



FEEDING MARKERS, NUTRITIONAL STATUS, AND SOCIAL DETERMINANTS OF CHILDREN IN PRIMARY HEALTH CARE

MARCADORES DE ALIMENTAÇÃO, ESTADO NUTRICIONAL E DETERMINAÇÕES SOCIAIS DE CRIANÇAS NA ATENÇÃO PRIMÁRIA À SAÚDE

MARCADORES DE ALIMENTACIÓN, ESTADO NUTRICIONAL Y DETERMINANTES SOCIALES DE NIÑOS EN LA ATENCIÓN PRIMARIA DE SALUD



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ABSTRACT

Introduction: Childhood obesity represents one of the greatest public health challenges, resulting from the interaction between genetic, behavioral, and environmental factors that contribute to the formation of an obesogenic environment. Factors such as increased consumption of ultra-processed foods (UPF), limited access to fresh foods, sedentary lifestyle, unhealthy food advertising, and high screen exposure contribute to inadequate diets and a higher risk of obesity and other chronic non-communicable diseases. In this context, the Food and Nutrition Surveillance System and Primary Health Care play an essential role in the early identification of inadequate eating habits and in the promotion of child health.

Objective: To investigate the relationship between the prevalence of dietary markers and nutritional status, considering the social and territorial context of children assisted in Primary Health Care.

Methods: Cross-sectional study based on secondary data from 1,030 children aged 2 to 9 years assisted in Primary Health Care in Governador Valadares, Minas Gerais, in 2023. Information was obtained from the Food and Nutrition Surveillance System and the electronic medical record “Vivver Sistemas,” analyzing the following data: food consumption and screen exposure, through the Food Consumption Markers questionnaire; and nutritional status, determined by weight and height.

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Results: Most participants were preschool-aged, female, brown-skinned, and residents of urban areas. The consumption of healthy food markers, such as beans, fruits, and vegetables, was more frequent among children living in rural areas, while the consumption of ultra-processed foods and the habit of eating meals in front of screens were more common among those living in urban areas. Obesity was more prevalent among urban and brown-skinned children and more frequent among school-aged than preschool children. In addition, both preschool and school-aged children with excess weight showed lower vegetable intake and higher consumption of ultra-processed foods, highlighting the relationship between inadequate dietary patterns and overweight.

Conclusion: Nutritional status and dietary markers among children were associated with social and territorial context, with higher consumption of healthy foods in rural areas and ultra-processed foods in urban areas. These findings reinforce the influence of social determinants of health on children's eating and nutrition.

Keywords: Child Nutrition. Nutritional Status. Primary Health Care. Social Determinants of Health. Pediatric Obesity.

RESUMO

Introdução: A obesidade infantil representa um dos maiores desafios da saúde pública, resultante da interação entre fatores genéticos, comportamentais e ambientais que favorecem a formação de um ambiente obesogênico. Fatores como o aumento do consumo de alimentos ultraprocessados (AUP), baixo acesso a alimentos in natura, sedentarismo, publicidade de alimentos não saudáveis e alta exposição a telas, contribuem para dietas inadequadas e maior risco de desenvolvimento de obesidade e demais doenças crônicas não transmissíveis. Nesse contexto, o Sistema de Vigilância Alimentar e Nutricional e a Atenção Primária à Saúde desempenham papel essencial na identificação precoce de hábitos alimentares inadequados e na promoção da saúde infantil.

Objetivo: Investigar a relação entre as prevalências dos marcadores da alimentação com o estado nutricional, considerando o contexto social e territorial de crianças atendidas na Atenção Primária à Saúde.

Material e Métodos: Estudo transversal, baseado em dados secundários de 1030 crianças de 2 a 9 anos atendidas na Atenção Primária à Saúde de Governador Valadares - Minas Gerais em 2023. As informações foram obtidas por meio do Sistema de Vigilância Alimentar e Nutricional e do prontuário eletrônico "Vivver Sistemas", analisando os seguintes dados: consumo alimentar e exposição à telas, através do questionário de Marcadores de Consumo Alimentar; e estado nutricional, determinado pelo peso e estatura.

