
ASSOCIATION BETWEEN PHYSICAL ACTIVITY PRACTICE AND FOOD CONSUMPTION IN SCHOOL TEENAGERS**ASSOCIAÇÃO ENTRE PRÁTICA DE ATIVIDADE FÍSICA E CONSUMO ALIMENTAR EM ADOLESCENTES ESCOLARES**

Lucineia de Pinho¹, Henrique Nunes Pereira Oliva¹, Anne Christine Alves Pereira¹, Ana Clara Veloso Campos de Quadros Godinho¹, Isaac Brandão Bittencourt Magalhães¹, Leandro Rodrigues Ramos Rocha¹, Maria Fernanda Santos Figueiredo Brito² e Rosângela Ramos Veloso Silva¹

¹University Center FIPMoc, Montes Claros, MG, Brazil.

²State University of Montes Claros, Montes Claros, MG, Brazil.

ABSTRACT

Adolescence is a period of transition, marked by habits that can influence the health of individuals in the long run. This study aimed to analyze the association between physical activity and food consumption in adolescents. This is a cross-sectional study with a probabilistic sample of 1.570 school adolescents from Montes Claros, MG, Brazil. The level of physical activity and consumption of fruits, vegetables, sweets, and soda/soft drinks was analyzed. Logistic regression was performed (significance level 5%). Among adolescents, 80.8% were classified as not active and practiced physical activity for at least 60 minutes in less than five days a week. In relation to food, 85.2% and 34.3% of adolescents reported consuming legumes and fruits less than three times a week, respectively. Consumption five times a week or more of treats was 64.1% and soft drinks 90.3%. Those who consumed fruit three times a week or less were 40% more likely to be less active. Those who consumed soda more than five times a week were twice as likely to be little active. Low levels of physical activity were associated with consumption of fruit less than or equal to three times a week and soft drinks greater than five times a week. There is a need to encourage the promotion of healthy lifestyle habits regarding the practice of physical activity and food consumption among adolescents, in school and family contexts.

Keywords: Feeding behavior. Physical aptitude. Physical exercise. Adolescents. Adolescent health.

RESUMO

A adolescência é um período de transição, marcado por hábitos que podem influenciar a saúde dos indivíduos a longo prazo. Este estudo objetivou analisar a associação entre a prática de atividade física e o consumo alimentar em adolescentes. Trata-se de estudo transversal com amostra probabilística de 1.570 adolescentes escolares de Montes Claros, MG. Analisou-se nível de atividade física e consumo de frutas, leguminosas, guloseimas e refrigerante. Foi realizada regressão logística (nível de significância 5%). Entre os adolescentes 80,8% foram classificados como pouco ativos e praticavam atividade física por pelo menos 60 minutos em menos do que cinco dias por semana. Em relação à alimentação, 85,2% e 34,3% dos adolescentes relataram consumo de leguminosas e frutas com frequência menor que três vezes por semana, respectivamente. O consumo cinco vezes por semana ou mais de guloseimas foi de 64,1% e refrigerantes de 90,3%. Os que consumiam frutas três vezes por semana ou menos apresentaram chance 40% maior de serem pouco ativos. Os que consumiam refrigerante com frequência superior a cinco vezes por semana apresentaram chance duas vezes mais alta de serem pouco ativos. Baixos níveis de atividade física foram associados ao consumo de frutas menor ou igual a três vezes por semana e de refrigerantes superior a cinco vezes por semana. Há necessidade de incentivo à promoção de hábitos de vida saudáveis quanto à prática de atividade física e ao consumo alimentar entre os adolescentes nos contextos escolar e familiar.

Palavras-chave: Comportamento alimentar. Atividade física. Exercício físico. Adolescentes. Saúde do adolescente.

Introduction

Adolescence covers the transition period from childhood to adulthood. This phase is marked by several emotional, cognitive, social, physical and hormonal transformations. Autonomy and independence are characteristics present in this phase of life, a fact that contributes to some behaviors that may represent health risk factors, such as low levels of physical activity and inadequate diet¹⁻³.

When it comes to adolescents, health risk behaviors generally tend to group together, with simultaneous exposure to two or more risk behaviors. Grouping between food

consumption and physical activity among adolescents is common^{3,4}. The diet adopted at this stage of life is marked by imbalances in the level of food and nutrient intake. Ultra-processed foods, with low nutritional value and rich in fats and sugars, increasingly occupy the adolescents' diet, to the detriment of eating healthy and traditional foods, such as vegetables and grains^{5,6}.

Processed and easily prepared foods have been associated with the routine of adolescents with insufficient physical activity^{5,7}. Physical inactivity in adolescence is a health deleterious behavior that, associated with nutritional imbalance, increases the risk for various diseases such as obesity, diabetes, hypertension, cardiovascular diseases and certain types of cancer and early mortality^{2,3}.

Adolescence represents an important period for health promotion and risk factor prevention actions⁸. These unhealthy lifestyles adopted in adolescence can remain until adulthood and lead to an increase in the prevalence of chronic non-communicable diseases. Therefore, it is important to investigate the practice of physical activity and food consumption in adolescents, since these behaviors are essential for healthy growth and development in this phase, in addition to being determinants of health throughout life⁵.

