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Consumption of ultra-processed foods by adolescents in Montes Claros, Minas Gerais

Consumo de alimentos ultraprocessados por adolescentes em Montes Claros, Minas Gerais

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ABSTRACT

Introduction: Ultra-processed foods (UPF) are industrial formulations made with very small amounts of substances extracted from fresh foods and a high concentration of flavorings, emulsifiers, colorings and other additives that alter the organoleptic properties of the product, having high energy value and low nutritional value. The exponential increase in the consumption of these foods among the adolescent population and its risks demands studies on the conditions related to this intake. **Objective:** To analyze the prevalence and factors associated with the consumption of ultra-processed foods in the adolescent population. **Methods:** This is a cross-sectional, quantitative and analytical study carried out in the city of Montes Claros, Minas Gerais, Brazil, with 880 students from public schools participating. The inclusion criteria used were to be a student regularly enrolled in the institution and in the selected class. Adolescents who did not attend school on the days of the questionnaire were applied were excluded. **Results:** A total of 880 adolescents from 6th to 9th grade from municipal public schools participated in this study. The mean age was 12.95 (±1.23) years, 51.9% were female and 35.7% were in the 6th grade. The mean screen time in the group was 7.56 (±6.48). **Conclusions:** In the present study, a high prevalence of UPF was observed among the interviewees, with every 4 out of 10 young people consuming UPF daily, with the most consumed being sweets and soft drinks. The highest prevalence of consumption was observed among female adolescents with higher average screen time.

Keywords: Adolescent; Ultra-processed foods; Food consumption.

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RESUMO

Introdução: Os alimentos ultraprocessados (AUP) são formulações industriais feitas com quantidades muito pequenas de substâncias extraídas de alimentos in natura e alta concentração de aromatizantes, emulsificantes, corantes e outros aditivos que alteram as propriedades organolépticas do produto, tendo alto valor energético e baixo valor nutricional. O aumento exponencial do consumo desses alimentos entre a população adolescente e seus riscos, demanda estudos acerca das condições relacionadas a essa ingestão. **Objetivo:** Analisar a prevalência e os fatores associados ao consumo de alimentos ultraprocessados na população adolescente. **Métodos:** Trata-se de um estudo transversal, quantitativo e analítico realizado no município de Montes Claros – MG realizado com 880 alunos de escolas da rede pública participaram. Utilizou-se como critérios de inclusão, ser aluno regularmente matriculado na instituição e na turma selecionada. Foram excluídos os adolescentes que não compareceram à escola nos dias da aplicação do questionário. **Resultados:** Participaram deste estudo 880 adolescentes entre o 6º ao 9º ano de escolas públicas municipais. A média de idade foi de 12,95 (±1,23) anos, 51,9 % eram do sexo feminino e 35,7 frequentavam o 6º ano. O tempo média de uso tela no grupo foi 7,56 (±6,48). **Conclusões:** No presente estudo observou-se alta prevalência de AUP, entre os entrevistados, a cada 4 em 10 jovens mostraram consumir AUP diariamente, sendo os mais consumidos guloseimas e refrigerantes. A maior prevalência de consumo foi observada entre adolescentes do sexo feminino e com maior média de tempo de tela.

Palavras-chave: Adolescente; Alimentos ultraprocessados; Consumo alimentar.

Introduction

The consumption of ultra-processed foods (UPF) has grown significantly among the young population as they are mostly ready-to-eat or ready-to-heat foods and therefore require little or no culinary preparation, making them easily accessible and convenient[1]. According to data from the National School Health Survey (PeNSE), the consumption of this type of food among Brazilian adolescent students increased from 2009 to 2015, when it reached about 60% of this population[2].

These foods are industrial formulations made with very small amounts of substances extracted from *fresh* foods and a high concentration of flavorings, emulsifiers, colorings and other additives that alter the organoleptic properties of the product, having high energy value and low nutritional value. The ingredients and processes used in the formulation of these foods aim to create low-cost, hyperpalatable and convenient products with the potential to replace minimally processed or fresh foods[3].