Resultados: A maioria das crianças participantes eram pré-escolares, do sexo feminino, de cor parda e residentes da zona urbana. Observou-se que o consumo de marcadores saudáveis da alimentação, como feijão, frutas e hortaliças, foi mais frequente entre as crianças que residiam na zona rural, enquanto o consumo de alimentos ultraprocessados e o hábito de realizar refeições em frente às telas foram mais comuns entre as residentes da zona urbana. A obesidade foi mais prevalente entre crianças da zona urbana e de cor parda, sendo mais frequente entre escolares do que pré-escolares. Além disso, tanto pré-escolares quanto escolares com excesso de peso apresentaram menor consumo de hortaliças e maior consumo de alimentos ultraprocessados, evidenciando a relação entre padrões alimentares inadequados e excesso de peso.

Conclusão: Observou-se que o estado nutricional e os marcadores da alimentação infantil estão associados ao contexto social e territorial, com maior consumo de alimentos saudáveis



em áreas rurais e de ultraprocessados em zonas urbanas. Esses achados reforçam a influência dos determinantes sociais da saúde na alimentação e nutrição de crianças.

Palavras-chave: Alimentação Infantil. Estado Nutricional. Atenção Primária à Saúde. Determinantes Sociais da Saúde. Obesidade Infantil.

RESUMEN

Introducción: La obesidad infantil representa uno de los mayores desafíos para la salud pública, resultante de la interacción entre factores genéticos, conductuales y ambientales que favorecen la formación de un entorno obesogénico. Factores como el aumento del consumo de alimentos ultraprocessados (AUP), el bajo acceso a alimentos frescos, el sedentarismo, la publicidad de alimentos no saludables y la alta exposición a pantallas contribuyen a dietas inadecuadas y a un mayor riesgo de desarrollar obesidad y otras enfermedades crónicas no transmisibles. En este contexto, el Sistema de Vigilancia Alimentaria y Nutricional y la Atención Primaria de Salud desempeñan un papel esencial en la identificación temprana de hábitos alimentarios inadecuados y en la promoción de la salud infantil.

Objetivo: Investigar la relación entre las prevalencias de los marcadores de alimentación y el estado nutricional, considerando el contexto social y territorial de los niños atendidos en la Atención Primaria de Salud.

Material y Métodos: Estudio transversal basado en datos secundarios de 1.030 niños de 2 a 9 años atendidos en la Atención Primaria de Salud de Governador Valadares, Minas Gerais, en 2023. La información se obtuvo del Sistema de Vigilancia Alimentaria y Nutricional y de la historia clínica electrónica “Vivver Sistemas”. Se analizaron los siguientes datos: consumo alimentario y exposición a pantallas (mediante el cuestionario de Marcadores de Consumo Alimentario), y estado nutricional, determinado por el peso y la estatura.

Resultados: La mayoría de los niños participantes eran preescolares, de sexo femenino, de color pardo y residentes en zonas urbanas. Se observó que el consumo de marcadores saludables de la alimentación, como frijoles, frutas y hortalizas, fue más frecuente entre los niños residentes en zonas rurales, mientras que el consumo de alimentos ultraprocessados y el hábito de realizar comidas frente a pantallas fueron más comunes entre quienes vivían en zonas urbanas. La obesidad fue más prevalente entre los niños de zonas urbanas y de color pardo, siendo más frecuente en escolares que en preescolares. Además, tanto preescolares como escolares con exceso de peso presentaron menor consumo de hortalizas y mayor consumo de alimentos ultraprocessados, evidenciando la relación entre patrones alimentarios inadecuados y exceso de peso.

Conclusión: Se observó que el estado nutricional y los marcadores de alimentación infantil están asociados al contexto social y territorial, con mayor consumo de alimentos saludables en áreas rurales y de ultraprocessados en zonas urbanas. Estos hallazgos refuerzan la influencia de los determinantes sociales de la salud en la alimentación y nutrición infantil.

Palabras clave: Alimentación Infantil. Estado Nutricional. Atención Primaria de Salud. Determinantes Sociales de la Salud. Obesidad Infantil.



1 INTRODUCTION

Childhood obesity is one of the main contemporary public health challenges, resulting from a complex series of genetic, behavioral (such as reduced duration of exclusive breastfeeding, excessive consumption of ultra-processed foods (UPF), sedentary behavior and reduced sleep duration) and environmental (such as advertising of unhealthy foods, high exposure to screens, swamps and food deserts), these are co-dependent on the families' living situation and therefore characterize an obesogenic environment¹. Such factors, when associated, contribute to a higher risk of developing obesity and other chronic non-communicable diseases (NCDs), such as diabetes mellitus, hypertension, and dyslipidemias², as well as growth, psychological, and behavioral problems in childhood³.