The impact represented by the regular practice of physical activity, as well as healthy eating, as habits capable of preventing chronic diseases in this age group, demonstrates the potential of the present study to contribute to the literature by correlating these variables to the investigated territory. Surveillance of risk and protective factors for chronic non-communicable diseases specific to adolescents based on regular surveys in the school environment can support adolescent health policies⁹. The objective of the present study is to verify the association between the practice of physical activity and food consumption in school adolescents in the city of Montes Claros, located in the Brazilian state of Minas Gerais (MG).

Methods

This study is part of the Project "*Uso de Drogas em Adolescentes da rede pública de ensino da cidade de Montes Claros- MG: um estudo de base populacional*" (Portuguese title for Drug Use in Adolescents from public schools in the city of Montes Claros-MG: a population-based study). This is a cross-sectional study carried out in Montes Claros, a municipality located in the northern region of Minas Gerais (MG), Brazil.

Participants

The target population of the study was composed of 13,996 high school adolescents from the state public school system in the city of Montes Claros, covering 61 teaching units in the city. To calculate the sample size, the following parameters were adopted: estimated prevalence of the event of interest of 50% and margin of error of 3.5%, considering a population of size $N = 13,996$ students. Correction by the effect of the drawing was carried out, adopting $d_{eff} = 2$ and 10% added to compensate for possible losses. Thus, the calculations showed a sample size of at least 1,488 students.

The selection of the sample was of the probabilistic sampling type by conglomerate in two stages, the first being the schools and the second by the classes of the selected schools. In the first stage, 30 schools were selected by probability proportional to size (PPS) sampling, in the second stage, by simple random sampling, a sample fraction of the classes was selected in each of the 30 schools drawn stratified by shift (morning, afternoon and evening). All students in the selected classes were invited to participate in the study.

To participate in the study, the student should be regularly enrolled in the established units and be present on the pre-stipulated day and time to answer the applied questionnaire; not having a disabling or organic physical disability of a nature that would prevent the individual

from exercising or eating in a conventional manner; not having insufficient neuropsychiatric development to answer the questionnaire.

All school adolescents who participated in the research signed the Free and Informed Consent Term and delivered the Free and Informed Consent Term signed by the guardians. The research was approved by the Research Ethics Committee with human beings of the State University of Montes Claros (Unimontes), with the substantiated opinion number 2,073,215 of 2017.

Procedures

Data were collected in 2018 by previously trained undergraduate students from health science majors. Initially, contact was made with the schools to present the project and the institution was asked to authorize the participation of adolescents in the present study. As they are underage, an authorization term was sent to the parents of the adolescents who were quoted to participate in the study, one day before the questionnaire was applied in a school environment. The questionnaires were applied in the selected schools, during class hours. An urn was used so that the adolescents themselves could deposit the questionnaires after completing and thus guarantee their anonymity. Questionnaires were applied, in which the interviewees themselves could read, interpret, and answer the questions. The time taken for the adolescents to answer the questionnaire was 20 minutes, on average.

The dependent variable used for physical activity, assessed using the International Physical Activity Questionnaire (IPAQ), developed and validated by Craig et al.¹⁰. Matsudo et al.¹¹ validated for Portuguese and the Brazilian population, the short version of the questionnaire. In the present study, for the classification of the practice of physical activity, the recommendation of the World Health Organization was used, which classifies physical activity as moderate / vigorous¹². Based on physical activity guidelines for children and adolescents, which recommend 60 minutes of moderate and vigorous physical activity on at least five days a week, adolescents who responded the option of five days or more during the week were considered as physically active and those who responded less than five days were classified as not physically active. This binomial division in relation to the practice of physical activity, although simplified, allows practitioners to be differentiated according to the WHO recommendation in relation to the others, in addition to being performed and recommended in the literature^{12,13}.

The independent variables of the study were the consumption of fruits, legumes, soft drinks and sweets. In the evaluation of food consumption, it was used the instrument proposed in the survey: Surveillance of Risk and Protection Factors for Chronic Diseases by Telephone Survey (VIGITEL, from the Portuguese title: *Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico*)¹⁴. The following questions were asked: "In the past 7 days, on how many days did you eat titbit (candies, sweeties, chocolates, chewing gum, chocolates or lollipops)?", "In the past 7 days, on how many days did you eat fresh fruit or salad" "In the past 7 days, on how many days did you drink soda?", "In the last 7 days, on how many days did you eat beans?" as answers they had the options I didn't eat / took, one, two, three, four, five, six or every day. The consumption of fruits and vegetables was categorized more than 3 times a week and 3 times or less a week. The consumption of soft drinks and sweets was dichotomized up to five times a week or more than 5 times a week.

As control variables for the study in question, which served to characterize the sample, sex (female / male) was used, age, which was collected continuously and categorized as ≤ 16 years and > 16 years, parents' education, which was collected continuously and categorized into ≤ 8 years and > 8 years, and the economic level. This was identified by the questionnaire of the Brazilian Association of Research Companies (ABEP, from the Portuguese: *Associação Brasileira de Empresas de Pesquisa*) through a system of points that, added

together, serve to classify the Brazilian population in economic classes according to their purchasing power. The classes of criteria adopted by ABEP are five: A, B1, B2, C1, C2, D and E, in decreasing order of purchasing power. Class A and B subjects were classified as high economic level, class C as medium economic level and class D and E as low economic level¹⁵.

