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Diet quality of adolescent students at State Technical Schools of São Paulo

Qualidade da dieta de adolescentes estudantes das Escolas Técnicas Estaduais de São Paulo

Abstract

Objective: To identify the diet quality and associated factors of adolescent students from public school system in accordance with the Dietary Guidelines for the Brazilian Population. **Methods:** The research sample was determined by simple random sampling procedures. An electronic questionnaire was administered containing questions to assess diet quality and sociodemographic characteristics: age, sex, skin color, family income, and maternal education. Diet quality was assessed using the diet quality scale (ESQUADA), with scores categorized as "very poor," "poor," "good," "very good," and "excellent" to evaluate the association with sociodemographic data using the chi-square test and correspondence analysis. A significance level of 95% was adopted. **Results:** A total of 733 adolescents participated in the study, 55.25% of whom were girls, with a mean age of 16 years old. The majority (79%) had a 'good' diet quality. 'Very good' and 'poor' diet quality were observed in 8% and 13%, respectively. A correspondence was observed between better diet quality and male adolescents who were older and had higher income. **Conclusion:** It was possible to assess the public school adolescents' diet quality by describing their food intake and eating habits in accordance with the Guide. The findings are fundamental for the planning and implementation of food and nutrition public policies aimed at this population.

Keywords: Adolescent. Diet. High school.

Resumo

Objetivo: Identificar a qualidade da dieta e fatores associados de adolescentes estudantes da rede pública de ensino em coerência com as recomendações do Guia Alimentar para a População Brasileira. **Métodos:** A amostra da pesquisa foi determinada por procedimentos de amostragem aleatória simples. O questionário eletrônico foi aplicado contendo questões para avaliação da qualidade da dieta e das características sociodemográficas: idade, sexo, cor da pele, renda familiar e escolaridade materna. A qualidade da dieta foi avaliada com aplicação da escala de qualidade da dieta (ESQUADA), sendo os escores categorizados em 'muito ruim', 'ruim', 'boa', 'muito boa' e 'excelente' para avaliação da associação com os dados sociodemográficos usando o teste de qui-quadrado e análise de

correspondência. Foi adotado um nível de significância de 95%. **Resultados:** Participaram do estudo 733 adolescentes, sendo 55,25% meninas, com idade média de 16 anos. A maioria (79%) apresentou qualidade da dieta 'boa'. A qualidade da dieta 'muito boa' e 'ruim' foram observadas em 8% e 13%, respectivamente. Foi observada uma correspondência entre a melhor qualidade da dieta e adolescentes do sexo masculino, mais velhos e com maior renda. **Conclusão:** Foi possível conhecer a qualidade da dieta dos adolescentes estudantes da rede pública descrevendo o consumo de alimentos e também as práticas alimentares em coerência com o Guia. Os achados são fundamentais para o planejamento e a execução de políticas públicas em alimentação e nutrição direcionadas para esse público.

Palavras-chave: Adolescente. Dieta. Ensino Médio.

INTRODUCTION

For decades, the individuals' diet quality has been assessed based on nutritional content, including caloric value, macronutrients, micronutrients, and bioactive compounds present in the foods consumed.¹ This entirely nutrient-centered view has changed based on scientific evidence and also on the Dietary Guidelines for the Brazilian Population (GAPB), which emphasizes how foods are produced and processed, as well as how dietary patterns are determinants of health, well-being, and sustainability.² The GAPB therefore exemplifies a new paradigm adoption for nutrition science³ in national dietary guidelines. However, research results in terms of the consumption of isolated food groups, without considering the diet in all its complexity, have proven insufficient to explain the main outcomes in the Public Health Nutrition area, due to the synergistic effects of health-related foods.^{4,6}

Although the term diet quality is generic and there is no single definition, according to the GAPB, to obtain an adequate, healthy, and sustainable diet, that is, to have a better diet quality, it is recommended to prioritize the choice of in natura or minimally processed foods,^{2,7,8} preferably locally grown, to reduce processed foods, and avoid ultra-processed foods (AUP).^{2,7}

Currently, AUP account for 26.7% of the total calories consumed by adolescents;⁹ however, as recent Brazilian food surveys have pointed to an increase in AUP intake and a decrease in in natura and minimally processed foods in the adolescents' diet,¹⁰ this prevalence is likely to increase in the near future.

Considering the association between food intake and harmful health outcomes, AUP have been considered effective predictors of the population's diet quality.^{5,11-17} The dietary share of AUP has been inversely associated with healthy eating patterns with higher sources of proteins, vitamins, elements, and dietary fiber and less free sugars, and directly associated with unhealthy eating patterns that include foods with higher levels of total, saturated, and trans fats and less dietary fiber.¹⁶ Higher consumption of AUP has been shown to be a good marker of poorer diet quality,^{15,18-20} and its association with chronic noncommunicable diseases is increasingly elucidated in the literature.^{11-14,17}

Sociodemographic inequalities are also associated with diet quality. With increased family income, there is a decrease in the total caloric intake of in natura or minimally processed foods and processed culinary ingredients and an increase in processed foods and AUP.²¹ In terms of age, adolescents reported consuming fewer in natura foods, such as fruits and vegetables, and, on the other hand, higher consumption of AUP, such as instant noodles, cookies, sausages, candies, and sweetened beverages, compared to adults and the elderly.²¹