The nutritional transition currently evidenced as a pandemic of alteration in the eating habits of the world population, especially in developing countries, is related to energy and nutritional imbalance, with food changes and the emergence of diseases resulting from an inadequate diet. In this context, it is noted, in practice, the replacement of meals composed of fruits, vegetables, meats and cereals, which should be the main ones, by snacks with high energy value, rich in saturated fats and simple carbohydrates, but with low nutritional potential[4].

It is important to identify the consumption of ultra-processed foods in adolescents, as this is one of the main causes of the global increase in obesity cases[2]. The consumption of UPF, in association with genetic and environmental risk factors, contributes to an unfavorable health outcome, since it favors the development of chronic non-communicable diseases such as obesity, dyslipidemia, hypertension and diabetes[1]. Analyzing the diet of adolescents can contribute to finding better ways to encourage healthy lifestyle habits and mitigate habits that cause harm to health.

The exponential increase in the consumption of these foods among the adolescent population and its potential risks demands studies on the conditions related to this ingestion, since the behaviors acquired in this age group are usually perpetuated in adult life and increase the morbidity and mortality of the population[5,6]. Thus, the objective of this study was to analyze the prevalence and factors associated with the consumption of ultra-processed foods in the adolescent population.

Methods

This is a cross-sectional, quantitative and analytical study carried out in the city of Montes Claros, Minas Gerais, according to the methodological recommendations of the *Strengthening the Reporting of Observational studies in Epidemiology* (STROBE) protocol[7]. The city is considered medium-sized, is located in the northern region of the state of Minas Gerais (MG), and is the main urban center of the region, with reference services in the areas of health, education and commerce. According to the IBGE in its last census (2021), the municipality has an estimated population of 417,478 inhabitants.

According to data from the municipal government of Montes Claros/MG, there are approximately 100 municipal educational institutions, from kindergarten to high school. The population consists of adolescents enrolled in elementary school in the municipal school system of Montes Claros/MG, in 2017. According to data provided by the Regional Superintendence of Education of Montes Claros, there were approximately 28,546 students enrolled in the city's municipal schools that year.

The sample size was defined considering the following parameters: 95% confidence level, estimated prevalence of 50% and sampling error of 5%. For the purpose of adjusting the design of the sampling process (by clusters), the number defined by the calculation was multiplied by a correction factor equal to two (*def*=2); it was estimated that 997 students would be needed, however, due to those excluded in data collection, 880 students participated in the study.

The sample was selected in a two-stage cluster probabilistic manner. In the first stage, the schools were randomly selected, followed by simple random sampling. Thus, the study consisted of adolescents from the 6th, 7th, 8th and 9th grades of elementary school from 13 municipal schools in the urban area of Montes Claros. Before data collection, contact was made with those responsible for education and health in the municipality, and each one was given a copy of the project and the opinion of the Research Ethics Committee.

The inclusion criteria used were to be a student regularly enrolled in the institution and in the selected class. Adolescents who did not attend school on the days of the application of the questionnaire and anthropometric measurements, those who did not have a valid age or date of birth registered, and those who did not have a free and informed consent form signed by their guardians were excluded.

Data were collected in the second semester of 2017 by a multidisciplinary team, previously trained, composed of professionals in the areas of physical education, nutrition, speech therapy, medicine, nursing, and undergraduate students linked to scientific initiation.

After the training stage, a pilot study was carried out with students from a school that presented the same characteristics as the schools in the study, in order to standardize the research procedures and assess the understanding of the data to be researched by the interviewees. Through the pilot study, it was possible to evaluate the performance of the interviewers for the application of the questionnaire and the physical evaluation, in addition to verifying the time spent for the development of the work.