Statistical analysis

The data were tabulated in the software Statistical Package for the Social Science (SPSS) version 21. The variables were described through their distributions of absolute and relative frequencies. In the analysis of factors associated with the outcome, the chi-square test was used to verify the association between the level of physical activity and the independent and control variables. In the analysis of association, crude and adjusted, the Wald test and binary logistic regression were used to estimate odds ratios (OR) and 95% confidence intervals (95% CI). In the adjusted regression analysis, all variables were included, regardless of the p value in the crude analysis.

Results

This study involved 1,570 students, aged 14 to 19 years (average 16.3 ± 1.1). Most of the adolescents participating in the survey were female (54.8%), under the age of 16 (54.0%) and with high economic status (63.8%). Parents' schooling over 8 years was observed in 56.7%. Fruit consumption at least three times a week was reported by 34.3% adolescents. Among adolescents, 85.2% reported consuming vegetables at least three times a week. The consumption of sweets and soft drinks more than five times a week was 35.9% and 90.3%, respectively. As for the practice of physical activity, 80.8% of the participants were classified as not physically active (Table 1).

Table 1. Sample distribution, according to the level of physical activity

Variable	Sample n (%)	Physical activity				<i>p</i> *
		Active		Not active		
		n	% (95% CI)	n	% (95% CI)	
<i>Total</i>	1570 (100)	301	19.2 (17.3 – 21.2)	1269	80.8 (78.8 – 82.7)	
<i>Gender</i>						0.004
Male	709 (45.2)	158	22.3 (19.4 – 25.5)	551	77.7 (74.5 – 80.6)	
Female	861 (54.8)	143	16.6 (14.3 – 19.2)	718	83.4 (80.8 – 85.7)	
<i>Age (Years old)</i>						0.941
≤ 16	848 (54.0)	162	19.1 (16.6 – 21.9)	686	80.9 (78.1 – 83.4)	
> 16	722 (46.0)	139	19.3 (16.5 – 22.3)	583	80.7 (77.7 – 83.5)	
<i>Economic level</i>						0.916
High level	1001 (63.8)	191	19.1 (16.8 – 21.6)	810	80.9 (78.4 – 83.2)	
Middle level	506 (32.2)	99	19.6 (16.3 – 23.3)	407	80.4 (76.8 – 83.4)	
Low level	63 (4.0)	11	17.5 (10.0 – 28.6)	52	82.5 (71.4 – 90.0)	
<i>Parents education</i>						0.084
> 8 years	890 (56.7)	184	20.7 (18.1 – 23.5)	706	79.3 (76.5 – 81.9)	
≤ 8 years	680 (43.3)	117	17.2 (14.6 – 20.2)	563	82.8 (79.8 – 85.4)	
<i>Fruit consumption</i>						0.011
> 3x/week	538 (34.3)	122	22.7 (19.3 – 26.4)	416	77.3 (73.6 – 80.7)	
≤ 3x/week	1032 (65.7)	179	17.3 (15.2 – 19.8)	853	82.7 (80.2 – 84.8)	
<i>Vegetables consumption</i>						0.177
> 3x/week	1338 (85.2)	264	19.7 (17.7 – 22.0)	1074	80.3 (78.1 – 82.3)	
≤ 3x/week	232 (14.8)	37	15.9 (11.8 – 21.2)	195	84.1 (78.8 – 88.2)	
<i>Titbits consumption</i>						0.776
≤ 5x/week	1006 (64.1)	195	19.4 (17.1 – 21.9)	811	80.6 (78.1 – 82.9)	
> 5x/week	564 (35.9)	106	18.8 (15.8 – 22.2)	458	81.2 (77.8 – 84.2)	
<i>Soda consumption</i>						0.004
≤ 5x/week	1417 (90.3)	285	20.1 (18.1 – 22.3)	1132	79.9 (77.7 – 81.9)	
> 5x/week	153 (9.7)	16	10.5 (6.5 – 16.3)	137	89.5 (83.7 – 93.5)	

Note: CI = confidence interval. *Chi-square test

Source: Authors

In the analysis of the association between the level of physical activity and food consumption of adolescents, it was observed that low-active adolescents had a greater chance of consuming fruit less than three times a week (OR = 1.402; 95% CI = 1.082 - 1.816). While low-active adolescents were more likely to consume soda more than five times a week (OR = 2.165; 95% CI = 1.268 - 3.694) (Table 2).

Table 2. Association analysis with odds ratio and 95% confidence interval between physical activity, fruit consumption and soda consumption among adolescents

Variables	<i>Physical Activity Practice (Not Active)</i>					<i>P</i>
	Gross analysis		<i>p</i>	Adjusted analysis		
	OR	95% CI		OR	95% CI	
<i>Fruit consumption</i>			0.012			0.011
>3x/week	1	–		1	–	
≤3x/week	1.396	1.077 – 1.809		1.402	1.082 – 1.816	
<i>Soda consumption</i>			0.006			0.005
≤ 5x/week	1	–		1	–	
>5x/week	2.146	1.246 – 3.698		2.165	1.268 – 3.694	

Note: CI = confidence interval. OR = odds ratio

Source: Authors

Discussion

The present study found that about a third of the students reported the consumption of fruits at least three times and most of the vegetables' intake of in that same weekly frequency. There was a high prevalence of adolescents who reported consuming soda five times a week or more and little active in relation to physical activity. Low levels of physical activity were associated with consumption of fruit less than or equal to three times a week and soft drinks greater than five times a week among adolescents. The investigation of these variables among school adolescents in the public school system in the northern region of Minas Gerais is relevant, since it contributes to the updated knowledge of these variables of the adolescents' life habits and, thus, to subsidize health policies aimed at young people¹⁶. The practice of physical activity and an adequate diet, when adopted in childhood and adolescence, can reduce the burden of chronic non-communicable diseases (NCDs)¹⁷.