In addition to food intake, a broader assessment of diet quality should also consider eating habits. According to PeNSE 2019 (National School Health Survey), approximately 60% of adolescents reported having breakfast and almost 70% reported having lunch or dinner with their parents five or more days a week, while about 6% reported eating at fast food restaurants three or more days a week.²² In this sense, the diet quality scale (ESQUADA) is a tool that allows for a broader assessment of food intake and eating habits in line with GAPB.²⁰

Recognizing the growing trend in the AUP intake and the poor eating habits adoption in adolescence, it is prudent to assess the diet quality at this stage. Conducting this assessment in technical schools is strategic for promoting and monitoring health and nutrition among adolescents, considering that this environment contributes to the formation of healthy eating habits, promotes food and nutritional security, and is part of their routine. The objective of this study was to identify the diet quality and associated factors of adolescent students from the public school system in accordance with the GAPB.

METHODS

Study design and population

A cross-sectional study was conducted with data collection from April to September 2022. The population considered for the study corresponds to adolescents, students from state technical schools (Etecs) in São Paulo state, of both genders and aged between 14 and 19 years old. The Etecs were selected as the field of study due to a previous

request by management to assess the students' diet quality and because they are an environment conducive to the development of actions to promote adequate and healthy eating. Thus, the sampling unit of the study corresponds to a student with the characteristics described. The sampling considered a two-stage cluster design. In the first stage, clusters (Etecs units) were systematically selected, with probability proportional to size and random start, considering the number of students enrolled in Etecs to determine the size measure for selection. In the second stage, a fixed number of students were selected in each selected Etec, respecting the proportion between boys and girls. The teacher responsible for each class in each selected Etec randomly selected the students, following the guidelines sent to the management of each Etec regarding the total number of students and each gender.

For the sample selection in both stages, information from 223 Etecs throughout the state was considered, which registered a total of 113,570 enrolled students.

The sample size was determined by simple random sampling and finite population, considering the population size, proportion of favorable results (value 0.50), critical value corresponding to a 95% confidence level (1.96), and margin of error of the population proportion (0.05). The sample was adjusted considering a 25% non-response rate and then adjusted for the design effect when considering the clusters, adopting a value of 3.0 as a measure of homogeneity. Thus, the proposed cluster design selected 30 Etecs in the first stage and 51 students from each selected unit, totaling 1,530 participants.

Although all selected Etecs were invited to participate through an official document sent to the administration and telephone contact with the administration and/or pedagogical coordination, 19 of the 30 selected participated in the study. Non-participation was motivated by lack of time and work accumulation during the pandemic period, with many employees absent for health reasons. In addition, there were losses due to student refusals ($n = 21$) and age over 19 years old ($n = 2$). Given this scenario, the simple random sample was calculated, obtaining a sample of 383 participants. Thus, data collection was completed with a final sample of 733 students without prejudice to representativeness, according to the simple random sample.

Study variables

Under the classroom teachers' supervision, who had previously been instructed on how to administer the instrument through official correspondence, students individually responded to an electronic questionnaire that included questions about diet quality and sociodemographic information. To assess diet quality, ESQUADA was used, a validated scale based on Item Response Theory (TRI),^{20,23} with evidence of association with nutritional status,^{24,25} perceived stress,²⁵ and markers of healthy and unhealthy eating.²⁶ ESQUADA contains 25 items referenced in the GAPB, covering the consumption of *in natura*, minimally processed, and AUP foods and eating practices (such as having breakfast, cooking, and replacing meals with snacks).²⁰

Diet quality scores were calculated using the TRI²⁷ gradual response model in RStudio software for Windows (R-tools Technology Inc.), version 4.2, using the mirt and mirt CAT statistical packages. For the calculation, parameters 'a' and 'd' of the items calibrated in the construction of the scale by Santos et al.²⁰ were considered. The scores were generated on a scale (0.1), i.e., with a mean of zero and a standard deviation of one, and categorized into five levels of diet quality: 'very poor', 'poor', 'good', 'very good', and 'excellent'.²⁰ In this study, the scores were classified into three categories: 'poor' (scores less than or equal to -1), 'good' (scores greater than -1 and less than or equal to 0.5) and 'very good' (scores greater than 0.5 and less than or equal to 2.5) due to the small number of participants in the 'very poor' level (grouped in the 'poor' category) and no adolescents with an 'excellent' level (scores greater than 2.5) of diet quality.

Sociodemographic information included gender (male and female), age group (in full years: 14 to 15, 16, and 17 to 19), skin color (subsequently categorized as white or yellow/brown/black), maternal education (number of years of

schooling completed by the mother, subsequently categorized as <8, 9 to 11, and ≥ 12) and monthly family income (subsequently categorized as: up to R\$1,908, R\$1,908 to R\$5,724, and above R\$5,724).

Data analysis

The variables were presented as absolute and relative frequencies, and the chi-square test was used to verify possible associations. Correspondence analysis was performed to explore associations among the different categories of variables. All analyses were performed using SPSS (Statistical Package for the Social Sciences), version 17.0, with statistical significance confirmed when $p < 0.05$.

