

Changes of food consumption in adolescents during the COVID-19 pandemic according to socioeconomic status

Mudanças no consumo alimentar de adolescentes durante a pandemia de COVID-19 segundo o nível socioeconômico

Cambios en el consumo de alimentos por adolescentes durante la pandemia de COVID-19 según el nivel socioeconómico

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Abstract

The expansion of the COVID-19 pandemic in Brazil has further evidenced the discrepancy between different social realities of the country, and it may have also impacted eating practices, including those of adolescents. *Objective:* To evaluate the eating practices of Brazilian adolescents according to socioeconomic status, during the period of social isolation. *Method:* In this cross-sectional study, demographic, dietary and socioeconomic data were collected from 676 adolescents from all regions of Brazil through an online questionnaire. Associations between social strata and food pattern, food frequency, and changes in food consumption were analyzed by univariate and multivariable logistic regression models. *Results:* During the COVID-19 pandemic, adolescents in the upper-middle class were more likely to consume milk ($p < 0.001$), vegetables ($p = 0.004$), fruits ($p < 0.001$), and sweets. In contrast, adolescents from the working-lower classes were 53% less likely to eat regular lunch ($OR = 0.47$, $p < 0.001$) and 50% more likely to replace large meals by snacks ($OR = 1.50$, $p = 0.03$). When assessing the change in food consumption in this period, adolescents from the lower-lower classes were 1.5 to 2 times more likely to increase consumption of sugary drinks ($OR: 1.71$; $p = 0.003$), fried snacks ($OR: 1.73$, $p = 0.005$), and ultra-processed foods ($OR: 1.54$, $p = 0.02$) in comparison with the other social classes. *Conclusion:* These results suggest a higher risk of unhealthy food consumption among adolescents from lower social classes and can be used as a basis for policies to address the pandemic.

Keywords: Adolescent; COVID-19; Feeding behavior; Social class.

Resumo

A expansão da pandemia COVID-19 no Brasil evidenciou ainda mais a discrepância entre as realidades sociais do país, podendo também ter impactado as práticas alimentares, inclusive de adolescentes. *Objetivo:* avaliar as práticas alimentares de adolescentes brasileiros de acordo com o nível socioeconômico, durante o período de isolamento social. *Método:* Neste estudo transversal, foram coletados dados demográficos, dietéticos e socioeconômicos de 676 adolescentes de todas as regiões do Brasil por meio de um questionário online. As associações entre estratos sociais e

padrão alimentar, frequência alimentar e mudanças no consumo alimentar foram analisadas por modelos de regressão logística univariada e multivariável. *Resultados:* Durante a pandemia de COVID-19, adolescentes da classe média-alta eram mais propensos a consumir leite ($p < 0,001$), vegetais ($p = 0,004$), frutas ($p < 0,001$) e doces. Em contraste, os adolescentes das classes mais baixas tinham 53% menos probabilidade de realizar regularmente o almoço (OR = 0,47, $p < 0,001$) e 50% mais probabilidade de substituir grandes refeições por lanches (OR = 1,50, $p = 0,03$). Ao avaliar a mudança no consumo alimentar nesse período, os adolescentes de classe baixa tiveram 1,5 a 2 vezes mais chance de aumentar o consumo de bebidas açucaradas (OR = 1,71; $p = 0,003$), salgadinhos fritos (OR = 1,73, $p = 0,005$) e alimentos ultraprocessados (OR = 1,54, $p = 0,02$) em comparação com as demais classes sociais. *Conclusão:* Esses resultados sugerem maior risco de consumo de alimentos não saudáveis entre adolescentes de classes sociais mais baixas, servindo de base para políticas de enfrentamento da pandemia.

Palavras-chave: Adolescente; COVID-19; Comportamento alimentar; Classe Social.