Due to the nutritional transition, access to UPF has become easier, especially for the population of lower socioeconomic status, due to the fact that such foods are less expensive⁴. In addition, a survey conducted by UNICEF in 2021 on Early Childhood Feeding⁵ showed that approximately 85% of families did not consume fruits and vegetables daily, due to the absence of vegetable gardens or markets near their homes. It is emphasized that the basis of the population's diet should be natural and minimally processed foods, especially by children who are in the phase of developing eating habits, thus favoring the prevention of micronutrient deficiencies, obesity and the promotion of healthy growth and development⁶.

In the last 25 years, the rate of overweight children and adolescents has increased by 197 million, with 5.0% of children under 5 years of age and 20.0% of children over 5 years of age currently living with overweight⁷. This increase occurs in a context marked by the growing availability and accessibility of the population to UPUs, whether through physical locations or through the media, thus compromising the effectiveness of policies and programs aimed at protecting children from an unhealthy food environment⁷. This reality contributes to nutritionally inadequate diets, as demonstrated by the 2017-2018 Household Budget Survey (POF)⁸, according to which less than 10% of the general population meets the daily recommendations for fruit and vegetable consumption.

In this scenario, the Food and Nutrition Surveillance System (SISVAN), an ally of Primary Health Care (PHC) professionals for food and nutrition surveillance actions, plays a fundamental role in the early identification of unhealthy eating habits in children, thus contributing to the planning of actions that promote child health⁹.

Thus, due to the need to assist the management of PHC in a medium-sized municipality in the east of Minas Gerais for actions to evaluate and monitor child nutrition and nutrition, the present study aimed to investigate the relationship between the prevalence of



food markers and nutritional status, considering the social and territorial context of children treated in Primary Health Care.

2 METHODOLOGY

This is a cross-sectional study, based on data from secondary sources, with a sample audience of 1030 children aged 2 to 9 years. The collection of data related to food consumption, nutritional status and social context of the children assisted in the PHC of Governador Valadares - Minas Gerais was carried out by the Municipality of Governador Valadares (PMGV), in 2023. The data were recorded in the individualized Food and Nutrition Surveillance System (SISVAN-WEB of the municipality by the Department of Health Care (DAS) and by the electronic medical record "Vivver Sistemas".

Information on food consumption was collected through the "Food Consumption Markers Form" proposed by SISVAN, which consists of questions referring to the day before the survey and is aimed at the entire population according to age groups: children under 6 months; children from 6 months to 23 months; children aged 2 and over, adolescents, adults, pregnant women and the elderly. Thus, the markers of healthy food consumption were established by the following questions: "Did you eat beans yesterday?", "Did you eat fresh fruit yesterday" and "Did you eat fresh fruit and vegetables?" Regarding unhealthy markers, the responses regarding the consumption of hamburgers and/or sausages, sweetened beverages and stuffed cookies, sweets or sweets on the previous day were grouped into a single analytical category, called "consumption of ultra-processed foods on the previous day", due to the similarity of the characteristics and degree of processing of these foods. In addition, within this same marker, the variable "Are you used to eating while watching TV, using the computer and/or cell phone?" was also analyzed?

For information regarding nutritional status, data from SISVAN were used, which were weight and height measurements in children aged 2 to 10 years, and analyzed according to W/A, H/A, and BMI/A according to z-scores, using the following classifications: low weight-for-age (\geq EZ -3 and \leq -2), adequate weight-for-age (\geq EZ -2 and \leq +2), and high weight-for-age ($>$ EZ +2); short stature for age ($<$ -2) and height appropriate for age (\geq EZ +2 and $<$ +3); thinness (\geq EZ -3 and $<$ -2), normal weight (\geq EZ -2 and \leq +2), overweight ($>$ EZ +1 and \leq +2) and obesity ($>$ EZ +2 and \leq +3)¹⁰. For the analysis of nutritional status, only children who had the food consumption marker duly filled in were selected, and this sample consisted of 283 children.



Sociodemographic data were collected from the Vivver Sistemas medical records, and information on age, sex, race/color, place of residence (urban/rural) and education level of the mother or guardian was collected.

Descriptive statistical analysis and Pearson's Chi-square or Fisher's exact test were performed. For variables with more than two categories, the Bonferroni correction was performed. The level of statistical significance adopted was 5%. The Stata software, version 16.1 was used to organize, process and analyze the data.