Ethical aspects

The research was authorized by the Centro Paula Souza, the institution that administers Etecs in São Paulo state. The study was approved by the Ethics Committee of the Public Health School at the University of São Paulo (number: 5.113.568, CAAE: 51031121.9.0000.5421). First, the Free and Informed Consent Form was sent to the students' parents and, after consent was given, the Free and Informed Consent Form was signed by the students.

RESULTS

The sociodemographic characteristics and diet quality of these adolescents are presented in Table 1. Among the 733 adolescents who participated in the study, 328 were boys (44.75%) and 405 were girls (55.25%), with a mean age of 16.16 years old (standard deviation = 0.92). Most adolescents were white (62.76%), aged 17 to 19 years old (39.84%), and had a monthly family income of up to R\$5,724 (78.8%). Regarding maternal education, approximately half of the adolescents had mothers with 9 to 11 years of schooling (46.9%) and a quarter had mothers with 12 or more years of schooling (25.4%). According to the diet quality classification, 79% of adolescents had a "good" diet quality (Table 1), and this variable was not associated with any other sociodemographic variable (Table 2).

Table 1. Distribution according to sociodemographic variables and diet quality of adolescent students at Etecs (n = 733).
São Paulo, Brazil, 2022.

Characteristics	N	%
<i>Gender</i>		
Female	405	55.3
Male	328	44.7
<i>Age (years old)</i>		
14 e 15	202	27.6
16	239	32.6
17 a 19	292	39.8
<i>Skin color</i>		
White	460	62.8
Yellow/brown/black	273	37.2
<i>Monthly family income (R\$)</i>		
Up to 1,908	116	15.8
1,908 to 5,724	462	63.0
Above 5,724	155	21.2
<i>Maternal education (in years)</i>		
≤ 8 (less than high school)	155	21.1
9 to 11 (completed high school or incomplete graduation degree)	344	46.9
≥ 12 (completed graduation degree)	186	25.4
No response	48	6.6
<i>Diet quality</i>		
Poor ¹	95	13.0
Good	579	79.0
Very good	59	8.0

¹Poor = 'poor' or 'very poor' diet quality.

Source: Prepared by the authors.

Table 2. Associations among diet quality measured by the Diet Quality Scale and sociodemographic variables (age, gender, skin color, income and maternal schooling) of adolescents. São Paulo, Brazil, 2022.

Variables	Diet quality				p-value*
	Poor ¹ % n = 95	Good % n = 579	Very good % n = 59	Total % n = 733	
<i>Age (year sold)</i>					
14 and 15	36.8 (35)	26.3 (152)	25.4 (15)	27.6 (202)	0.13
16	23.2 (22)	33.5 (194)	39.0 (23)	32.6 (239)	
17 to 19	40.0 (38)	40.2 (233)	35.6 (21)	39.8 (292)	
<i>Total</i>	100	100	100	100	
<i>Gender</i>					
Female	60.0 (57)	55.4 (321)	45.8 (27)	55.3 (405)	0.22
Male	40.0 (38)	44.6 (258)	54.2 (32)	44.7 (328)	
<i>Total</i>	100	100	100	100	
<i>Skin color</i>					
White	58.9 (56)	62.9 (364)	67.8 (40)	62.8 (460)	0.54
Yellow/brown/black	41.1 (39)	37.1 (215)	32.2 (19)	37.2 (273)	
<i>Total</i>	100	100	67.8 (40)	62.8 (460)	
<i>Monthly Family income (R\$)</i>					
Up to 1,908	15.7 (15)	15.5 (90)	18.7 (11)	15.9 (116)	0.96
1,908 to 5,724	61.1 (58)	63.6 (368)	61.0 (36)	63.0 (462)	
Above 5,724	23.2 (22)	20.9 (121)	20.3 (12)	21.1 (155)	
<i>Total</i>	100	100	100	100	
<i>Maternal education (in years)</i>					
Up to 8	17.9 (17)	21.7 (126)	20.3 (12)	21.1 (155)	0.96
9 to 11	45.3 (43)	47.0 (272)	49.2 (29)	46.9 (344)	
≥12	26.3 (25)	25.4 (147)	23.7 (14)	25.4 (186)	
No response	10.5 (10)	5.9 (34)	6.8 (4)	6.6 (48)	
<i>Total</i>	100	100	100	100	