In this study, it was found that, regarding food consumption, about one third of the adolescents surveyed consumed fruits at least three times a week. With the same frequency, the consumption of legumes was verified by most adolescents. In the analysis of the average weekly frequency of healthy and unhealthy food markers among Brazilian adolescents (13 to 17 years old), it was observed that the highest weekly frequencies of consumption were observed for the intake of beans (4.57 days / week) and vegetables (3.43 days / week), among the marker foods for healthy eating¹⁸. In this study, like the present investigation, most adolescents do not meet the recommendations for regular consumption of these foods proposed by VIGITEL¹⁴.

These results are similar to an investigation carried out with 1399 school adolescents in the state of Maranhão, which evidenced the low consumption of fruits and vegetables, in 84.27% and 71.98% of those surveyed respectively¹⁹. A study carried out with adolescents in the state of Santa Catarina, found between the years 2001 to 2011 a decrease, around 50% of the consumption of fruits and vegetables²⁰. Guerra et al.²¹ analyzing the frequency distribution of food availability in households with adolescents in the Amazon, they observed a low frequency of consumption of vegetables, fruits and legumes. Research on the price of food groups consumed in Brazil fresh, such as fruits, observed a tendency to cost more expensive than ultra-processed foods, which shows the importance of measures related to the price of food in the adoption of a healthy diet²².

The present study also evaluated an excessive consumption of soda in the majority of adolescents. In a study with adolescents in the State of Sergipe, the excessive intake of soft drinks was 57.5%¹³. In Niterói, the consumption of soft drinks was reported by approximately ¾ of the adolescents surveyed, being the drink that most contributed to the total energy consumption. Changes in the pattern of beverage consumption among adolescents was observed over time, with an increase in the consumption of processed drinks, such as soda, with the intake also on weekdays²³. In a national survey on the consumption of food markers on five or more days of the week, a high prevalence of soda/soft drinks was observed (one third of the students)²⁴. This aspect is considered warning since sugary drinks can increase the risk of being overweight and of NCDs¹. Data from the National School Health Survey 2009 found that 21.7% reported the consumption of soft drinks daily. Among eutrophic boys, there was a greater chance of being in the highest tertiles of the Body Mass Index (BMI) Z score among those who consumed soft drinks when compared to non-consumers²⁵. Population-based 2008 Health Survey from São Paulo, with a sample of 1494 consumers of sugary drinks, which included adolescents, found that regardless of age, the increase in the consumption of sugary drinks was associated with a decrease in the total score of the Index Quality Report - Revised and the components "whole fruits", "total fruits", "meat, eggs and vegetables" and "solid fat, alcohol and added sugar"²⁶.

Soft drinks consumption has been associated with an increase in energy intake and body weight and a decrease in the quality of the diet, which increases health risks. There is not an adequate compensation of the energy added with the consumption of soft drinks with the intake of other foods and, consequently, there is an increase in the intake of sugar and the total energy. There is a possibility that soft drinks increase hunger, decrease satiety or simply calibrate people to a high level of sweetness that is generalized to the preferences of other foods. Therefore, it is prudent to recommend population reductions in the consumption of soft drinks²⁷.

The fact that the student spends part of the day at school, it must be considered that this scenario may have an important contribution to the students' eating habits. Food consumption is one of the indicators for evaluating health promotion in schools¹⁶. Brazil has an important school feeding program, the National School Feeding Program (PNAE), in order to guarantee school feeding as a right, in a healthy and appropriate way and also the inclusion of food and nutrition education in the teaching and learning process. learning²⁸. However, the 2015 National School Health Survey (PENSE) found that more than half of Brazilian students reported rarely or never consuming the food offered by the school⁹. Another study carried out with school adolescents in a municipality in Paraná found that students' adherence to the food offered by the school was 23.7% in urban public schools, the main reason for non-adherence not liking the preparations²⁹.

On the other hand, an investigation carried out across the national territory found that 90% of the students had access through the school cafeteria to unhealthy foods, including soda and 53.4% did not have access to healthy foods. Among the regions of the country, the lowest exposure of students to the supply of unhealthy food was detected in the southeastern region¹⁶. A study carried out in canteens of public and private schools in Curitiba showed that the majority marketed foods considered prohibited because they have low nutritional value such as soda and did not offer two types of fruits³⁰. It should be noted that despite the existence of criteria established in the current legislation for the sale of food in the school environment, they are still not enough to guarantee the provision of adequate and healthy food, which denotes the importance of frequent training for the owners of these establishments on these laws and nutrition and food education, in addition to inspecting these places, to encourage healthy eating practices³⁰. Adolescents' eating practices can be determined by social influences and preferences that may or may not suit their taste. This situation, in many moments, has overcome your health concerns³¹.