The present study was submitted to the Human Research Ethics Committee of the Federal University of Juiz de Fora - Minas Gerais, as required by the Resolution of the National Health Council No. 738, of February 1, 2024, which provides for the use of databases for scientific research purposes involving human beings, being approved under opinion number 79307024.4.0000.5147.

3 RESULTS

A total of 1,030 children participated in this study, 62.6% of whom were preschoolers and 37.4% were schoolchildren. The children were mostly female (51.7%), residents of the urban area (85%), brown (85%) and children of mothers who had completed elementary school (32%) or high school (31%). This sociodemographic profile was similar between the two age groups (preschool and school) (**Table 1**).

Markers of healthy eating, such as the consumption of beans, fruits and vegetables, showed different patterns, according to sex and place of residence. For preschool children, there was a higher frequency of consumption of beans among boys (84.3%, $p = 0.035$) and those who lived in the rural area (95.1%, $p = 0.002$), as well as a higher frequency of consumption of fruits and vegetables among rural residents (91.8%, $p = 0.036$ and 73.8%, $p = 0.020$, respectively), when compared to their peers in the urban area (77.8%; 79.6%; 81.1% and 58.5%, respectively). It was also possible to observe a higher frequency of UPF consumption (89.0%, $p = 0.001$) and a greater habit of eating in front of screens (64.2%, $p = 0.002$) by residents of the urban area when compared to those in the rural area (70.7% and 44.3%, respectively). In relation to schoolchildren, there was a higher consumption of fruit among children whose mothers had not completed primary education when compared to those with higher education (100.0% vs. 64.7%, $p = 0.029$) and higher consumption of vegetables by residents of rural areas compared to those in urban areas (64.8% vs. 52.5%, $p = 0.035$). It was also possible to observe a higher frequency of UPF consumption by residents of the urban area (88.1%, $p = 0.009$), in addition to the greater habit of girls having



their meals in front of screens (85.5%, $p = 0.044$), when compared to their peers in the rural area (76.9% and 74.1%) (**Table 2**).

In the analysis of nutritional status, no statistically significant differences were observed between age groups and sociodemographic variables. However, according to BMI/A, 6.29% of **preschool children were obese**, while among **schoolchildren** this percentage increased to **16.94%**. Obesity was more frequent among residents of urban areas compared to rural areas, both among preschool children (100% vs. 0.0%) and schoolchildren (76.2% vs. 23.8%). It was also found among brown children when compared to white and black children, both among preschool children (100% vs. 0% vs. 0%) and schoolchildren (85.7% vs. 4.8% vs. 4.8%) (**Table 3**).

The association analysis showed significant relationships between dietary markers and the nutritional status of children. Preschool children with obesity had lower vegetable consumption compared to eutrophic children (20.0% vs. 67.0%, respectively; $p = 0.022$). Similarly, among schoolchildren, vegetable consumption was significantly lower in those with high weight-for-age (30.0%) compared to those with adequate weight (70.0%) and low weight (50.0%) ($p = 0.002$). In addition, UPF consumption was more frequent among schoolchildren with high weight for their age (90.0%) than among those with adequate weight (82.0%) and low weight (0.0%) ($p = 0.001$) (**Figure 1**).

4 DISCUSSION

The results of this study indicate that the urban environment is associated with a higher frequency of consumption of ultra-processed foods, use of screens and obesity; while the rural environment favors less exposure to risk behaviors. In addition, they show the worsening of the prevalence of overweight in the transition from preschool to school, which reinforces the need for longitudinal follow-up. It is also noteworthy how social determinants directly influence food consumption and children's nutritional status.

The consumption of beans and vegetables were the most frequently consumed by children living in rural areas, both preschool and school. This reality can be explained by the easier access to natural or minimally processed foods in this context, thus favoring the prevention of nutritional deficiencies and NCDs⁸. In the study conducted by Costa, DVP *et al.*,¹¹ it was also possible to identify that residents of rural areas tend to have a higher consumption of healthy foods such as beans, fruits and vegetables.