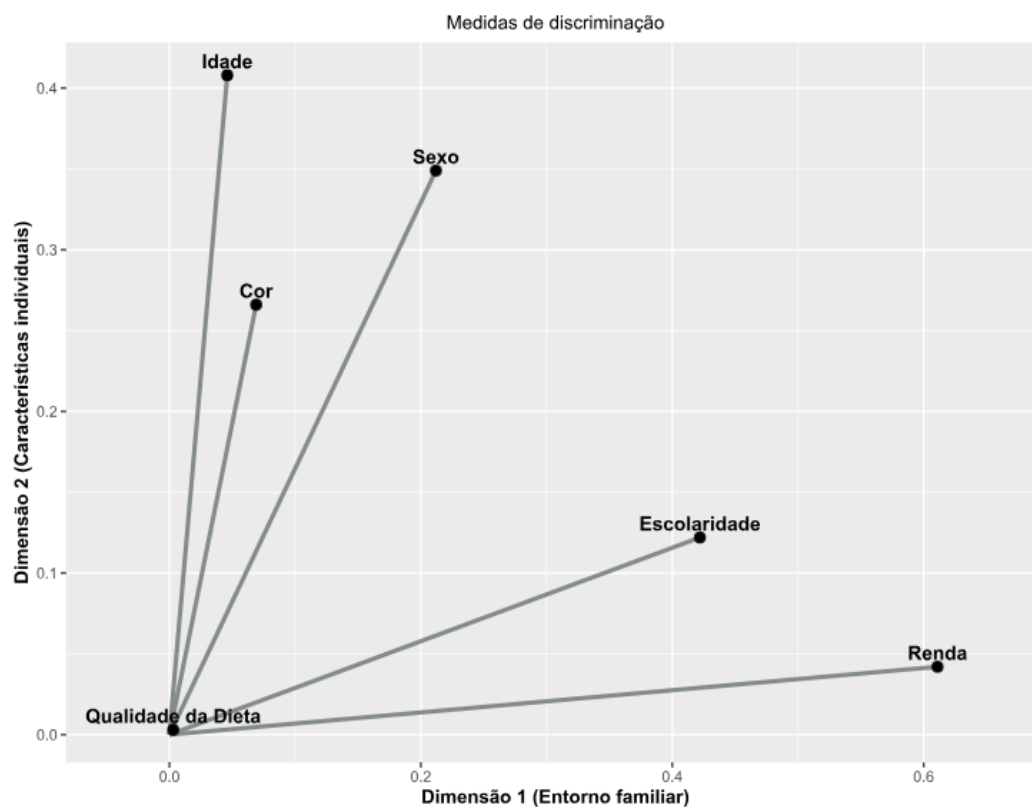
¹Poor = 'poor' or 'very poor' diet quality.

*p-value corresponding to the Chi-squared test

Source: Prepared by the authors.

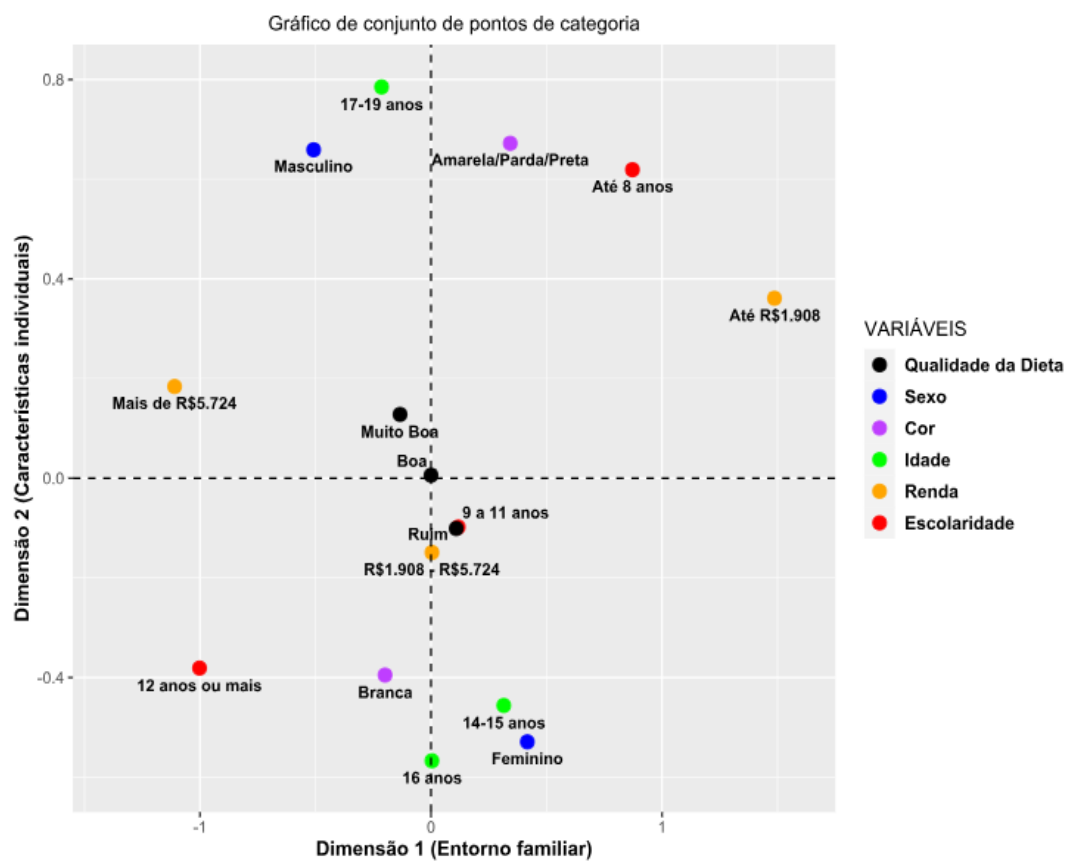
Although no statistically significant association was found, a multiple correspondence analysis was performed on an exploratory basis to identify some demographic characteristics related to a specific group of diet quality. In Figure 1, two dimensions were clearly identified: dimension 1, called "family environment," which is determined by the variables family income and maternal education, and dimension 2, called "individual characteristics," which is determined by the variables gender, skin color, and age. In Figure 2, a weak association was observed between "very good" diet quality with males aged 17 years old or older and with a family income greater than R\$5,724; on the other hand, "poor" diet quality was slightly associated with female students aged 14 to 15 years old whose mothers had 9 to 11 years of schooling. However, the 'good' diet quality did not show a specific association with any characteristic, since 79% of students were at this level of the ESQUADA; that is, it is expected to group a diversity of demographic characteristics without highlighting any specific one. These results suggest a correspondence among better diet quality and male gender, older age, and higher income; and among poorer diet quality and female gender, younger age, and intermediate maternal education.