The instrument used in this study was a structured, self-administered questionnaire containing the following demographic variables: gender (male and female), age group (11 to 19 years), school grade (6th to 9th grade of elementary school). In addition, the Food Frequency Questionnaire (FFQ) was used to assess the frequency of daily consumption of at least one group of Ultra-Processed Foods. The variable was investigated based on the question: "In the last 7 days, on how many days did you eat...?", for each of the following foods/food groups: sweets, soda, sausages (hamburger, sausage, mortadella, salami, ham, nuggets or sausage), and packaged snacks. The daily consumption of at least one group of UPFs was determined by the affirmative response to the consumption of at least one of the groups on all seven days of the week investigated. The screen time of these adolescents was also investigated in order to assess its relationship with the consumption of UPF.

The statistical treatment of the collected information was performed using the *Statistical Package for the Social Sciences* (SPSS), version 20.0. To characterize the sample, descriptive statistical analysis of simple (n) and percentage (%) frequencies were used. The magnitude of the association between the outcome and the independent variables was estimated by the prevalence ratio (PR) adjusted with their respective 95% confidence intervals, using the Poisson regression model with robust variance. The adjustment variables were included in their entirety, regardless of the *p*-value in the crude analysis. Statistical significance was set at p-value <0.05.

This research complied with the ethical precepts established by Resolution N° 466/2012 and was approved by the Human Research Ethics Committee of the State University of Montes Claros (CEP), under protocol number 1,908,982. After approval of the research by the departments, a meeting was held with the school principals, where they were clarified about the importance, objectives and methodology of the project, and authorization was requested for the scheduling of data collection and consent from the students' parents through the free and informed consent form. Researchers with projects approved by a

research ethics committee will have access to the anonymized database, through communication with the corresponding author.

Results

A total of 880 adolescents from the 6th to the 9th grades of elementary school in municipal public schools participated in this study. The mean age was 12.95 (±1.23) years, 51.9% were female and 35.7% were in the 6th grade (Table 1). The mean screen time in the group was 7.56 (±6.48).

Graphic 1 shows the prevalence of daily consumption of each group of UPFs among adolescent students. Among the adolescents, 42.2% consumed at least one of the UPF food groups daily. Daily consumption of sweets was the most prevalent and accounted for 35.1% (309) of the participants.

In the crude and adjusted analysis, it was observed that the prevalence of high consumption of ultra-processed foods was associated with the variables gender and screen time among adolescent students (p<0.05) (Table 2). In the adjusted analysis, the higher prevalence of daily consumption of at least one UPF was significantly higher in females (PR:1.30; 95% CI: 1.09-1.55). Adolescents who had more than average screen time per day showed an increased prevalence of daily UPF consumption by 24% (PR: 1.24; 95% CI: 1.05-1.48). No significant interactions were observed between the other sociodemographic variables (age and grade) in their association with high consumption of ultra-processed foods.

Table 1. Sociodemographic characteristics of adolescent students. Montes Claros, Minas Gerais, 2017 (n=880).

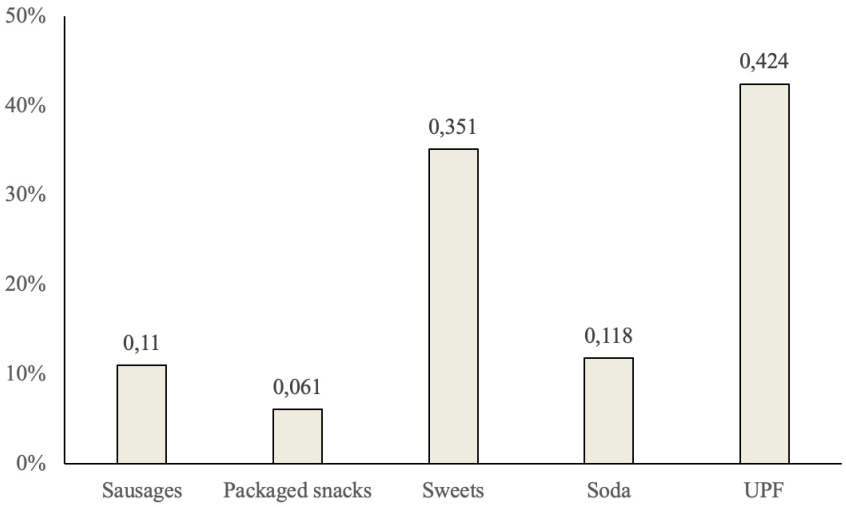
Variable	N	%
Sex		
Female	457	51.9
Male	423	48.1
Age (years)		
11-12	343	39.4
13-14	445	51.1
≥15 years	83	9.5
Series		
Year 6	195	22.2
Year 7	314	35.7
Year 8	263	29.9
9th Grade	106	12.0
Shift		
Morning	731	90.8
Afternoon	74	9.2
Screen Time		
Below Average	187	39.5
Above average	140	51.7