The present study found that approximately 8 out of 10 adolescents do not comply with the recommendation to practice physical activity of at least 300 minutes per week³². This finding corroborates the results of a study conducted in the Brazil's Northeast, with adolescents aged 14 to 19 years (77.5%)¹³. Insufficient physical activity was the most prevalent risk factor (82%) among adolescents aged 12 to 19 years in Mato Grosso³³. The National School Health Survey, 2015, indicated that 72.7% of students performed physical activity for 60 min / day for less than four days a week, that is, they did not reach the recommendation, despite 50% of schools offering classes of Physical Education in three days a week⁵. A study carried out among adolescent students from the state public school, in the city of Sobral (CE), found the predominance of the group of students who did not perform any physical activity, for at least 10 continuous minutes, during the week or who practiced it irregularly for all domains evaluated³⁴. When comparing the three editions³⁴ of PENSE in Brazilian capitals, there was stability in the percentage of students who practice physical activities²⁴, reflecting the importance of promoting healthy behavior among schoolchildren.

Physical education, integrated with the school's pedagogical proposal, is a mandatory curricular component of basic education³⁵, thus, Physical Education teachers have an important role in promoting physical activity in the school environment as a strategy to increase the practice among students, since school Physical Education is mandatory in the country. Student

participation in Physical Education contributes to the increase in habitual physical activity³⁶. Allowing high school students 'dialogical participation in pedagogical planning could be a strategy to increase students' interest in physical education classes, as noted by Santos and Piccolo³⁷, by stating that a great tool to assist the Physical Education teacher in high school is participatory planning.

The practice of physical activity is associated with better health conditions and quality of life in adolescents. It is an important factor for psychomotor and functional development, in addition to contributing to social and intellectual development. In this age group, physical activity prevents the early development of NCDs and reduces the risk of development in adulthood. There is also an increased chance of becoming more active adults^{38,39}. In recent years, many countries have undergone important socioeconomic changes that impacted the amount of physical activity among adolescents. The low percentage of sufficiently active individuals in this age group can be attributed to the increase in the use of automobiles and the time spent watching television, on the internet, playing sedentary games and social media, and by decreasing opportunities for physical activity on the way to school, at school and at leisure³⁹. In this perspective, it is recommended to encourage actions to increase the levels of physical activity, such as the creation of community programs, promotion of sports competitions in leisure time and strengthening of school physical education classes.

In this research, it was found that low-active adolescents were more likely to consume fruit less than three times a week and to consume soda more than five times a week. In the international scenario, a longitudinal study in Germany with children and adolescents showed that high levels of physical activity were associated with a higher consumption of fruits and vegetables among boys and girls. And even though these participants were also less likely to have a high consumption of soft drinks⁴⁰. In a National School Health Survey (PENSE) conducted in 2015, it was found that the longer the time of sedentary behavior, the greater the prevalence of consumption of ultra-processed foods⁷. A study carried out by students from public schools in Aracaju (SE) and the metropolitan region found that those who consumed few servings of fruit on the day were 40% more likely to be physically inactive¹³. Another previous study of national scope also found an association between the consumption of healthy foods such as fruits and vegetables and the practice of physical activity⁴¹. Research conducted in the city of São Paulo found that among different population groups, adolescents had the lowest prevalence of healthy lifestyle⁴². In another study with adolescents in the last year of elementary school in all regions of Brazil, it was found that regular consumption of soft drinks was more prevalent in adolescents with sedentary habits⁴³. Unhealthy diets and physical inactivity contribute to body weight gain and changes in metabolism, and are considered risk factors for major NCDs, including cardiovascular disease, type 2 diabetes, and certain types of cancer. Contribute to the global burden of disease, death and disability¹².

The grouping of various health-compromising behaviors is associated with an increased risk of several chronic diseases. Behavioral risk factors, such as physical inactivity and inadequate food consumption, influence each other, tending to coexist in the same individual and can result in an additional risk of developing overweight and other comorbidities^{6,13,43}. In Saudi adolescents, there was a grouping between low fruit consumption and low physical activity, reflecting non-adherence to preventive health behaviors. The grouping of health behaviors has important implications for health promotion⁴. The adoption of unhealthy behaviors by the adolescents in the present study, may be due to easy access to the consumption of ultra-processed foods, being possible an association with the lack of adequate and safe places for sports practices and possibly the adolescents' lack of knowledge about the importance to adopt a more active lifestyle⁴⁴.

For a holistic approach to prevention it is important to understand and take into account that these health behaviors can interact with each other⁴⁰. For this reason, intersectoral action

between health services, schools and the community is essential to promote awareness actions, awareness to promote healthy habits and daily physical activity routines for adolescents³⁴. The performance of the health and education sectors in an integrated manner is essential to promote awareness and changes in the lifestyle of school adolescents, based on a more participatory model, which distances itself from the prescriptive and disjointed tradition. Therefore, the strengthening of primary prevention strategies³⁵, as the Health at School Program, which seeks to encourage programs to increase physical activity and healthy eating in the school context, it is essential to support measures to promote and protect the health of adolescents⁶.

The findings obtained in the present study can contribute to a reflection and awareness of managers and other professionals related to health sciences about the current context of physical inactivity and unfavorable eating behavior of adolescents, which can have a negative impact on their health conditions. It is important recommending public policies and interventions that make it possible to prevent, monitor and examine this situation. Health professionals in Primary Health Care in partnership with the school, through the Health at School Program, can carry out actions in the school context, especially for the planning and execution of practices focused on balanced nutrition linked to the practice of physical activities such as being the path to a healthy lifestyle, with a focus on reducing risky health behaviors, and adopting protective behaviors, considering that the school is an important space for access to the adolescent public³³. Further studies are encouraged to better understand the health impacts of physical inactivity and inappropriate eating behavior of adolescents.

