

Food Consumption and Anthropometric Evaluation of Students in Elementary School: Literature Review

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Schoolchildren, School Health.

Abstract—Food presents as a vital necessity, necessary for the conservation of life and well-being of individuals. This process is considered a basic requirement for health promotion, contributing to human growth and development with quality. Healthy food is one that keeps the body in a state of health, when it prioritizes adequate food, in quantities and quality, at the right times, and that contains varied nutrients to achieve satisfactory benefits for the health of the body and thus contribute to the acquisition of quality of life (BUSATO et al., 2021). The objective of this work was to discuss the main factors associated with Food Consumption and Nutritional Status of schoolchildren, based on a critical review on the subject. To review the topic, the following databases were consulted: BIREME and CAPES journal, covering the period from 2018 to 2021. The descriptors used in the search were: "food consumption", "nutritional assessment", "nutritional status," "school" and "school health". The research results indicate, through the analysis of the scientific literature, a low consumption of in natura and healthy foods among schoolchildren, in addition to the high consumption of processed and ultra-processed foods, resulting in changes in the nutritional status and consequently in the health of the investigated population, with the presence of overweight and obesity, dyslipidemia and increased blood glucose, predisposing factors for cardiovascular diseases. Thus emphasizing the importance of the debate on the subject in future research.

I. INTRODUCTION

Food presents as a vital necessity, necessary for the conservation of life and well-being of individuals. This process is considered a basic requirement for health

promotion, contributing to human growth and development with quality. Healthy food is one that keeps the body in a state of health, when it prioritizes adequate food, in quantities and quality, at the right times, and that contains varied nutrients to achieve satisfactory benefits

for the health of the body and thus contribute to the acquisition of life quality[1].

With the beginning of school life, the child becomes susceptible to the influences of dietary patterns. In this sense, it is worth mentioning that this is one of the most important phases for the formation of eating habits and behaviors of the little ones, which can last throughout adult life. In the last decade, studies carried out on food consumption in the school environment have revealed a high consumption of foods with low nutritional value (sweets) and high energy density (rich in low value-added carbohydrates), whether these foods are purchased in school canteens, or even , taken from home to be consumed at school [2].

Each child grows and develops from different standards, in this sense; the assessment of nutritional status is one of the most effective instruments to help identify nutritional disorders in all life cycles, being closely linked to ingestion, absorption, use and excretion of nutrients [3]. Thus, when food consumption is inadequate and/or insufficient to meet the needs of each individual, so-called nutritional deficiency can be triggered, such as protein energy malnutrition, overweight and obesity.

Seeking to observe the conjunctures of the current scenario regarding the topic addressed, the work aims to investigate in the available literature articles from the last five years that address the theme "food consumption and anthropometric assessment of elementary school students".

II. METHODOLOGY

2.2 Type of study

This is a qualitative, exploratory study, applying the rules of a bibliographic review.

2.2.1 Study Period

A literature review was carried out through an investigation of articles available in electronic media and published in the period of five years (2018 to 2021). Data collection took place from December 2021 to January 2022.

2.2.2 Sampling

The samples were collected from the academic database BIREME and the CAPES journal using the descriptors: food consumption, nutritional assessment, nutritional status, schoolchildren and school health. The

AND connective was applied between the descriptors. After this selection, there was the moment of analysis, through selective reading of the articles related to the research topic and they were judged according to the research objectives. The chosen language was Portuguese.

2.2.3 Inclusion Criteria

Completed articles were included in this work, which investigated the specific topic addressed in this research, on food consumption and anthropometric assessment of elementary school students.

2.2.4 Exclusion Criteria

Duplicate articles, dissertations, non-indexed publications, theses and monographs were excluded from the research.

2.2.5 Ethical aspects

This research uses the norms of a literature review, and in the approach of ethical aspects, it exempts the submission to the evaluation of the Research Ethics Committee in accordance with Resolution 466/12 of the National Health Council (CNS). However, all established ethical precepts will be considered to ensure the legality of information, privacy and data confidentiality.

2.2.6 Data collection and analysis

After reading the selected articles, the data for the work were obtained, following a synchronized, ordered and divided methodology. Initially, the selection of articles was made, followed by a structured organization highlighting the most relevant points that were addressed in the work and finally the separation and assembly of the final Excel was carried out, with the most relevant results.

2.2.7 Financing

The study received no funding; all costs were borne by the researchers.