Resumen

La expansión de la pandemia de COVID-19 en Brasil ha evidenciado aún más la discrepancia entre las diferentes realidades sociales brasileñas y puede haber afectado también las prácticas alimentarias, incluso de adolescentes. *Objetivo:* Evaluar la alimentación de adolescentes brasileños según su nivel socioeconómico durante el período de aislamiento social. *Método:* En este estudio transversal, se recogieron datos demográficos, alimentarios y socioeconómicos de 676 individuos de todo el país mediante un cuestionario virtual. Las asociaciones entre estratos sociales y patrón alimentario, frecuencia de alimentos y cambios en su consumo se analizaron por modelos de regresión logística univariada y multivariada. *Resultados:* Durante la pandemia, los adolescentes de clase media-alta eran más propensos a consumir leche ($p < 0,001$), verduras ($p = 0,004$), frutas ($p < 0,001$) y dulces. Por el contrario, los de clases trabajadoras más bajas eran un 53% menos propensos a almorzar regularmente (OR = 0,47, $p < 0,001$) y un 50% más propensos a sustituir almuerzos y cenas por tentempiés (OR = 1,50, $p = 0,03$). El cambio en el consumo de alimentos durante este periodo muestra que adolescentes de clases más bajas tenían entre 1,5 y 2 veces más probabilidades de consumir más bebidas azucaradas (OR = 1,71; $p = 0,003$), bocadillos fritos (OR = 1,73; $p = 0,005$) y alimentos ultraprocesados (OR = 1,54; $p = 0,02$) ante las demás clases. *Conclusión:* Estos resultados sugieren un mayor riesgo de que adolescentes de clases sociales más bajas consuman alimentos no saludables, lo que sirve de base a políticas de combate a la pandemia.

Palabras clave: Adolescente; COVID-19; Conducta alimentaria; Clase Social.

1. Introduction

The disease caused by the new coronavirus, SARS-Cov-2, was first discovered in China in December 2019 and has spread rapidly into a global pandemic (Wang, Horby, Hayden & Gao, 2020). With the exponential advance of the disease worldwide and the collapse of health services, several protective health measures have been recommended by the World Health Organization (WHO); the main one being social isolation, adopted in Brazil, in March 2020 (Teixeira et al., 2021).

However, during the stay-at-home orders, some families suffered from the imminent possibility of unemployment, reduced income, and uncertainty about the future, resulting in a reduction of their financial expenditures, which also impacted the quantity and quality of food (Scarmozzino & Visioli, 2020). At the same time, restriction measures—like closing schools—compromised the distribution of meals in public schools by the National School Food Program (PNAE), which probably contributed to the food insecurity of the more vulnerable adolescents (Amorim, Ribeiro & Bandoni, 2020).

In addition, families with limited financial resources have greater difficulty to acquire nutritionally healthy foods, exposing themselves to obesity-promoting foods with higher calorie density and lower micronutrient intake—ultra-processed foods (Barufaldi et al., 2016; Claro, Maia, Costa & Diniz, 2016). In addition, income restriction and the need for social isolation decreased the opportunity for physical activity and favored increased exposure to screens, which contributes to the development of excess body weight (Ruíz-Roso et al., 2020; Ammar et al., 2020 & SBP, 2020).

For at least a decade, national and international research portrays that adolescents, regardless of the pandemic, present inadequate eating habits characterized by insufficient intake of fruits and vegetables and high intake of ultra-processed foods (Barufaldi et al., 2016; IBGE, 2015 & Ruiz, Zuelch, Dimitratos & Scherr, 2019), which not only increases the chance of developing diseases such as overweight, obesity, diabetes, hypertension, and dyslipidemia, but also affects mental health, contributing to diseases such as depression and low self-esteem (Ruiz, Zuelch, Dimitratos & Scherr, 2019). It is believed that

the socioeconomic condition, which often became worse during the pandemic, may have worsened this dietary scenario.

Therefore, research became necessary to investigate whether the eating habits of adolescents were changed during the period of social isolation, especially among families with lower purchasing power, in order to assist in the promotion of public policies on food and health that can contribute to food security and prevention of chronic diseases in adulthood.

2. Methodology

2.1 Population and type of study

This is a cross-sectional study, with a non-probability sample of adolescents, aged between 10 and 18 years and 11 months, consisting of an anonymous electronic survey, also known as an e-survey or web survey. The inclusion criteria were the adolescent had no food restrictions. The online questionnaire was applied during stay-at-home recommendations in Brazil, between May and June 2020, in all regions of the country. The questionnaire included questions that assessed demographic, socioeconomic, and diet-related variables of Brazilian adolescents during the COVID-19 pandemic.