On the other hand, UPF consumption was significantly higher among children in urban areas, both preschool and school. The literature shows that the migration that occurred over the years of the population to the urban area contributes to the characterization of an



obesogenic environment¹². In addition, findings from the UNICEF5 pointed out that about 80% of children under 6 years of age and residents of urban areas have a high consumption of UPF, such as hamburgers, sausages, sugary drinks, salty/stuffed cookies, sweets, sweets, instant noodles and/or packaged snacks. Such foods favor excess weight, however, consumption is still high in the population due to high palatability, practicality, long shelf life and a strong advertising appeal¹³. Costa, CS *et al.*,¹⁴, when conducting a study with children aged 4 to 8 years, demonstrated that there is a positive association between UPF consumption and increased waist circumference, thus indicating an increased risk for metabolic complications related to obesity.

In this study, it was also observed that children had a high habit of having their meals in front of screens. This result corroborates the findings of Silva, MCB¹⁵, where approximately 60% of the children analyzed also had the habit of using screens during meals. The prolonged use of screens during meals is positively related to increased UPF consumption and reduced intake of fresh foods by children¹⁶. In addition, both the habit of eating in front of screens and the consumption of any UPA characterize an unhealthy eating pattern. This relationship is aggravated by the influence of advertising, which encourages the excessive consumption of these products and can generate negative impacts on children's health¹⁷. In the integrative review carried out by Strauss¹⁸, it was possible to perceive that food *marketing* impacts children's awareness, food choices and nutritional status. In this context, the National Food and Nutrition Policy (PNAN)¹⁹ highlights the importance of monitoring food-related advertising, with the aim of protecting consumers from undue nutritional claims and promoting individual autonomy for healthy food choices.

In this study, no statistically significant associations were found between nutritional status and sociodemographic variables, a factor that can be explained by the sample size analyzed. However, Buss & Filho²⁰ highlight that factors such as maternal education, family income, place of residence and race/color can be considered social determinants and influence the health of individuals. Faria²¹ highlighted in his study a higher prevalence of overweight in schoolchildren whose mothers had a low level of education. Similarly, in a study carried out with schoolchildren in the interior of Minas Gerais, it was shown that the excess weight found in 29.8% of the sample was related to low parental education, low socioeconomic level, high intake of UPF and low consumption of fresh foods²².

At the global level, indices reveal a higher prevalence of obesity compared to malnutrition in children⁷. In Brazil, data from SISVAN in 2023²³ showed that, according to BMI/A, 6.23% of preschool children and 14.36% of schoolchildren were obese. In the local context, the results of this study revealed slightly increased prevalences, both for preschool



and school children (6.29% and 16.94%, respectively). When comparing these findings with those of Silva, CG24, who analyzed the nutritional status of preschool children in Governador Valadares in 2018, an increase of 3.18% in overweight in this age group was observed. These results reinforce the growing trend of childhood obesity in the city over the last few years.

In addition, in agreement with the literature^{2,25} that points to high UPF consumption and low consumption of fresh foods as predictors of childhood obesity and other NCDs, this study also identified the association between preschool and overweight schoolchildren. In addition, another relevant point of the study was the low consumption of vegetables among preschool children and overweight schoolchildren, evidencing the association between inadequate dietary patterns and nutritional status in a longitudinal manner.

These findings reveal the need for intersectoral actions aimed at food and nutrition education from early childhood. The prevention of childhood obesity in PHC should go beyond traditional consultations, requiring a multiprofessional approach and educational actions that involve children, guardians and also the school environment²⁶. In this context, the school is of great relevance for the formation of healthy eating habits in childhood, especially through the National School Feeding Program (PNAE), which promotes adequate nutrition in accordance with the principles of the Food Guide for the Brazilian Population²⁷. In a study conducted by Pedroso²⁸ that evaluates the temporal trend of the nutritional status of Brazilians assisted in PHC from 2012 to 2021, it is shown that the nutritional indicators of preschool children have remained stable over the years; on the other hand, among schoolchildren, there was a decrease in thinness and an increase in the rates for overweight (both through W/A and BMI/A), thus reinforcing the need for early interventions in relation to the determinants of childhood obesity. Based on this context, the creation of the National Strategy for the Prevention and Care of Obesity (PROTEGE)²⁹ on August 10, 2021, aims to prevent and combat the increase in childhood obesity through actions articulated by various sectors, such as education, food and nutrition security, sports, social assistance, urban development, and agriculture. However, according to the established eligibility criteria (such as population less than 30 thousand inhabitants, minimum prevalence of 15% of children under 10 years of age with overweight and coverage of the assessment of nutritional status greater than 50% in children under 10 years of age), it is not possible for several Brazilian municipalities to participate. Such limitation compromises the effective reach of preventive actions and public policies to combat childhood obesity, especially in places in Brazil where this prevalence has been increasing over the years, such as Governador Valadares.