Legend: n = number; % = percentagem.

Table 2. Crude and adjusted prevalence ratio (PR) and 95% confidence interval (95% CI) of ultra-processed food consumption among adolescents according to sociodemographic variables and screen time. Montes Claros, Minas Gerais, 2017 (n=880).

Variables	UPF Prevalence n (%)	Crude prevalence ratio (95%CI)	*p*-value	Adjusted prevalence ratio (95%CI)	*p*-value
Sex					
Male	156 (36.9)	1		1	
Female	217(47.5)	1.29 (1.10-1.51)	**0.002**	1.30 (1.09-1.55)	**0.004**
Age (years)					
11-12	199 (58.0)	1		1	
13-14	257 (57.8)	1.01 (0.76-1.33)	0.975	1.05(0.84-1.32)	0.913
≥15 AM	48 (57.8)	1.01 (0.85-1.19)	0.941	1.02(0.68-1.53)	0.663
Series					
6th and 7th	219 (43.0)	1		1	
8th and 9th	153 (41.5)	0.96 (0.82-1.13)	0.645	0.85(0.67-1.09)	0.197
Screen Time					
Below Average	187 (39.5)	1		1	
Above average	140 (51.7)	1.30 (1.11-1.53)	**0.001**	1.24 (1.05-1.48)	**0.014**

Legend: n = number; % = percentagem; CI = confidence interval; UPF = ultra-processed foods.



Graphic 1. Prevalence of daily consumption of each ultra-processed food group (UPF) among adolescent students. Montes Claros, Minas Gerais, 2017 (n=880).

Discussion

In this study, a high prevalence of UPF consumption was observed among the interviewees. Four out of every 10 young people reported consuming UPF daily, with sweets and soft drinks being the most consumed. UPF consumption was associated with the female gender and above-average screen time, which evidences a sedentary behavior among adolescent students.

According to Monteiro et al. (2010)[8], with the NOVA classification, UPFs are now divided according to the processing they have had on a scale ranging from fresh foods to ultra-processed foods. The consumption of UPF by adolescents has been shown to be a predisposing factor for several repercussions during adulthood, such as increased chances of type 2 diabetes mellitus, cardiovascular diseases, depression, and gastrointestinal tract disorders[9].

The consumption of ultra-processed foods is a contemporary trend in eating habits[2]. Countries such as the United States, the United Kingdom, and Canada have the highest rates of this consumption in the world[10]. A study conducted in 2016 observed that 69.7% of the school-based population in southern Brazil consumed UPF[2]. In Brazil, a previous survey carried out with 102,072 adolescent students from 6th to the 9th grade of the entire national territory showed that the daily consumption of UPF was reported by 39.7% of adolescents, with even higher consumption among girls and students from private schools. The percentage of UPF consumption among genders varied according to the type of UPF consumed, namely: soft drinks (girls = 35.7% and boys = 40.7%), sweets (girls = 57.7% and boys = 46.7%), sausages (girls = 46.8% and boys = 43.7%) and fried snacks (girls = 21.5% and boys = 20.2%)[11].