2.2 Ethical considerations

Participants were clarified that the collected data in the questionnaire was used for research purposes only. Participants' responses were kept confidential in accordance with Google's privacy policy (<https://policies.google.com/privacy?hl=en>). The adolescent provided an authorization to participate in the study, the signed Informed Consent Form, and the Free and Informed Consent Form digitally signed by one guardian, when necessary. As already described in the Informed Consent Form, any participant had the right to withdraw from participating in the research at any point. Survey responses were not saved until after submission. The study was approved by the National Research Ethics Committee, under n°. 30629420.7.0000.5285.

2.3 Dietary assessment

The evaluation of the adolescents' food consumption and dietary practices followed the same criteria of the National School Health Survey (PeNSE) (IBGE, 2015). The reported frequency of consumption, food groups or preparations consumed in the last seven days were sorted as follows: (1) milk and dairy products; (2) beans; (3) vegetables; (4) fresh salad and (5) fresh fruits (or natural, whole-grain or organic juices); (6) fries and/or fried snacks; (7) hamburger and/or sausage; (8) cookies and crackers; (9) sweets (candies, chocolates, gum, or lollipops); (10) soft drinks and (11) sugary drinks (industrialized juices, herb tea, other teas, coffee, flavored waters, isotonic, soy-based drinks, among others). The first five were considered healthy eating markers and the last six, unhealthy eating markers. To evaluate dietary practices according to SES, the frequencies of consumption were, for both food markers, 0 to 2 times a week, 3 to 4 times a week, and 5 or more times a week.

The performance of each meal and the substitution of lunch and/or dinner by unhealthy snacks (pizza, hot dog, hamburger and others) were measured by the weekly frequency in the last seven days preceding the study; the habit of eating breakfast on five or more days of the week was considered a healthy eating routine marker and the habit of replacing lunch and/or dinner by unhealthy snacks was an unhealthy eating routine marker. They were also asked about their perception of food, whether they considered it healthy or not.

2.4 Socioeconomic status

The socioeconomic status (SES) was classified according to the level of education of the head of the household, consumer goods, and specific rooms and services of the house proposed by the Classification Criteria of the Brazilian Association of Research Companies (ABEP, 2020). For the analyses of frequency of food intake, eating routines, and/or

change in food intake according to SES, adolescents were regrouped into high-middle and low-very low. Isolation status and frequencies of outside activities (academic or work-related) were also recorded. Families were classified as isolated when all family members carried out such activities in their household.

2.5 Statistical analysis

Descriptive data were presented as count and percentages (%) for categorical variables. Pearson's chi-square test was used to analyze the association between social economic status and sociodemographic, eating practices, and food frequency variables. To identify the factors associated with meal pattern, food frequency, and change in food intake during the period of social isolation, univariate and multivariate logistic regression models were used. The multivariate logistic regression model was adjusted by sex, age, and region of the country, considering SES as the base category. To construct the models, frequencies of dietary markers and meals were categorized into two classes: less than 5 times a week and 5 or more times a week (regular consumption). For healthy eating markers, the change in food consumption was categorized into 'decreased' and 'increased/no change,' and for unhealthy eating markers, the categorization was 'increased' and 'decreased/no change.' Statistical significance was set at $p < 0.05$. Data were stored in Microsoft Office Excel 2013 spreadsheets and analyses were conducted using R software version 4.0.2.

3. Results

The sample consisted of 676 Brazilian adolescents of which more than half were female (76.5%), of the high-middle SES (69.4%), and residents of the central-western, southeastern, or southern regions of the country (80.9%). There was no difference in the prevalence of families in social isolation by SES. When asked about food quality, half of the adolescents perceived their food choices as unhealthy, with the upper-middle class showing the lowest relative frequency ($p = 0.01$). Table 1 shows the sociodemographic and behavioral characteristics of the sample.

Table 1 - Descriptive characteristics of adolescents according to socioeconomic status. Brazil, 2020.

Variables	Total		High-Middle		Low-Very low		p-value*
	n = 676	%	n = 469	%	n = 207	%	
Age group (years)							0.14
<16	248	36.69	181	38.59	67	32.37	
>=16	428	63.31	28	61.41	140	67.63	
Sex							<0.001
Female	517	76.48	338	72.07	179	86.47	
Male	15	23.52	131	27.93	2	13.53	
Brazilian Regions							<0.001
N-NE	129	19.08	67	14.29	6	29.95	
S-SE-CW	54	80.92	402	85.71	145	70.05	
Social Isolation							0.35
Yes	330	48.82	235	50.11	95	45.89	
No	346	51.18	234	49.89	112	54.11	
Perception of Healthy Eating							0.01
Yes	341	50.44	253	53.94	88	42.51	
No	335	49.56	216	46.06	11	57.49	

N: North, NE: Northeast; SE: Southeast; S: South; CW: Central-West.