The results of this research should be interpreted with caution, considering that these are school students only from public schools in a region of the country. Its limitation is the use of self-report instruments that are prone to information bias, e.g., tendencies to mask the response to a favorable path, thus contradicting socially advised habits and behaviors³⁵. It should be noted that this is a study conducted with a representative sample of adolescents, and results were obtained being able to reveal associations and interesting conclusions for the research.

Conclusion

It is concluded that low levels of physical activity among adolescents are associated with poor fruit consumption and, on the other hand, the excessive consumption of soft drinks. This relationship was found for adolescents in a municipality in southeastern Brazil. It can be concluded, therefore, that the frequency of physical activity is related to diet. These findings reinforce the need for measures in the school and family environment to encourage lifestyle habits that involve, in addition to encouraging regular physical activity, adequate nutrition, avoiding foods that are harmful to health and encouraging healthy food intake. . Strategies for regulating the supply and marketing of health-risk foods are important, the implementation of actions directed to parents and teachers to encourage the adoption of healthy habits, in addition to broader approaches such as the improvement of physical spaces for the practice of physical activity.

References

1. World Health Organization. Global status report on noncommunicable diseases 2014. Geneva: WHO; 2014.
2. Malta DC, Andreazzi MAR, Oliveira-Campos M, Andrade SSCA, Sá NNB, Moura L, et al. Tendência dos fatores de risco e proteção de doenças crônicas não transmissíveis em adolescentes, Pesquisa Nacional de Saúde do Escolar (PeNSE 2009 e 2012). *Rev Bras Epidemiol* 2014;17(1):77S-91S. Doi: <https://doi.org/10.1590/1809-4503201400050007>.
3. Leech RM, McNaughton SA, Timperio A. The clustering of diet, physical activity and sedentary behavior in children and adolescents: a review. *Int J Behav Nutr Phys Act* 2014;11:4. Doi: 10.1186/1479-5868-11-4