2.2.8 Conflict of interests

The authors declare no conflict of interest.

III. RESULTS AND DISCUSSION

Table 1 represents the summary of the analyzed articles.

Table 1 – Summary of the articles

Year	Author	Title	Aim	Results	Conclusion
2018	PAIVA, A. C. T. <i>et al.</i> [4]	Childhood Obesity: Anthropometric, biochemical, food and lifestyle analysis.	To identify changes in BMI in schoolchildren in the city of Poços de Caldas - MG - BR, aged between 6 and 12 years, in addition to evaluating biochemical analyses, anthropometric data and dietary pattern.	The results showed a significant increase in food intake from the sugar group.	It is an important study in the area in order to map and improve the nutritional profile to reduce the risks to which children are exposed.
2018	SCHISLER, C.; PERETTI, G.; BARATTI, L. [5]	Nutritional status and food adequacy of children in a school in the city of São Jorge d'Oeste - PR.	To trace the nutritional profile of schoolchildren and verify the adequacy of energy, proteins, calcium and iron of the school lunch in the morning and afternoon, verifying if they reach the recommendations of the FNDE.	The children included in the study were evaluated grouped by sex (36 females and 41 males). No significant differences were observed between the groups in terms of nutritional status.	The results showed the majority of schoolchildren in adequate nutritional status, however, the foods offered do not meet the nutrient recommendations.
2019	DA SILVA, K. M.; SILVA, K. L. G. D; SANTOS, M. M. D.[3]	Assessment of nutritional status and food consumption of preschoolers and schoolchildren residing in Caetés-PE	To evaluate the nutritional status, food consumption and socioeconomic level of children attending the public school system in the city of Caetés - PE.	Most children had a low intake of fruits, vegetables, legumes, offal, milk and dairy products. The analysis of the socioeconomic profile pointed to a context of social vulnerability, due to the large number of parents with low education and unemployed.	There was a relevant association between physical inactivity, poor diet quality and high rate of excess weight. Therefore, it is necessary to promote strategies that stop the obesogenic factors found, as they favor the emergence of clinical and nutritional disorders.
2019	CORDEIRO, M. C. <i>et al.</i> [6]	Food habits consumption of ultra-processed foods and its	To evaluate the eating habits, the consumption of ultra-processed	The occurrence of overweight/obesity in schoolchildren was highlighted,	It was found that although there was a high consumption of ultra-processed foods, no

		correlation with the nutritional status of schoolchildren in the private network.	foods and their correlation with the nutritional status of schoolchildren from the private network in Teresina - PI.	with excess abdominal adiposity, a factor that indicates risk for cardiovascular diseases.	significant relationships were found between nutritional status and consumption of these foods.
2019	ROSSI, C. E. <i>et al.</i> [2]	Factors associated with food consumption at school and overweight/obesity in schoolchildren aged 7-10 years in Santa Catarina, Brazil.	To investigate the association between the origin of snacks consumed at school, their nutritional value and overweight/obesity.	The research results showed that students from the private network consumed snacks of high nutritional value with significantly higher frequency than students from the public network.	The results show not only the need to expand legislative measures in order to minimize the availability of risky foods in school canteens nationwide, as well as the greater availability/consumption of healthy foods in canteens.
2019	BATALHA, T. B. <i>et al.</i> [7]	Nutritional status and food profile of a female Futsal school team in the city of Caxias do Sul - RS.	To evaluate the nutritional status and food profile of a futsal school team in the city of Caxias do Sul.	The schoolchildren were well-nourished, according to waist circumference, and were not at risk for cardiovascular disease. The percentage of fat was adequate and the athletes have good eating habits, although the associations between the variables studied were not statistically significant.	The research findings showed that the players studied have a balanced diet with a high consumption of vegetables, but also consume candies, breads and pasta with some regularity.
2019	MELO, A. P. R <i>et al.</i> [8]	Nutritional status, eating habits and oral health in a group of schoolchildren.	To investigate the nutritional status, eating habits, caries experience and oral hygiene practices in a group of schoolchildren.	Of the children evaluated, 25% were overweight and 3.5% were underweight. Regarding food consumption, there was a high frequency of ultra-processed foods and sugars.	The findings showed that the nutritional status did not present satisfactory results, showing to be in disagreement with the current guidelines and recommendations of the World Health Organization.
2020	CESAR, J.	Adherence to school meals and	To analyze the rate of adherence	The results showed that the rate of	The findings indicate that the low rate of adherence to