*Chi-square test

Source: Authors.

Regarding the pattern of meals eaten during the pandemic, most adolescents did not have a healthy eating routine: 54.6% of adolescents did not eat breakfast regularly (five or more times a week) (Table 2). However, when social classes were evaluated separately, the highest frequency among those who regularly ate breakfast was found in adolescents from high SES families ($p = 0.02$) when compared with the other socioeconomic classes (data not shown).

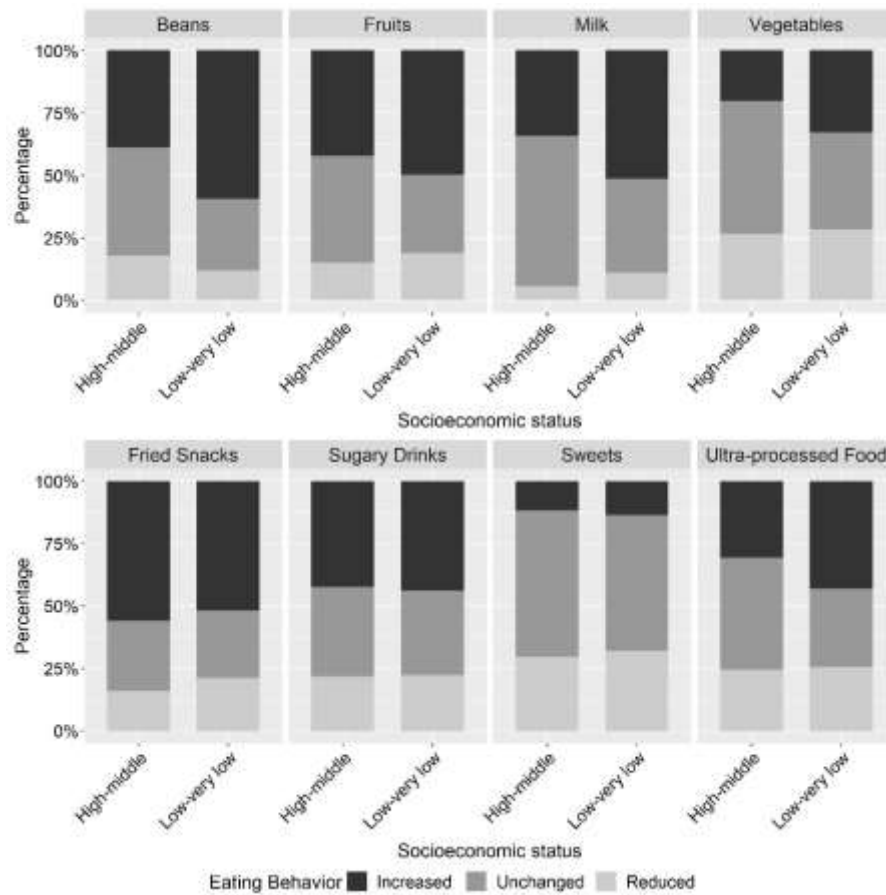
Table 2- Frequency and pattern of food consumption by socioeconomic status. Brazil, 2020.