Therefore, the results obtained reinforce the urgency of structuring policies that expand access to healthy foods, regulate the advertising of ultra-processed foods, and strengthen the role of schools and PHC as spaces for the formation of healthy eating habits.

The study presents limitations to the use of secondary data, which can compromise the accuracy of the information, concomitantly with memory biases, due to the fact that the questions about food refer to a previous date; the filling out of the food marker form and the measurement of weight and height were not carried out by the research company itself, which may result in the absence of uniform criteria; sample loss for the analysis of the nutritional status of children; and, finally, it is also possible to list the lack of some information about the research audience in the medical records of the Vivver system. However, the study included data from a population in a representative sample size of the municipality, in order to ensure greater reliability of the results; use of official data from SISVAN and the municipal electronic medical record; in addition to the relevance of the theme, centered on food markers, nutritional status and the social and territorial context of children, stratifying by preschool and school age groups.

5 CONCLUSION

Our study demonstrated that food consumption and nutritional status of children between 2 and 9 years of age are strongly related to the social and territorial context. Children living in rural areas had a higher consumption of healthy foods, such as beans and vegetables, while the consumption of UPF foods was more prevalent among those living in urban areas, especially among brown and overweight children. In addition, the worsening of the prevalence of overweight in the transition from preschool to school was also demonstrated.

These findings reinforce that infant feeding is the result of social determinants of health that involve social and territorial context, access to food, and media influence. Food and nutrition surveillance, and other public sectors, especially through SISVAN, PHC actions and the school environment, are an essential tool for the early detection of risks and for the confrontation of childhood obesity, as well as for the full exercise of the Human Right to Adequate and Healthy Food. Therefore, it is of paramount importance to continue and need future longitudinal studies with multivariate analyses, capable of elucidating in more depth the determinants of childhood obesity and subsidizing more effective public policies.



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APPENDIX

Table 1

Sociodemographic characteristics of preschool and school children using Primary Health Care, living in the municipality of Governador Valadares – MG, in 2023

Variables	Preschool		Scholastic		Total	
	n	%	n	%	n	%
Gender						
Male	312	48,4	185	48,1	497	48,3
Female	333	51,6	200	51,9	533	51,7
Place of residence						
Urban	563	90,4	293	76,3	876	85
Rural	61	9,5	91	23,7	152	14,8
Not informed	1	0,2	1	0,3	2	0,2
Race/Color						
White	51	7,9	43	11,5	94	9,1
Brown	563	87,3	313	83,7	876	85
Black	16	2,5	14	3,7	30	2,9

Not informed	13	2	11	2,9	24	2,3
Mother's education						
Higher education	15	2,3	17	4,4	32	3,1
Middle school	199	30,9	120	31,2	319	31
Complete Elementary School	212	32,9	118	30,6	330	32
Incomplete Elementary School	17	2,6	17	4,4	34	3,3
None	8	1,2	8	2,1	16	1,6
Not informed	194	30,1	105	27,3	299	29

Source: The authors.

Table 2
Diet markers of preschool and school children using Primary Health Care, according to sociodemographic characteristics, living in the municipality of Governador Valadares – MG, in 2023

Variables	Bean		Fruits		Vegetables		Ultra-processed foods		Screen at meal	
	preschool		scholastic		preschool		scholastic		preschool	
	%	p	%	p	%	p	%	p	%	p