Figure 1. Description of dimensionality in correspondence analysis.



Source: Prepared by the authors.

Figure 2. Percentage map of the correspondence analysis.



Source: Prepared by the authors.

DISCUSSION

The results of this study showed that most adolescent students at Etecs have a “good” diet quality. However, 13% of them reported AUP intake and replacing meals with snacks, with in natura and minimally processed foods rarely present in their usual diet (“poor” diet quality). The study of the association between diet quality and sociodemographic information was not statistically significant, but it suggested a correlation among better diet quality and male gender, older age (17 years old or older), and higher income (R\$5,724 or more), and among poorer diet quality and female gender, younger age (14 to 15 years old), and higher maternal education.

There are still few studies that have applied ESQUADA to assess diet quality. This is the first study in which ESQUADA has been applied to the adolescent population, although it was developed for adolescents and adults, making it difficult to discuss the results under the same nutrition science paradigm according to the GAPB and the same measurement approach using TRI to generate diet quality scores. However, it is possible to observe results on the adolescents’ diet quality using a classical statistical approach to calculate scores (Classical Test Theory), as in the studies by Wendpap et al.²⁸ and Castilhos et al.,²⁹ which only allows similarities to be found in the findings, but not their comparison.

No significant association was found among the diet quality variable and the variables gender and skin color in this study, but the results suggest a correlation between female gender and “poor” diet quality, corroborating some other studies. When analyzing the eating behavior of PeNSE participants in 2009, 2012, and 2015, Haddad & Sarti³⁰ found that the highest unhealthy foods intake was observed among female adolescents, and that those who reported having white/yellow skin color tended to consume unhealthy food groups less frequently.

Although the study did not find a significant association, a correlation was observed between a “very good” diet quality and higher family income and a “poor” diet quality and higher maternal education, and other studies confirm this association. According to PeNSE (2015), adherence to unhealthy eating patterns was positively associated with adolescents whose mothers had at least completed elementary school, corroborating the findings of Castilhos et al.²⁹ who observed that diet quality decreases as the head of household's education level increases and that diet quality was significantly lower for adolescents in the highest asset quintile. These results are similar to data from the 2017-18 Family Budget Survey (POF), which showed that per capita processed foods and AUP intake was also higher in the highest income category.⁹

One in eight adolescents at Etecs had a “poor” diet quality; therefore, they consume AUP and replace meals with snacks up to two days a week, and fruits and vegetables are present less than one day a week, meaning that these in natura foods are not part of their usual diet.²⁰ This finding is higher than that found in two studies that applied ESQUADA to adults, with 9.9% of participants from the five regions of Brazil³¹ and 3.9% of those from Piauí³² having a ‘poor’ and/or ‘very poor’ diet quality. Therefore, it is clear that this level of diet quality, in which AUP foods are more prevalent than in natura and minimally processed foods, is more common among adolescents, representing a warning sign for this stage of life. Research results that analyzed the percentage of AUP in the diet reverberated this characteristic. It is concerning to recognize that adolescents consume fruits and vegetables less frequently and AUP more frequently (26.7% of total calories) when compared to the adult (19.5%) and elderly (15.1%) populations.⁹

Among the most commonly consumed AUP by adolescents are: sweet and savory cookies, candies, breads, sweetened beverages, snacks, and processed meats, according to studies ERICA (2013-2014), ISA-Capital (Health Survey in São Paulo city, 2015), and PeNSE (2019) and a systematic review.^{13,29,33,34} It is believed that the increase in the AUP intake by adolescents can be justified by convenience, practicality,

hyperpalatability, and low cost.^{11,12} Most of the time, they are sold as snacks, beverages, or ready-to-eat or semi-ready-to-eat meals and are commonly chosen to replace traditional meals, in addition to being promoted by aggressive marketing strategies. According to Louzada et al.,^{11,12} these products are easily associated with eating patterns that induce excessive and “unnoticed” calorie consumption, in addition to replacing meals based on “in natura” foods. The majority (79%) of adolescents in the present study had a “good” diet quality, a level at which adolescents replace meals with snacks and consume sweetened beverages, oats, rye, quinoa, nuts, and whole rice/pasta less than one day a week; do not consume some AUP; consume fruits and vegetables one to four days a week; and have breakfast at least one day a week, according to the ESQUADA description.²⁰ In other words, these adolescents have both healthy and unhealthy eating habits. Although in natura and minimally processed foods intake is observed, AUP are present in the usual diet of adolescents from Etecs with ‘poor’ and ‘good’ diet quality.