	T. <i>et al.</i> [9]	associated factors in adolescents from public schools in the southern region of Brazil.	to school meals and associated factors in adolescents enrolled in state public schools in the city of Lapa, Paraná, southern Brazil.	adherence to school meals, regardless of the frequency of consumption, was 70.9%, it is observed that the effective adherence rate, four to five times a week, was also higher among adolescents enrolled in a school in the rural area (30.1%).	school meals, in attendance is not being reached. The mentioned factors can help to improve the execution of the program.
2021	OLIVEIRA, R. R; PETER, N. B; MUNIZ, L. C. [10]	Food consumption according to the degree of processing among adolescents in the rural area of a municipality in southern Brazil.	To evaluate food consumption according to the degree of processing and nutrient intake among adolescents in the rural area of Pelotas - RS.	The research results indicate that the average daily consumption was 1,921 calories, 48.2% from natural or minimally processed foods and 31.9% from ultra-processed foods.	The findings of the study indicate that adolescents in rural areas have a higher energy intake from the consumption of in natura or minimally processed foods, even though ultra-processed foods are also part of their diet, demonstrating the nutritional transition.
2021	FERREIRA, C. S. e ANDRADE, F. B [11]	Socioeconomic inequalities associated with overweight and sedentary lifestyle in Brazilian adolescents.	To estimate the prevalence of overweight and physical inactivity in Brazilian schoolchildren aged between 13 and 17 years, and to investigate the magnitude of socioeconomic inequalities related to these outcomes.	The prevalence of overweight in Brazil was 24.2%, ranging from 20.7% in the Northeast region to 27.8% in the South region. The prevalence of sedentary lifestyle in Brazil was 67.8%, ranging from 61.8% in the North region to 70.3% in the Southeast region.	Those in this research point out that it is necessary to restructure and strengthen existing public policies that include adolescents, such as: PNAE and PSE, in order to improve a healthy lifestyle and reduce inequalities.
2021	BEZERRA, M. K. A. <i>et al.</i> [12]	Lifestyle of adolescent students from public and private schools in Recife: ERICA.	To analyze lifestyle-related behaviors of adolescents in Recife, Brazil.	In the research, it was possible to notice that 60% of the adolescents had inappropriate eating behaviors, and ended up	As a result, this research shows that adolescents in Recife have a low frequency of health protection eating behaviors and regular practice of physical activity.

				having breakfast, water/day and meals in front of the TV, around 40% did not have meals with their responsible parents.	
2021	CARVALH O, M. J. L. N. et al. [13]	Perception of above-ideal body weight, anthropometric profile and lifestyle in adolescents from Recife, PE, Brazil.	To analyze the perception of above-ideal body weight in adolescents from Recife/PE and its association with anthropometric profile and lifestyle.	Weight perception was answered by 48.8% of adolescents, of which 36.8% and 63.2% perceived themselves as underweight and overweight, respectively.	The data found in this research suggest that there is an association between the perception of body weight above the ideal and the sociodemographic, anthropometric and lifestyle factors of adolescents aged 12 to 17 years in the city of Recife.

Fonte: Authors, 2022.

3.1 Assessment of food consumption

Melo et al. [8] demonstrated in their research that 27% of their total sample was not in the habit of ingesting fruits and vegetables; this consumption profile contributes to changes in nutritional status, since these foods are rich in fiber and nutrients, and are linked to increased satiety. Similarly to what was observed in this research, Silva et al. [14] in their study on nutritional assessment and food consumption in schoolchildren aged 10 to 14 years, found that the intake of fruits, vegetables, milk and dairy products was below the recommended, and such factors were correlated with socioeconomic characteristics and favorable eating habits; food with products with more accessible prices, being considered nutritionally inadequate. Similarly, Spinelli et al. [15] observed that adequate intake of fruits and vegetables is related to lower BMI values, thus suggesting that both the energy value of the food consumed and the quality of the diet offered will contribute to body weight control, and in the condition adequate health of the individual.

Also in this sense, the results found by Melo et al. [8] of overweight schoolchildren are similar to the study by Henrique et al. [16], in which 105 children participated, of which 28.8% were overweight, data similar to those found in the study. Regarding eating habits Henrique et al. [16], through the food frequency questionnaire, observed that the students had a monthly food consumption of stuffed cookies (62.8%) and sweets (28.6%), similar to that observed in the study. Lopes et al. [17], points out in their study a high consumption of cakes, stuffed cookies,

soft drinks and sugars that are identified as cariogenic foods. The study by Carteri et al. [18], in which 50 children were part of the studied sample, in which the prevalence of caries was 46% and 24% of the children had at least one tooth with untreated caries. In summary, it was possible to observe that schoolchildren have worrying levels of poor eating habits, overweight and compromised oral health.