These results are in agreement with the evidence found in the present study, which also demonstrates a higher consumption of UPF by females. The excessive consumption of UPF in the female adolescent population favors the formation of adult women with unhealthy eating habits that can cause damage to their health, such as noncommunicable diseases (NCDs), which are more prevalent in women and are caused by the association of genetic and environmental factors. In addition, during and after menopause, women experience a reduction in female sex hormones, which enhances weight gain and increased cardiovascular risk[4,12].

The World Health Organization (WHO) limits children and adolescents to spend a maximum of two hours a day in front of screens[13]. In the present study, the average daily screen time was higher than recommended, which is a characteristic of sedentary habits. A study conducted in public schools in São José dos Pinhais, Paraná, also showed a longer screen time than recommended in adolescents[14]. The excessive use of screens is associated with a higher prevalence of unhealthy habits and lower rates of physical activity[9,15,16]. It is also suggested that there is a permanence of sedentary habits in adult life, as evidenced by a longitudinal study that shows, as a result, the use of screens for more than two hours a day by adolescents is perpetuated in adult individuals[17].

According to research conducted by Kelishadi et al. (2017)[18], students who were more likely to consume UPFs had a screen time greater than four hours per day, but there was no relationship between screen time and the consumption of vegetables and foods that are considered healthy. The association between inadequate screen time and UPF consumption can be explained by the ease of ingestion of this class of foods, which does not require so much attention to the act of eating, and by the decrease in the feeling of satiety that occurs when food is ingested simultaneously with screen use, leading individuals to consume larger amounts of food[11]. Studies in the literature corroborate the results found, associating the higher consumption of frozen foods and soft drinks with the time of exposure to the screen in preschool children in the metropolitan region of São Paulo[19].

The current eating habit is characterized by a diet composed primarily of empty calories, evidencing associated nutritional poverty that impacts the health of individuals and generates additional expenses for public health[12]. These results suggest the implementation of campaigns to promote healthy eating among adolescents and actions that integrate the public sector, school, family and health professionals in PHC, such as campaigns and lectures aimed at disseminating knowledge about the consequences of UPF food consumption on health and encouraging and enabling early adherence to healthy eating habits and practices[20].

The limitations of this study include the inability of the study design to establish causal relationships between the variables, allowing only associations to be made. Representativeness may be limited as the data comes from a single region. Memory and response bias, which is common in observational studies, and the presence of confounding factors, such as family environment and access to healthy foods, are also methodological challenges. Despite this, the choice of public schools ensures a representative socioeconomic diversity, and the cross-sectional nature of the study allows the collection of up-to-date data, reflecting contemporary trends in food consumption. In addition, the observational methodology facilitates the execution of the study, and the results obtained are crucial for the development of nutrition education programs and public health policies.

The findings can guide health professionals, educators, and policymakers in creating effective approaches to reduce ultra-processed food consumption among young people, potentially promoting better long-term health outcomes. In addition, the findings of this study can be used to sensitize society about the importance of healthy eating and encourage positive changes in adolescent eating behavior.

Conclusion

Adolescent students had a high prevalence of ultra-processed food consumption. The highest prevalence was observed among female adolescents with higher average screen time. In view of the results achieved, measures are recommended to adjust the dietary pattern of this portion of the population in order to prevent the negative health effects associated with the consumption of UPF.

Author's Contributions

We describe contributions to the papers using the taxanomy (CRediT) provided above:

Conceptualization, Investigation, Methodology, Visualization & Writing – review & editing: ARRN; ELV; GCG; JVSQ; MASC; RESS; LP. *Project administration, Supervision & Writing – original draft*: ARRN; ELV; GCG; JVSQ; MASC; RESS; LP. *Validation & Software*: LP. *Resources & Funding acquisition*: There was no funding. *Data curation & Formal Analysis*: ARRN; ELV; GCG; JVSQ; MASC; RESS; LP.

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