Dietary routines	Total		High-Middle		Low-Very low	
	n=676	%	n=469	%	n=207	%
Food pattern (≥5 times/week)						
Breakfast	307	45.4	222	47.3	85	41.1
Morning snack	89	13.2	69	14.7	2	9.7
Lunch	509	75.3	376	80.2	133	64.3
Afternoon snack	330	48.8	237	50.5	93	44.9
Dinner	408	60.4	293	62.5	115	55.6
Evening snack	175	25.9	120	25.6	55	26.6
Replacement of meals with snacks	226	33.4	142	30.3	84	40.6
Food frequency (≥5 times/week)						
Milk and dairy products	401	59.3	302	64.4	99	47.8
Vegetables	247	36.5	188	40.1	59	28.5
Beans	331	49.0	22	48.8	102	49.3
Fresh fruits and fruit juices	262	38.8	203	43.3	59	28.5
French fries	37	5.5	26	5.5	11	5.3
Cookies, crackers, and packaged salty snacks	185	27.4	125	26.7	60	29.0
Hamburger and/or sausage	3	4.6	20	4.3	11	5.3
Sweets	207	30.6	156	33.3	51	24.6
Sugary drinks	171	25.3	121	25.8	50	24.2
Soft drinks	111	16.4	71	15.1	40	19.3
Changes in food intake during the social isolation						
<i>Reduced food intake</i>						
Fresh fruits and fruit juices	110	16.3	71	15.1	39	18.8
Vegetables	139	20.6	8	18.3	53	25.6
Beans	72	10.7	49	10.4	23	11.1
Milk and dairy products	77	11.4	52	11.1	25	12.1
<i>Increased food intake</i>						
Ultra-processed food	409	60.5	266	56.7	143	69.1
Fried snacks	162	24.0	94	20.0	68	32.9
Sweets	369	54.6	262	55.9	107	51.7
Sugary Drinks	233	34.5	144	30.7	89	43.0

Source: Authors.

When assessing the frequency of healthy eating markers, it was found that regular consumption of milk ($p < 0.001$), vegetables ($p = 0.02$), and fruits ($p = 0.001$) was higher among adolescents from high-middle classes. In addition, half of the adolescents from low and very low social economic status had low frequency of consumption (below twice a week) of vegetables (49.8%), fresh salad (52.7%), and fruits (48.9%). Regarding the unhealthy eating markers, only the consumption of sweets showed a statistically significant association with social economic status ($p = 0.003$), with a higher percentage of regular consumption among high-middle SES adolescents (Figure 1).

Figure 1. Frequency of healthy and unhealthy markers according to social economic status.



Source: Authors.

Considering the logistic regression analysis, it was observed that adolescents from low and very low SES were 53% less likely to eat lunch regularly (≥ 5 times a week) when compared with those from high and middle SES (OR = 0.47, $p < 0.001$) and 50% more likely to replace large meals by snacks (OR = 1.50, $p = 0.03$) during the period of social isolation, suggesting an unhealthy eating routine (Table 2 and Table 3).

Table 3- Crude and adjusted logistic regression analysis between socioeconomic status and food pattern, frequency and consumption. Brazil, 2020.

Dietary routines	Crude OR	95%CI	p-value	Adjusted OR*	95%CI	P-value
Food pattern (≥5 times/week)						
Breakfast	0.78	0.56-1.08	0.132	0.85	0.60-1.21	0.377
Morning snack	0.62	0.36-1.03	0.075	0.65	0.37-1.10	0.120
Lunch	0.44	0.31-0.64	<0.001	0.47	0.32-0.68	<0.001
Afternoon snack	0.80	0.57-1.11	0.179	0.82	0.58-1.16	0.267
Dinner	0.75	0.54-1.05	0.091	0.80	0.57-1.13	0.210
Evening snack	1.05	0.72-1.52	0.788	1.04	0.70-1.52	0.860
Replacement of meals with snacks	1.57	1.12-2.21	0.009	1.50	1.05-2.14	0.026
Food frequency (≥5 times/week)						
Milk and dairy products	0.51	0.36-0.71	<0.001	0.54	0.38-0.77	0.001
Vegetables	0.60	0.42-0.85	0.004	0.64	0.44-0.92	0.017
Beans	1.02	0.73-1.41	0.914	1.09	0.77-1.55	0.629
Fresh fruits and fruit juices	0.52	0.37-0.74	<0.001	0.52	0.36-0.75	<0.001
French fries	1.12	0.78-1.61	0.531	1.12	0.76-1.63	0.568
Cookies, crackers, and packaged salty snacks	0.96	0.45-1.93	0.904	0.99	0.45-2.04	0.973
Hamburger and/or sausage	1.2	0.57-2.63	0.548	1.17	0.52-2.51	0.697
Sweets	0.66	0.45-0.94	0.025	0.67	0.45-0.98	0.043
Sugary drinks	0.92	0.62-1.33	0.650	0.96	0.65-1.42	0.849
Soft drinks	1.34	0.87-2.05	0.177	1.43	0.91-2.23	0.114
Changes in food intake during the social isolation						
<i>Reduced food intake</i>						
Fresh fruits and fruit juices	1.30	0.84-1.99	0.230	1.24	0.79-1.94	0.344
Vegetables	1.53	1.03-2.26	0.032	1.43	0.94-2.15	0.090
Beans	1.07	0.62-1.79	0.797	0.97	0.55-1.67	0.923
Milk and dairy products	1.10	0.65-1.81	0.709	0.95	0.55-1.60	0.841
<i>Increased food intake</i>						
Ultra-processed food	1.71	1.21-2.42	0.003	1.54	1.08-2.21	0.019
Fried snacks	1.95	1.35-2.82	<0.001	1.73	1.17-2.53	0.005
Sweets	0.85	0.61-1.17	0.315	0.75	0.53-1.06	0.106
Sugary Drinks	1.70	1.21-2.39	0.002	1.71	1.20-2.44	0.003