In the research by Schissler et al. [5], the example of inadequate nutrition can be observed, in which the results of the study with schoolchildren showed the amount of calcium below the recommended range, with only 53.37% of the indicated total being consumed in the afternoon and 50, 92% in the morning, and it was found that values consumed in the present study are below the recommended, such results can promote a series of nutritional deviations and cause changes in health. Similarly, Verly-Junior et al. [19], observed in their study on school menus that the amount of calcium was not achieved in inflexible meal models, that is, which did not allow adjustments, in menus with 30% of the RDI, it was easily possible to supply 60% of the need for these nutrients, on the menus with 20% of the RDI, this fact was more difficult. It is not enough just to introduce these foods into the diet, it is necessary that they are consumed in adequate quantity and frequency.

3.2 School Meals

Cesar et al. [9] in their research with adolescents enrolled in state public schools in the municipality of Lapa, Paraná, southern Brazil, which includes 5 urban and

5 rural schools in the municipality, observed that the rate of adherence to school meals was high (70.0 %) according to the classification proposed by Sturion [9], mainly among schools in rural areas. Similarly, it was possible to observe in the study by Ferro et al. [20] (2019), where 41 students were analyzed, in a school in the interior of São Paulo, and in which it was possible to verify that 70.7% of the total of the evaluated children consumed in the canteen daily, in addition, the snacks eaten were mostly composed of processed and high-calorie foods, which may be related to the low variety of healthy foods sold in the canteen and the high supply of low-nutrition products available for this public to access, such as: industrialized beverages (juices and soft drinks); stuffed dumplings; chips; chocolates and sweets, among others.

Likewise, the work by Rossi et al. [2] presented results of an investigation into the association between the origin of snacks consumed at school, their nutritional value and overweight/obesity. As a result, it was noticed in the study that overweight/obesity was associated with the consumption of food from canteens in the private network. And the fact that students brought food from home was associated with a higher consumption of snacks of low nutritional value in public schools. Equivalently, Melim et al. [21] in their research on the eating habits of students in the metropolitan region of Rio de Janeiro, it can be observed that there was a greater consumption of carbohydrate foods such as cookies and bread for breakfast, mainly; such habits were also reflected in the other meals with the consumption of hypercaloric and unhealthy foods.

3.3 Consumption of ultra-processed foods

The results of the work by Oliveira et al. [10] with the rural school community, in the city of Pelotas-RS, showed that even in the rural area, where the availability of natural food is greater, industrialized products become more accessible to adolescents, who integrate them into their daily consumption. Furthermore, a lower contribution of fruits and vegetables to daily caloric intake was observed. Likewise, in their study Valença et al. [22], when investigating the influences and preferences in the food consumption of ultra-processed foods in rural areas, could see that the factor that most influences the food preferences of their target population was the taste of food, in which this was formed since early childhood. In this sense, the school must work on Food and Nutrition Education in a present way since the first cycles of education, in order to minimize the impacts on the health of individuals over time.

In their research, Cordeiro et al. [6] evaluated the percentage of consumption of ultra-processed foods by

children from a private school in Teresina-PI. The results showed expressive percentages of consumption of ultra-processed foods, and highlighted that most of the caloric intake of these children is composed of high glycemic index carbohydrates and total fat. Similarly, Andretta et al. [23] in their study on food consumption of ultra-processed foods observed a high percentage of consumption of ultra-processed foods in schoolchildren aged 6 to 16 years enrolled in schools in the municipal education network of Caxias do Sul-RS. This fact highlights the need to promote preventive health programs aimed at informing schoolchildren, parents and guardians about healthy eating. Likewise, the results of the study by Landim et al. [24], were similar to the findings in the research on the food consumption of ultra-processed foods in schoolchildren, in which a high intake of ultra-processed foods was observed, making it possible to correlate these results with the overweight and obesity presented, as well as a greater susceptibility to risk of cardiovascular disease.