As the electronic questionnaire was administered during the COVID-19 pandemic, it is possible that some associations were not found because adolescents were under parental supervision, i.e., their food choices were not directly related to them, and as pointed out by some studies, eating habits changed during this period. When assessing changes in the dietary trends of adolescents during the period of social distancing resulting from the pandemic, Malta et al.³⁵ found that there was an increase in the regular vegetables intake and a reduction in packaged snacks intake among Brazilian adolescents aged 12 to 17 years old; however, among those aged 16 to 17 years old, there was an increase in the consumption of frozen meals, chocolate, candy, and packaged snacks. Among adolescents in Italy, Spain, Chile, Colombia, and Brazil, Ruiz-Roso et al.³⁶ found a significant increase in legumes, vegetables, and fruits intake and a reduction in fast food among adolescents (average age 15 years); however, the average intake of fried foods and sweets increased significantly during this period of confinement. It is interesting to note that during isolation, some families sought to prepare their meals at home, using more in natura and minimally processed foods,³⁶ thus providing their families with a better chance of having a higher-quality diet; on the other hand, some took the opportunity to buy frozen ready meals³⁵ or order ready-made meals prepared with AUP through mobile apps.³⁷

Since diet is a potential risk factor for chronic noncommunicable diseases, which are the leading cause of death worldwide,⁵ it is important to routinely assess the adolescents' quality diet. Furthermore, eating habits established during adolescence tend to continue into adulthood, reinforcing the importance of monitoring during this phase. Through this diagnosis, it is possible to plan food and nutrition education actions at schools, in accordance with the guidelines of the Health at Schools Program (Programa Saúde na Escola)³⁸ and the National School Feeding Program (Programa Nacional de Alimentação Escolar),³⁹ to be included in the public policies agenda aimed at reducing the prevalence of these diseases, which pose a serious threat to health systems.

Verly Jr. et al.⁴⁰ showed that it is possible to reduce the calorie supply from AUP without increasing the cost of the diet, which leads to an increase in diet quality. These results validate the principles of GAPB and the recent FAO (Food and Agriculture Organization) report,¹⁸ in which the reduction of AUP is a strategy to improve diet quality and promote health. A systematic review revealed that a higher quality diet and healthy eating patterns or behaviors are associated with better health-related quality of life in adolescents, including physical, school and emotional functioning, as well as physical and emotional quality of life.⁸

Despite the interesting results, some of the study's limiting factors need to be discussed. These include the nature of the cross-sectional study, which does not allow causal relationships to be established; the lower adherence to the expected, which may reflect changes in work processes and participation in classes during social isolation, although it did not impact on the significant sample value; the use of a self-reported

questionnaire, which may not reflect the participants' real eating practices, especially when answered at a delicate time such as the pandemic; and the difficulty of comparing its results with the literature, which uses a different methodological approach to measuring diet quality, which may directly influence the findings and conclusions.

Among the strengths, it is worth highlighting the assessment of the adolescent students' diet quality at the Etecs, making it possible to produce scientific evidence on this scenario with a representative sample; and the use of an instrument to assess the diet quality based on a theory of measurement that produces more accurate scores.

CONCLUSION

The study made it possible to describe the food intake and eating practices of adolescents in line with the GAPB. The results contribute to the planning and implementation of actions to promote adequate and healthy eating for this public. It is necessary to prioritize this agenda in order to reduce AUP intake and promote healthier eating practices, and more comprehensive recognition of the factors associated with diet quality can provide important guidelines for food and nutrition education actions

REFERENCES

1. Morais DDC, Moraes LFDS, Silva DCGD, Pinto CA, Novaes JFD. Aspectos metodológicos da avaliação da qualidade da dieta no Brasil: revisão sistemática. *Ciênc Saúde Coletiva*. 2017;22(8):2671–80. <https://doi.org/10.1590/1413-812320172228.23502015>
2. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Guia alimentar para a população brasileira / Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento de Atenção Básica. 2. ed. Brasília: Ministério da Saúde; 2014.
3. Cannon G, Leitzmann C. Food and nutrition science: the new paradigm. *Asia Pac J Clin Nutr*. 2022;31(1):1-15. [https://doi.org/10.6133/apjcn.202203_31\(1\).0001](https://doi.org/10.6133/apjcn.202203_31(1).0001)
4. Maia EG, Silva LES da, Santos MAS, Barufaldi LA, Silva SU da, Claro RM. Padrões alimentares, características sociodemográficas e comportamentais entre adolescentes brasileiros. *Rev Bras Epidemiol*. 2018;21(suppl 1):e180009. <https://doi.org/10.1590/1980-549720180009.supl.1>
5. Chen X, Zhang Z, Yang H, Qiu P, Wang H, Wang F, et al. Consumption of ultra-processed foods and health outcomes: a systematic review of epidemiological studies. *Nutr J*. 2020;19(1):86. <https://doi.org/10.1186/s12937-020-00604-1>
6. Ronca DB, Blume CA, Cureau FV, Camey SA, Leotti VB, Drehmer M, Schaan BD, Carvalho KMB. Diet quality index for Brazilian adolescents: the ERICA study. *European Journal of Nutrition*. 2020;59:539–56. <https://doi.org/10.1007/s00394-019-01923-8>
7. Alkerwi A. Diet quality concept. *Nutrition*. 2014;30(6):613–8. <https://doi.org/10.1016/j.nut.2013.10.001>
8. Wu XY, Zhuang LH, Li W, Guo HW, Zhang JH, Zhao YK, et al. The influence of diet quality and dietary behavior on health-related quality of life in the general population of children and adolescents: a systematic review and meta-analysis. *Qual Life Res*. 2019;28(8):1989–2015. <https://doi.org/10.1007/s11136-019-02162-4>

