane S, Lovelady C. Diets Rich in Fruits and Vegetables Are Associated with Lower Cardiovascular Disease Risk in Adolescents. Nutrients. 2018 Jan 27;10(2):136. doi: 10.3390/nu10020136. PMID: 29382069; PMCID: PMC5852712.

3. Oliveira AS, Moreira NF, Moraes AB, Pereira, RA, Veiga GV. Co-occurrence of behavioral risk factors for chronic non-communicable diseases in adolescents: Prevalence and associated factors. Rev Nutr. (Online). 2017; 30(6):747-758. Available from: <https://doi.org/10.1590/1678-98652017000600007>. ISSN 1678-9865 doi: 10.1590/1678-98652017000600007.

4. Lane MM, Davis JA, Beattie S, Gómez-Donoso C, Loughman A, O'Neil A, et al. Ultraprocessed food and chronic noncommunicable diseases: a systematic review and meta-analysis of 43 observational studies. Obes. rev. 2020;22(3):e13146. doi: 10.1111/obr.13146. Epub 2020 Nov 9. PMID: 33167080.

5. Brasil. Pesquisa Nacional de Saúde do Escolar (PENSE): 2015 / IBGE, Coordenação de População e Indicadores Sociais. – Rio de Janeiro: IBGE, 2016. 132p. Acesso em 01 Abr. 2020. ISBN 978-85-240-4387-1.

6. Brasil. Pesquisa Nacional de Saúde: 2019: atenção primária à saúde e informações antropométricas: Brasil/IBGE, Coordenação de Trabalho e Rendimento. Rio de Janeiro: IBGE, 2020. Acesso em: 15 Nov 2020. 66p. ISBN 978-65-87201-25-2.

7. Pires RK, Luft VC, Araújo MC, Bandoni D, Molina MDC, Chor D, et al. Análise crítica do índice de qualidade da dieta revisado para a população brasileira (IQD-R): aplicação no ELSA-Brasil. Ciênc. Saúde Colet. [Internet]. 2020 Feb [cited 2021 Feb 22]; 25(2): 703-713. Epub Feb 03, 2020. doi: 10.1590/1413-81232020252.12102018.

8. Morais DC, Moraes LF, Silva DC, Pinto CA, Novaes JF. Aspectos metodológicos da avaliação da qualidade da dieta no Brasil: revisão sistemática. Ciênc. Saúde Colet. 2017; 22 (8):2671-80. doi: 10.1590/1413-81232017228.23502015.

9. Fisberg RM, Slater B, Barros RR, Lima FD, Cesar CL, Carandina L, et al. Índice de Qualidade da Dieta: avaliação da adaptação e aplicabilidade. Rev. Nut. (Online). 2004; 17(3):301-18. doi: 10.1590/S1415-52732004000300003.

10. De Oliveira MRM, Firmino MAD, Souza LM, Montenegro APDR, Montenegro Junior RM, Maia CSC, et al. Qualidade da dieta e risco cardiometabólico em crianças e adolescentes com excesso de peso. Rev. bras. promoç. saúde (Impr.). 2021. 34:10952, doi:10.5020/18061230.2021.10952.

11. Castilhos CB, Schneider BC, Muniz LC, Assunção MC. Qualidade da dieta de jovens aos 18 anos de idade, pertencentes à coorte de nascimentos de 1993 da cidade de Pelotas (RS), Brasil. Ciênc. Saúde Colet. 2015; 20(11):3309-18. doi: 10.1590/1413-812320152011.17822014.

12. Horta PM, Verly Junior, E, Santos LC. Usual diet quality among 8-to 12-year-old Brazilian children. Cad. Saúde Pública (Online). 2019;35(2):e00044418. doi: 10.1590/0102-311X00044418.

13. IBGE. Instituto Brasileiro de Geografia e Estatística. Censo 2010. Disponível em: http://www.censo.2010.ibge.gov.br/resultados

14. WHO/Europe | Home [Internet]. Inequalities in young people's health Key findings from the Health Behaviour in School-aged Children (HBSC) 2005/2006 survey; 17 jun 2008 [citado 6 jun 2021]. Disponível em: https://www.euro.who.int/__data/assets/pdf_file/0004/83695/fs_hbsc_17june2008_e.pdf

15. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Orientações para avaliação de marcadores de consumo alimentar na atenção básica [recurso eletrônico] / Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento de Atenção Básica. – 2. ed. – Brasília: Ministério da Saúde, 2016. 32 p.: il. Acesso em 21 fev 2021.