95% CI: 95% confidence interval; OR: odds ratio.

*Odds ratio was adjusted according to sex, age and Brazilian region, considering high-middle class as base category.

Source: Authors.

When evaluating the eating frequency of healthy marker foods, logistic regression showed that adolescents from the low-very low SES had smaller chances of regularly consuming milk (OR = 0.54, p = 0.001), vegetables (OR = 0.64, p = 0.02), fruits (OR = 0.52, p < 0.001), and snacks (OR = 0.67, p = 0.043) when compared with the high-middle SES (Table 2).

When the change in food intake, during the pandemic, was assessed, adolescents in the low SES were 53% more likely to reduce their vegetable consumption during the period of social isolation (OR = 1.53, p = 0.032), but this difference was not observed in the adjusted model. With regard to unhealthy eating markers, adolescents from low-very low SES were almost twice more likely to increase their consumption of ultra-processed foods (OR = 1.54, p = 0.019), fried snacks (OR = 1.73, p = 0.005), and sugary drinks (OR = 1.71, p = 0.003) during the isolation period (Table 2 and Table 3).

4. Discussion

Our findings revealed that adolescents of medium-high SES were more likely to regularly consume fruits, vegetables, and milk, while those belonging to low-very low SES increased their consumption of unhealthy foods during the COVID-19

pandemic. Such results ratify that adolescents' eating habits were changed in this period, and that these changes were influenced by the social economic status of the investigated families. In addition, it was observed that the habit of not eating breakfast regularly was present in more than half of the sample.

The social and economic impact caused by social isolation (imposed to prevent the spread of the new coronavirus) affected all nations in the world, including Brazil, especially the families with lower purchasing power (FAO, 2020). Because of the pandemic, around 63% of Brazilian families reduced their financial income and purchasing power, leading 58% of households to change their eating habits and routines (UNICEF, 2020).

The adolescents in our study presented low frequency of regular consumption (5 times per week or more) of vegetables and fruits, especially those from low- to very-low SES families, which is similar to results from other studies in this population (Barufaldi et al., 2016 & Veiga et al., 2013). Furthermore, compared with the period before the pandemic, adolescents were even less likely (50%) to consume vegetables regularly during social isolation. It is noteworthy that the WHO suggests consuming more than 400 g of fruits and vegetables per day to improve overall health and reduce the risk of certain NCDs, and emphasizes that good nutrition is crucial for good health, particularly in times when the immune system might need to fight back, such as during the COVID-19 pandemic (WHO, 2020).

Regarding the group of milk and dairy products, a little less than half of the adolescents from low-to very low SES reported consuming them more than 5 times a week. A worrisome fact, since the exclusion or inadequate consumption of this group in adolescence may impair structural growth, lead to lower bone mineral density, and, consequently, contribute to the development of osteoporosis and increased risk of fractures in the long term (Silva, 2020), especially among girls, who were the majority in the group of adolescents with low and very low SES in our study. In addition, low consumption of milk may contribute to suboptimal intake of calcium, magnesium, iodine, and other important nutrients (Givens, 2020).