3.4 Nutritional status of schoolchildren

In a research on the assessment of the nutritional status and food profile of a school team of futsal players, carried out by Batalha et al. [7], the results showed that more than 90% of schoolchildren were classified as eutrophic. Even with a high consumption of carbohydrates and industrialized products, the adolescents managed to maintain an adequate weight and BMI within the eutrophic classification. Still in this context, in a study proposed by Silva et al. [25], responsible for evaluating the nutritional composition of school meals in a state school in Paraná, it was possible to observe that 66.88% were eutrophic, and to a lesser extent 31.17 % were overweight. Similar to this study, Conceição et al. [26] in their study that addressed food consumption in schoolchildren from public and private schools in the city of São Luís do Maranhão, found that there was insufficient consumption in 66.3% of the students participating in the study, however, 30, 1% had high consumption. In this context, it is important to emphasize the relevance of good eating practices in the school environment.

In the research by Carvalho et al. [13], who worked with schoolchildren enrolled in the public and private school system in the city of Recife, and addressed the perception of body weight, it was highlighted that more than 50% of the participants reported a different body image from the ideal, and, most respondents reported being overweight or very overweight. On the other hand, in the study by Cutchma et al. [27] carried out in the city of Colombo-PR, overweight was present in 7.1%. In this way, it is necessary to carry out, whenever possible, a survey regarding health and well-being conditions within

schools, as well as psychological monitoring whenever necessary, in order to improve the perception of their own image by young people today.

3.5 Changes in health

In their studies Romanholo et al. [28] observed the relationship between biological maturation and the image of schoolchildren aged 7 to 12 years old in a municipal school in Cacoal in Rondônia, and their results showed that sexual maturation in girls was related to obesity, the same was not observed in the sample of boys. The results of this study corroborate the findings of Carvalho et al. [13], in which it was also possible to observe a greater tendency of overweight among the analyzed girls, to the detriment of the boys who composed the sample. Thus, it can be intuited that they present a high success rate for this pattern, a fact linked mainly to the period of body development and hormonal changes, to which they are subject.

In the research by Bezerra et al. [12], which analyzed the behaviors related to the lifestyle of adolescents in Recife-PE, it was observed that the most prevalent lifestyle areas among adolescents were inappropriate eating behavior and physical inactivity, as well as consumption of alcohol and smoking. These behaviors also revealed different patterns between sex, higher and lower social classes and by type of school (public and private). Similarly, in the study by Barbalho et al. [29] with school adolescents in the city of Sobral-CE, it was also possible to observe inadequate eating habits, associated with the increasing prevalence of overweight/obesity cases in the evaluated schoolchildren, as well as a plurality in the prevalence of overweight/obesity in relation to the women. Regarding physical activity, there was also a predominance of physical inactivity among adolescents. Thus, it is considered important to monitor the lifestyle during adolescence, especially in the school environment, so that health intervention strategies can be subsidized, with the objective of preventing Chronic Non-Communicable Diseases (NCDs) in adult life.

3.6 Socioeconomic profile

Ferreira and Andrade's [11] research carried out with Brazilian schoolchildren, in which they demonstrated in their results that the prevalence of overweight and sedentary behaviors is greater in the South, Southeast and Midwest regions, where they have a higher level of economic development, when compared to the North and Northeast regions. Another fact also observed in the study correlated with these factors is the inequality in relation to the schooling of the adolescents' mothers. The results of the study by Rosa & Araújo [30] corroborate these findings,

in which it was observed that the mother's education has been indicated as a condition related to the intensification of childhood obesity. With regard to family income, it was noted that the height deficit between the thresholds of the purchasing power classes is up to three times, with growth retardation in childhood being centralized in the socioeconomically less favored classes. It can be inferred that these occurrences are related to difficulties in obtaining food and higher caloric expenditure among the most disadvantaged.

IV. CONCLUSION

The present study obtained significant results through the analysis of the scientific literature on the current situation of food consumption in elementary school students. In this context, it was possible to observe that there is a low consumption of fresh and healthy foods among schoolchildren, in addition to the high consumption of processed and ultra-processed foods, resulting in changes in the nutritional status and consequently in the health of the investigated population, with the presence of overweight and obesity, dyslipidemia and increased blood glucose, predisposing factors for cardiovascular diseases.

These factors reinforce the need to improve the child's dietary pattern, which is outside the recommended range by Organs responsible bodies. With regard to socioeconomic conditions, low schooling is closely associated with the quality of the diet offered, since low knowledge about healthy eating and the difficulty in acquiring food impairs adherence to this practice.

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