4. Alzahrani SG, Watt RG, Sheiham A, Aresu M, Tsakos G. Patterns of clustering of six health-compromising behaviours in Saudi adolescents. *BMC Public Health* 2014;14:1215. Doi:<https://doi.org/10.1186/1471-2458-14-1215>
5. Monteiro LZ, Varela AR, Souza P, Maniçoba ACM, Braga Júnior F. Eating habits, physical activity and sedentary behavior among Brazilian schoolchildren: National Student Health Survey, 2015. *Rev Bras Epidemiol* 2020;23:e200034. Doi: <https://doi.org/10.1590/1980-549720200034>.
6. Azeredo CM, Rezende LFM, Canella DS, Claro RM, Castro IRR, Luiz OC, et al. Dietary intake of Brazilian adolescents. *Public Health Nutr* 2015;18(7):1215-24. Doi: <https://doi.org/10.1017/S1368980014001463>
7. Costa CS, Flores TR, Wendt A, Neves RG, Assunção MCF, Santos IS. Comportamento sedentário e consumo de alimentos ultraprocessados entre adolescentes brasileiros: Pesquisa Nacional de Saúde do Escolar (PeNSE), 2015. *Cad Saúde Pública* 2018;34(3):e00021017. Doi: <https://doi.org/10.1590/0102-311x00021017>.
8. Plan of action for the prevention of obesity in children and adolescents. Resolution CE154.R2. In: 154th Session of the Pan American Health Organization Executive Committee. Washington, D.C., USA; 2015, p.16-20.
9. Instituto Brasileiro de Geografia e Estatística (IBGE). Pesquisa Nacional de Saúde do Escolar 2015 (PENSE). Rio de Janeiro: IBGE; 2016.
10. Craig CL, MarshallAL, SjoströmM, Bauman AE, Booth ML, Ainsworth BE, et al. International Physical Activity Questionnaire: 12-country reliability and validity. *MedSci Sports Exerc* 2003;35(8):1381-95. Doi: <https://doi.org/10.1249/01.MSS.0000078924.61453.FB>
11. Matsudo SM, AraújoTL, MatsudoVKR, Andrade DR, Andrade EL, Oliveira LC, et al. Questionário Internacional de Atividade Física (IPAQ): estudo de validade e reprodutibilidade no Brasil. *Rev Bras Ativ Saude* 2001;10:5-18. Doi: <https://doi.org/10.12820/rbafs.v.6n2p5-18>
12. World Health Organization. Global Strategy on diet, physical activity and health. Geneva: WHO; 2004.
13. Silva FMA, Smith-Menezes A, Duarte MFS. Consumo de frutas e vegetais associado a outros comportamentos de risco em adolescentes no Nordeste do Brasil. *Rev paul de pediatri* 2016;34(3):309-15. Doi: <https://doi.org/10.1016/j.rppede.2015.09.004>.
14. Ministério da Saúde [Internet]. Vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico. [acesso em 02 de Abr 2019]. Disponível em: http://bvsms.saude.gov.br/bvs/publicacoes/vigitel_brasil_2017_vigilancia_fatores_riscos.pdf
15. Associação Brasileira de Empresas de Pesquisa [Internet]. Critério de Classificação Econômica Brasil. [acesso em 02 de Abr 2019]. Disponível em: <http://www.abep.org/novo/Content.aspx?ContentID=302>.
16. Horta RL, Andersen CS, Pinto RO, Horta BL, Oliveira-Campos M, Andreazzi MA, et al. Promoção da saúde no ambiente escolar no Brasil. *Rev Saúde Publica* 2017;51(27):1-11. Doi: <https://doi.org/10.1590/s1518-8787.2017051006709>
17. Scheer C, Helal L, Ferrari F, Belém LJ, Fabiano LCC, Pinheiro LT, et al. Programa do Ginásio Experimental Olímpico e sua associação com a prevalência de fatores de risco cardiovascular em adolescentes: estudo transversal. *Arq Bras Cardiol* 2019; 112(6):775-81. Doi: <https://doi.org/10.5935/abc.20190067>.
18. Maia EG, Silva LES, Santos MAS, Barufaldi LA, Silva SU, Claro RM. Padrões alimentares, características sociodemográficas e comportamentais entre adolescentes brasileiros. *Rev Bras Epidemiol* 2018;21(Suppl 1): e180009. Doi: <https://doi.org/10.1590/1980-549720180009.supl.1>
19. Souza EA, Borba JA, Barbosa JMA, Ribeiro GFF, Maylla LB, Martins LB. Consumo de frutas, legumes e verduras por adolescentes do Estado do Maranhão. *Rev Adolescência Saúde* 2016;13(4):33-44.
20. Silva JA, Silva KS, Silva MC, Silveira PM, Duca GFD, Benedet J et al. Consumo de frutas e verduras por adolescentes catarinenses ao longo de uma década. *Ciênc Saúde Coletiva* 2020;25(2):613-21. Doi: <https://doi.org/10.1590/1413-81232020252.32452017>.
21. Guerra LDS, Espinosa MM, Bezerra ACD, Guimarães LV, Martins MSAS. Desafios para a segurança alimentar e nutricional na Amazônia: disponibilidade e consumo em domicílios com adolescentes. *Ciênc Saúde Coletiva* 2018;23(12):4043-4054. Doi: <https://doi.org/10.1590/1413-812320182312.26352016>.
22. Claro RM, Maia EG, Costa BVL, Diniz DP. Preço dos alimentos no Brasil: prefira preparações culinárias a alimentos ultraprocessados. *Cad Saúde Pública* 2016;32(8):e00104715. Doi: <https://doi.org/10.1590/0102-311X00104715>.
23. Monteiro LS, Vasconcelos TM, Veiga GV, Pereira RA. Modificações no consumo de bebidas de adolescentes de escolas públicas na primeira década do século XXI. *Rev Bras Epidemiol* 2016;19(2):348-61. Doi: <https://doi.org/10.1590/1980-5497201600020012>.
24. Oliveira-Campos M, Oliveira MM, Silva SU, Santos MAS, Barufaldi LA, Oliveira PPV, et al. Fatores de risco e proteção para as doenças crônicas não transmissíveis em adolescentes nas capitais brasileiras. *Rev Bras Epidemiol* 2018;21(1):e180002S. Doi: <https://doi.org/10.1590/1980-549720180002.supl.1>