As for the unhealthy eating markers, our results showed high consumption of sweets, soft drinks, cookies and other ready-to-consume ultra-processed products, similar to other studies conducted with adolescents and young adults (Souza et al., 2016; Andrade et al., 2016 & Azeredo et al., 2015). Adolescents with lower purchasing power were almost twice more likely to increase consumption of unhealthy foods, except for sweets, during the period of social isolation, and they recognized themselves their unhealthy eating habits. Sugar-sweetened beverages were the food group that showed the highest chance of increased consumption during social isolation among adolescents of the low-very low SES. The higher dietary participation of soft drinks and other beverages with added sugar may be associated with low consumption of milk and dairy products by adolescents (Veiga et al., 2013 & Silva, 2020). Sugar-containing beverages and free sugars increase the risk of overweight/obesity and dental cavities, result in poor nutrient supply and reduced dietary diversity, and may be associated with increased risk of developing type 2 diabetes, cardiovascular risk, and other health problems in adolescence (Malik, Pan, Willett & Hu, 2013 & Fidler, 2017).

The high consumption of ultra-processed foods, often poor in protein and fiber—but high in fat, sugar, and sodium—that we observed in this study, is similar to others with the same age group (Souza et al., 2016; Santaliestra-Pasías et al., 2012; Louzada et al., 2015; Enes, Camargo & Justino, 2019) and also in the pandemic period (Ruíz-Roso, 2020). Its consumption is justified mainly by its longer durability and low cost compared with fresh foods (Bezerra, Silva, Soares & Silva, 2020 & Wolfson & Leung, 2020). Added to this is the fact that individuals with lower purchasing power may not have access to fresh fruits and vegetables at affordable prices, in addition to not having the nutritional knowledge, skills, or control of resources to buy and prepare necessary foods for a healthy diet (WHO, 2018). It is recognized that high consumption of ultra-processed foods may contribute to negative outcomes such as increased chance of developing obesity, diabetes, dyslipidemia, and other nutritional problems in adolescents (Barufaldi et al., 2016; Ruiz, Zuelch, Dimitratos & Scherr, 2019; Malik, Pan, Willett & Hu, 2013; Santaliestra-Pasías et al., 2012; Louzada et al., 2015 & Enes, Camargo & Justino, 2019).

The meal consumption pattern, as in other studies (Sousa, 2020), revealed a high prevalence of irregular breakfast among adolescents, which is a major concern for health professionals. Individuals who habitually eat breakfast are more likely to ingest nutrients in the proper amount, have better cognitive academic performance, and have a lower chance of developing excess body weight (Barufaldi et al., 2016; Barr, Vatanparast & Smith, 2018; Gaal, 2018 & Adolphus, Lawton, Champ, & Dye, 2016), which is why the regular practice of this meal should always be encouraged among young people.

Also with regard to breakfast, it was found that only adolescents from high SES families consumed this meal 5 or more times a week, which may be associated with higher educational level of families, contributing to healthier eating behaviors (Barufaldi et al., 2016; Haddad & Sarti, 2020; Assari, 2020). The closing of schools during the pandemic, and the suspension of the school routine and the provided food (Amorim, Ribeiro & Bandoni, 2020), especially in the case of public schools for low-very low SES families, may have negatively affected the frequency of breakfast consumption. At the same time, it probably contributed to longer screen-time and its respective marketing influence on ultra-processed foods consumption (Sadeghirad et al., 2016).

As for the frequency of other meals, it was found that around a third of the adolescents with low/very low SES had the habit of replacing lunch or dinner by snacks. This practice may contribute to reduced consumption of fresh foods such as fruits and vegetables, which are important sources of vitamins, minerals, and fiber (Jordão, Assumpção, Barros & Barros, 2021).

One of the main limitations of this study is due to the use of an online questionnaire, as it contributed to a selection bias of the participants, since only people who had access to a computer/cell phone and to the internet could participate in the study. It is worth noting that in Brazil, 8 out of 10 homes are connected to the mobile network and half the population has a personal computer with Internet access; the cell phone is the main source of contact for all users (PNAD, 2018). On the other hand, the use of the digital questionnaire allowed, in a short period of time, the acquisition of information about the eating habits in several regions of the country, during a time when Brazil was experiencing the highest rates of social isolation, allowing an earlier diagnosis of the adolescents' eating habits and the development of intervention proposals that contribute to the promotion of healthy eating practices and prevention of chronic diseases.

5. Conclusion

Finally, despite the consensus that adolescence is a crucial phase of human development and that the acquisition of good lifestyle habits, including eating habits, are crucial for the promotion of health in adulthood, our results showed that the eating habits of Brazilian adolescents were inadequate, mainly from lower social classes, and that the social isolation due to the COVID-19 pandemic only worsened this situation of the most vulnerable.

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