16. Gomes AP, Soares AL, Gonçalves H. Baixa qualidade da dieta de idosos: estudo de base populacional no sul do Brasil. Ciênc. Saúde Colet. 2016 [cited 2020 Sep 29];21(11):3417-3428. doi:10.1590/1413-812320152111.17502015.

17. Zagmignan, A., Marques, A. C. G., Reis, A. D., de Sena Alcantra, C. P., da Silva Barros, C., de Sousa, L. F., ... & Mendes, R. D. S. O. PREVALÊNCIA DE OBESIDADE E CONSUMO ALIMENTAR DE ADOLESCENTES DA REGIÃO NORDESTE DO BRASIL: Registros do SISVAN. PREVALÊNCIA DE OBESIDADE E CONSUMO ALIMENTAR DE ADOLESCENTES DA REGIÃO NORDESTE DO BRASIL: Registros do SISVAN, 1-388.

18. WHO | World Health Organization [Internet]. WHO guidelines on physical activity and sedentary behaviour; [citado 5 fev 2021]. Disponível em: https://www.who.int/publications/i/item/9789240015128

19. Wendpap LL, Ferreira MG, Rodrigues PR, Pereira RA, Loureiro AD, Gonçalves-Silva RM. Qualidade da dieta de adolescentes e fatores associados. Cad. Saúde Pública (Online), 2014 [cited 2020 Sep 29]; 30(1):97-106. doi: 10.1590/0102-311X00082412.

20. Silva JB, Elias BC, Mais LA, Warkentin S, Konstantyner T, Oliveira FL. Fatores associados ao consumo inadequado de leite em adolescentes: Pesquisa Nacional de Saúde do Escolar - PeNSE 2012. Rev. paul. Pediatr. (Ed. Port., Online). 2020 [citado 6 jul 2021];38. doi: 10.1590/1984-0462/2020/38/2018184.

21. Brasil. Pesquisa de Orçamentos Familiares 2017-2018: análise do consumo alimentar pessoal no Brasil / IBGE, Coordenação de Trabalho e Rendimento. - Rio de Janeiro: IBGE, 2020. Acesso em 20 Out 2020. 120 p.

22. Dos Santos Correa A, Rodrigues PR, Monteiro LS, de Souza RA, Sichieri R, Pereira RA. Beverages characterize the nutritional profile of Brazilian adolescents' breakfast. Nutrire (Online). 2016 [citado 01 Mar 2020]; 41(3):1-11 doi:10.1186/s41110-016-0004-z.

23. Diniz CB, Feitosa AA, Coutinho BL, Gomes SC, Sant'anna AL, de Araújo AF, et al. Acompanhamento nutricional de adolescentes no Programa Saúde na Escola. J. Hum. Growth Dev. [online]. 2020; 30(1):32-39. doi: 10.7322/jhgd.v30.9961.

24. Menezes AMB, Dumith S, Martínez J, Silva AE, Cascaes A, Domínguez GG, et al. Mental health problems and smoking among adolescents from Southern Brazil. Rev. Saúde Pública [Internet], 2011 [citado 2020 Dez 29];45(4):700-5.

25. Ribeiro SC, Pires GAR, Charlo PB, da Silva Rodrigues T. F. C, Paiano M, Radovanovic CAT, et al. O consumo de derivados do tabaco por adolescentes: Revisão integrativa da literatura. Saude Coletiva (Barueri. CR-Room). 2019;9(51):2005-12.

26. Bergmans RS, Coughlin L, Wilson T, Malecki K. Cross-sectional associations of food insecurity with smoking cigarettes and heavy alcohol use in a population-based sample of adults. Drug Alcohol Depend. 2019 [Acesso em: 29 Dez 2020]; 205:107646. doi: 10.1016/j.drugalcdep.2019.107646.

27. De Andrade SC, Barros MBA, Carandina L, Goldbaum M, Cesar CLG, Fisberg RM. Dietary quality index and associated factors among adolescents of the state of São Paulo, Brazil. J Pediatr. 2010 [acesso em 2020 Dec 14]; 156(3):456-60. doi: 10.1016/j.jpeds.2009.09.066.

28. Oliveira RR, Peter NB, Muniz LC. Consumo alimentar segundo grau de processamento entre adolescentes da zona rural de um município do sul do Brasil. Ciên Saúde Colet. 2021; 26(3):1105-1114.

29. Gonsalez PS, Retondario A, Bricarello LP, González-Chica DA, Silva DAS, Vasconcelos FAG. Exclusive breastfeeding, complementary feeding and association with body fat excess among schoolchildren in Florianópolis, Santa Catarina, Brazil. Rev. Bras. Saude Mater. Infant (Online). 2017 [cited 2020 Nov 07];17(1):115-125. doi: 10.1590/1806-93042017000100007.