9. Brasil. Instituto Brasileiro de Geografia e Estatística. Pesquisa de Orçamentos Familiares 2017- 2018: avaliação nutricional da disponibilidade domiciliar de alimentos no Brasil. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística; 2020.
10. Rodrigues RM, Souza A de M, Bezerra IN, Pereira RA, Yokoo EM, Sichieri R. Evolução dos alimentos mais consumidos no Brasil entre 2008-2009 e 2017-2018. *Rev Saúde Pública*. 2021;55(Supl.1):1–10. <https://doi.org/10.11606/s1518-8787.2021055003406>
11. Louzada ML da C, Baraldi LG, Steele EM, Martins APB, Canella DS, Moubarac JC, et al. Consumption of ultra-processed foods and obesity in Brazilian adolescents and adults. *Prev Med*. 2015;81:9–15. <https://doi.org/10.1016/j.ypmed.2015.07.018>
12. Louzada ML da C, Costa C dos S, Souza TN, Cruz GL da, Levy RB, Monteiro CA. Impacto do consumo de alimentos ultraprocessados na saúde de crianças, adolescentes e adultos: revisão de escopo. *Cad Saúde Pública*. 2021;37(suppl 1):e00323020. <https://doi.org/10.1590/0102-311x00323020>
13. Costa CS, Del-Ponte B, Assunção MCF, Santos IS. Consumption of ultra-processed foods and body fat during childhood and adolescence: a systematic review. *Public Health Nutrition*. 2017; 21(1):148–59. <https://doi.org/10.1017/S1368980017001331>
14. Poti JM, Braga B, Qin B. Ultra-processed Food Intake and Obesity: What Really Matters for Health – Processing or Nutrient Content? *Curr Obes Rep*. 2017;6(4):420–31. <https://doi.org/10.1007/s13679-017-0285-4>
15. Cunha DB, da Costa THM, da Veiga GV, Pereira RA, Sichieri R. Ultra-processed food consumption and adiposity trajectories in a Brazilian cohort of adolescents: ELANA study. *Nutr Diabetes*. 2018;8(1):28. <https://doi.org/10.1038/s41387-018-0043-z>
16. Louzada ML da C, Ricardo CZ, Steele EM, Levy RB, Cannon G, Monteiro CA. The share of ultra-processed foods determines the overall nutritional quality of diets in Brazil. *Public Health Nutr*. 2018;21(1):94–102. <https://doi.org/10.1017/S1368980017001434>
17. 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*. 2021;22(3). <https://doi.org/10.1111/obr.13146>
18. Monteiro CA, Cannon G, Lawrence M, Costa Louzada ML, Pereira Machado P. Ultra-processed foods, diet quality, and health using the NOVA classification system. Rome, Food and Agriculture Organization (FAO); 2019.
19. Vandevijvere S, De Ridder K, Fiolet T, Bel S, Tafforeau J. Consumption of ultra-processed food products and diet quality among children, adolescents and adults in Belgium. *Eur J Nutr*. 2019;58(8):3267–78. <https://doi.org/10.1007/s00394-018-1870-3>
20. Santos TSS, Araújo PHM, Andrade DF, Louzada MLC, Assis MAA, Slater B. Duas evidências de validade da ESQUADA e níveis de qualidade da dieta dos brasileiros. *Rev Saude Publica*. 2021;55:39. <https://doi.org/10.11606/s1518-8787.2021055002397>
21. Brasil. Instituto Brasileiro de Geografia e Estatística. Pesquisa de Orçamentos Familiares 2017- 2018: análise do consumo alimentar no Brasil. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística; 2020.
22. Instituto Brasileiro de Geografia e Estatística. Pesquisa nacional de saúde do escolar: 2019. Rio de Janeiro: IBGE, 2021.