25. Chaves OC, Velasquez-Melendez G, Costa DAS, Caiaffa WT. Consumo de refrigerantes e índice de massa corporal em adolescentes brasileiros: Pesquisa Nacional de Saúde do Escolar. *Rev Bras Epidemiol* 2018;21(1):e180010. Doi: <https://doi.org/10.1590/1980-549720180010.supl.1>.
26. Fontes AS, Pallottini AC, Vieira DAS, Batista LD, Fontanelli MM, Fisberg RM. Increased sugar-sweetened beverage consumption is associated with poorer dietary quality: A cross-sectional population-based study. *Rev Nutr* 2019;32:e180121. Doi: <https://doi.org/10.1590/1678-9865201932e180121>.
27. Vartanian LR, Schwartz MB, Brownell KD. Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis. *Am J Public Health* 2007;97(4):667-75. Doi: <https://doi.org/10.2105/AJPH.2005.083782>
28. Brasil. Lei nº 11.947, de 16 de junho de 2009. Dispõe sobre o atendimento da alimentação escolar e do Programa Dinheiro Direto na Escola aos alunos da educação básica. *Diário Oficial da União* 2009 17 jun 2009; p2-4 .
29. Cesar JT, Taconeli CA, Osório MM, Schmidt ST. Adesão à alimentação escolar e fatores associados em adolescentes de escolas públicas na região Sul do Brasil. *Ciênc Saúde Coletiva* 2020;25(3):977-88. Doi: <https://doi.org/10.1590/1413-81232020253.10742018>.
30. Wognski ACP, Ponchek VL, SchuedaDibas EE, Orso MR, Vieira LP, Ferreira BGCS, et al. Comercialização de alimentos em cantinas no âmbito escolar. *Braz J Food Technol* 2019;22:e2018198. Doi: <https://doi.org/10.1590/1981-6723.19818>.
31. Silva JG, Ferreira MA. Alimentação e saúde na perspectiva de adolescentes: contribuições para a promoção da saúde. *Texto & contexto enferm* 2019;28:e20180072. Doi: <https://doi.org/10.1590/1980-265x-tce-2018-0072>
32. Pate RR, Freedson PS, Sallis JF, Taylor WC, Sirard J, Trost SG, et al. Compliance with physical activity guidelines: prevalence in a population of children and youth. *Ann Epidemiol* 2002;12(5): 303-8. Doi: [https://doi.org/10.1016/s1047-2797\(01\)00263-0](https://doi.org/10.1016/s1047-2797(01)00263-0).
33. Raizel R, Silva VG, Godois AM, Espinosa MM, Machado AD, Duarte SJH, Ravagnani CFC. Comportamentos de risco à saúde de adolescentes e atividades educativas da Estratégia Saúde da família em Cuiabá, Mato Grosso, 2011. *Epidemiol Serv Saúde* 2016;25(2):291-99. Doi: <https://doi.org/10.5123/s1679-49742016000200008>.
34. Barbalho EV, Pinto FJM, Silva FR, Sampaio RMM, Dantas DSG. Influência do consumo alimentar e da prática de atividade física na prevalência do sobrepeso/obesidade em adolescentes escolares. *Cad Saúde Colet* 2020;28(1):12-23. Doi: <https://doi.org/10.1590/1414-462x202028010181>
35. Brasil. [Internet] Lei de Diretrizes e Bases da Educação. MEC/SEB Brasília; 2006. [acesso em 23 ago 2020]. Disponível em: <http://portal.mec.gov.br/pet/323-secretarias-112877938/orgaos-vinculados-82187207/12962-educacao-fisica-obrigatoriedade-da-disciplina>.
36. Barros MVG, Nahas MV, Hallal PC, Farias Júnior JC, Florindo AA, Barros SSH. Effectiveness of a school-based intervention on physical activity for high school students in Brazil: The Saudena Boa Project. *J Phys Act Health* 2009;6:163-9. Doi: <https://doi.org/10.1123/jpah.6.2.163>.
37. Santos MAGN, Piccolo VL. O esporte e o ensino médio: a visão dos professores de educação física da rede pública. *Revbraseducfisesp* 2011;25:65-78. Doi: <https://doi.org/10.1590/S1807-55092011000100008>.
38. Wu XY, Han LH, Zhang JH, Luo S, Hu JW, Sun K. The influence of physical activity, sedentary behavior on health-related quality of life among the general population of children and adolescents: a systematic review. *PLoS One* 2017;12(11):e0187668. Doi: <https://doi.org/10.1371/journal.pone.0187668>.
39. World Health Organization. Global strategy on diet physical activity and health. Fifty-seventh World Health Assembly. Genebra: WHO; 2004
40. Manz K, Mensink GBM, Finger JD, Haftenberger M, Brettschneider AK, Barbosa CL, et al. Associations between physical activity and food intake among children and adolescents: results of KiGGS Wave 2. *Nutrients* 2019;11(5):1060. Doi: <https://doi.org/10.3390/nu11051060>.
41. Sousa JG, Lima LR, Fernandes CRS, Santos GM. Atividade física e hábitos alimentares de adolescentes escolares: Pesquisa Nacional de Saúde do Escolar (PENSE), 2015. *RBNE* 2019;13(77):87-93.
42. Ferrari TK, Cesar CLG, Alves MCGP, Barros MBA, Goldbaum M, Fisberg RM. Estilo de vida saudável em São Paulo, Brasil. *Cad Saúde Pública* 2017;33(1):e00188015. Doi: <https://doi.org/10.1590/0102-311x00188015>.
43. Ferreira NL, Claro RM, Lopes ACS. Consumption of sugar-rich food products among Brazilian students: National School Health Survey (PeNSE 2012). *Cad Saúde Pública* 2015; 31(12):2493-504. Doi: <https://doi.org/10.1590/0102-311X00014515>.
44. Martins MO, Cavalcante VLF, Holanda GS, Oliveira CG, Maia FES, Meneses Júnior JR, et al. Associação entre comportamento sedentário e fatores psicossociais e ambientais em adolescentes da região nordeste do Brasil. *Rev Bras Ativ Fis e Saúde* 2012;17(2):143-50. Doi: <https://doi.org/10.12820/rbafs.v.17n2p143-150>

Authors' **ORCID**:

Lucineia de Pinho: <https://orcid.org/0000-0002-2947-5806>

Henrique Nunes Pereira Oliva: <https://orcid.org/0000-0001-6452-9833>

Anne Christine Alves Pereira: <https://orcid.org/0000-0003-1772-3750>

Ana Clara Veloso Campos de Quadros Godinho: <https://orcid.org/0000-0003-0929-620X>

Isaac Brandão Bittencourt Magalhães: <https://orcid.org/0000-0002-9145-0642>

Leandro Rodrigues Ramos Rocha: <https://orcid.org/0000-0001-9520-8602>

Maria Fernanda Santos Figueiredo Brito: <https://orcid.org/0000-0001-5395-9491>

Rosângela Ramos Veloso Silva: <https://orcid.org/0000-0003-3329-8133>

Received on Jul, 23, 2019.

Reviewed on Jun, 08, 2020.

Accepted on Nov, 13, 2020.

Author address: Lucinéia de Pinho. Av. Profa. Aida Mainartina Paraíso, 80 - Ibituruna, Montes Claros - MG, CEP: 39408-007.
E-mail: lucineiapinho@hotmail.com