23. Santos TSS, Sato PM, Carriero MR, Lopes CP, Segura IE, Scagliusi FB, Assis MAAA, Villar BS. Qualitative and quantitative analysis of the relevance, clarity, and comprehensibility of the Scale of Quality of Diet (ESQUADA). *Arch Latinoamer Nutr*. 2018;68:4. <https://doi.org/10.37527/2018.68.4.003>
24. Costa e Silva DM, Santos TSS, Conde WL, Slater B. Estado nutricional e risco metabólico em adultos: associação com a qualidade da dieta medida pela ESQUADA. *Ver Bras Epidemiol*. 2021;24:E210019. <https://doi.org/10.1590/1980-549720210019>
25. Galvão LLP, Santos TSS, Slater B, Lyra CO, Rolim PM, Ramalho AA, et al. Diet quality and associated factors in Brazilian undergraduates during the COVID-19 pandemic. *Front Nutr*. 2023;10:1169147. <https://doi.org/10.3389/fnut.2023.1169147>
26. Costa e Silva DM, Santos TSS, Slater B. ESQUADA e sua correlação com os marcadores de alimentação em inquérito de saúde: evidências de validade. *Rev Contexto & Saúde*. 2024;24:48. <https://doi.org/10.21527/2176-7114.2024.48.14141>
27. Samejima FA. Estimation of latent ability using a response pattern of graded scores. *Psychometrika*. 1969;34:1-97.
28. Wendpap LL, Ferreira MG, Rodrigues PRM, Pereira RA, Loureiro A da S, Gonçalves-Silva RMV. Qualidade da dieta de adolescentes e fatores associados. *Cad Saúde Pública*. 2014;30(1):97-106. <https://doi.org/10.1590/0102-311X00082412>
29. Castilhos CB de, Schneider BC, Muniz LC, Assunção MCF. 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 Coletiva*. 2015;20(11):3309-18. <https://doi.org/10.1590/1413-812320152011.17822014>
30. Haddad MR, Sarti FM. Sociodemographic determinants of health behaviors among Brazilian adolescents: Trends in physical activity and food consumption, 2009-2015. *Appetite*. 2020;144:104454. <https://doi.org/10.1016/j.appet.2019.104454>
31. Maciel BLL, Lyra C de O, Gomes JRC, Rolim PM, Gorgulho BM, Nogueira PS, et al. Food Insecurity and Associated Factors in Brazilian Undergraduates during the COVID-19 Pandemic. *Nutrients*. 2022;14(2):358. <https://doi.org/10.3390/nu14020358>
32. Silva DMC, Santos TSS, Conde WL, Slater B. Estado nutricional e risco metabólico em adultos: associação com a qualidade da dieta medida pela ESQUADA. *Ver Bras Epidemiol*. 2021;24:e210019. <https://doi.org/10.1590/1980-549720210019>
33. Rocha LL, Gratão LHA, Carmo AS do, Costa ABP, Cunha C de F, Oliveira TRPR de, Mendes LL. School Type, Eating Habits, and Screen Time are Associated With Ultra-Processed Food Consumption Among Brazilian Adolescents. *J Acad Nutr Diet*. 2021;121(6):1136-42. <https://doi.org/10.1016/j.jand.2020.12.010>
34. Lopes T dos S, Mello AV de, Nogueira LR, Leme ACB, Fisberg RM. Energy, nutrients and food sources in snacks for adolescents and young adults. *Rev Paul Pediatr*. 2022;40:e2020148. <https://doi.org/10.1590/1984-0462/2022/40/2020148>
35. Malta DC, Gomes CS, Barros MB de A, Lima MG, Silva AG da, Cardoso LS de M, et al. The COVID-19 pandemic and changes in the lifestyles of Brazilian adolescents. *Rev Bras Epidemiol*. 2021;24:e210012. <https://doi.org/10.1590/1980-549720210012>

36. Ruiz-Roso MB, de Carvalho Padilha P, Mantilla-Escalante DC, Ulloa N, Brun P, Acevedo-Correa D, et al. Covid-19 Confinement and Changes of Adolescent's Dietary Trends in Italy, Spain, Chile, Colombia and Brazil. *Nutrients*. 2020;12(6):1807. <https://doi.org/10.3390/nu12061807>
37. Botelho LV, Cardoso LDO, Canella DS. COVID-19 e ambiente alimentar digital no Brasil: reflexões sobre a influência da pandemia no uso de aplicativos de delivery de comida. *Cad Saúde Pública*. 2020;36(11):e00148020. <https://doi.org/10.1590/0102-311x00148020>
38. Ministério da Saúde (BR), Gabinete do Ministro. Portaria Interministerial nº 1.055, de 25 de abril de 2017. Redefine as regras e os critérios para adesão ao Programa Saúde na Escola - PSE por estados, Distrito Federal e municípios e dispõe sobre o respectivo incentivo financeiro para custeio de ações. *Diário Oficial União*. 26 abr 2017; Seção 1:36.
39. Brasil. Resolução nº 06, de 08 de maio de 2020. Dispõe sobre o atendimento da alimentação escolar aos alunos da educação básica no âmbito do Programa Nacional de Alimentação Escolar – PNAE. *Diário Oficial da União*. 12 de mai 2020; Edição 89; Seção:1:38.
40. Verly-Jr E, Pereira A da S, Marques ES, Horta PM, Canella DS, Cunha DB. Reducing ultra-processed foods and increasing diet quality in affordable and culturally acceptable diets: a study case from Brazil using linear programming. *Br J Nutr*. 2021;126(4):572–81. <https://doi.org/10.1017/S0007114520004365>

Contributors

Previtali-Sampaio IC participated in the conception of the study design, data collection, analysis, and interpretation, writing, final review, and approval of the manuscript for submission; Santos TSS and Slater B participated in the conception of the study design, data analysis and interpretation, writing, final review, and approval of the manuscript for submission; Contreras CAH participated in the analysis and interpretation of data, writing, final review, and approval of the manuscript for submission.

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