	(n)		(n)		(n)		(n)		(n)		(n)		(n)		(n)		(n)		
Gender																			
Male	84,3		85,9		83,7		75,7		61,2		60,0		87,8		84,9		61,9	74,1	
	(263)	0,035*	(159)	0,096	(261)	0,341	(140)	0,673	(191)	0,491	(111)	0,076	(274)	0,294	(157)	0,861	(193)	(137)	0,044*
Female	77,8		79,5		80,8		77,5		58,6		51,0		85,0		85,5		62,5	85,5	
	(259)		(159)		(269)		(155)		(195)		(102)		(283)		(171)		(208)	(165)	
Place of residence																			
Urban	79,6		78,5		81,1		75,1		58,5		52,2		89,0		88,1		64,2	78,8	
	(474)	0,002*	(230)	0,000**	(473)	0,036*	(220)	0,220	(341)	0,020*	(153)	0,035*	(519)	0,001*	(258)	0,009*	(374)	(231)	0,868
Rural	95,1		95,6		91,8		81,3		73,8		64,8		70,7		76,9		44,3	78,0	
	(58)		(87)		(56)		(74)		(45)		(890		(37)		(70)		(27)	(71)	
Race/Color**																			
White	86,3		81,4		86,3		79,1		62,8		55,8		84,3		88,4		62,8	74,4	
	(44)		(35)		(44)		(34)		(32)		(24)		(43)		(38)		(32)	(32)	
Brown	80,6	0,470	82,4	0,978	81,5	0,798	76,4	0,940	59,7	0,790	55,9	0,624	86,2	0,423	84,3	0,658	61,8	79,6	0,164
	(454)		(258)		(459)		(239)		(336)		(175)		(485)		(264)		(348)	(249)	
Black	93,8		85,7		87,5		71,4		50,0		64,3		100,0		92,9		56,3	57,1	
	(15)		(12)		(14)		(10)		(8)		(9)		(16)		(13)		(9)	(8)	
Mother's education																			
E.S	60,0	0,426	82,3	0,324	93,3	0,391	64,7	0,029*	80,0	0,117	52,9	0,639	73,3	0,112	82,3	0,111	46,7	76,5	0,877
	(9)		(14)		(14)		(11)		(12)		(9)		(11)		(14)		(7)	(13)	

E.M	80,4 (160)	80,83 (97)	81,4 (162)	76,7 (92)	52,8 (105)	57,5 (69)	82,9 (165)	80,8 (97)	61,8 (123)	79,2 (95)
E.F.C	82,1 (174)	84,7 (100)	78,8 (167)	69,5 (82)	64,6 (137)	56,8 (67)	90,6 (192)	89,8 (106)	65,6 (139)	79,7 (94)
E.F.I	82,4 (14)	100 (17)	82,4 (14)	100,0 (17)	58,5 (10)	70,6 (12)	94,1 (16)	70,6 (12)	64,7 (11)	76,5 (13)
None	75,0 (6)	87,5	100,0 (8)	87,5 (7)	62,5 (5)	50,0 (4)	87,5 (7)	75,0 (6)	50,0 (4)	62,5 (5)
Not informed	78,8 (160)	78,8	85,1 (166)	80,8 (80)	49,5 (118)	49,5 (49)	87,9 (167)	87,9 (87)	60,0 (117)	77,8 (77)

Source: The authors.

Legend: E.S = Higher Education; E.M = High School; E.F.C. = Complete Elementary School; E.F.I = incomplete elementary school; B = Low weight-for-age; A = Appropriate weight for age; E = High weight for age; B = Short height for age; A = Appropriate height for age; M = Thinness; E = Eutrophy; SP = Overweight; O = Obesity; * = $p < 0.05$; ** = $p < 0.001$.

"Yellow" was not considered for data tabulation.

Bonferroni test performed

Table 3

Nutritional Status of preschool and school children using Primary Health Care, according to sociodemographic characteristics, living in the municipality of Governador Valadares – MG, in 2023

Variables	Weight/Age*							Height/Age**							BMI/Age***									
	B	The	And		B	The	And	B	The		B	The		M	And	SP	Or		M	And	SP	Or		
	Preschool				Scholastic				Preschool				Scholastic				Preschool				Scholastic			
	%			p	%		p	%		p	%		p	%			p	%			p	%		p
	(n)				(n)			(n)			(n)			(n)				(n)				(n)		
Gender																								
Male	100,0	48,9	52,0		0,0	39,0	50,0		61,5	49,3		0,0	40,8		14,3	50,0	54,2	60,0		25,0	41,3	21,1	52,4	
	(3)	(64)	(13)		(0)	(39)	(10)		(8)	(72)		(0)	(49)		(1)	(47)	(26)	(6)		(1)	(33)	(4)	(11)	
Female	0,0	51,2	48,0	0,303	100,0	61,0	50,0	0,183	38,5	50,7	0,290	100,0	59,2	0,130	85,7	50,0	45,8	40,0	0,246	75,0	58,8	78,9	47,6	0,191
	(0)	(67)	(12)		(4)	(61)	(10)		(5)	(74)		(4)	(71)		(6)	(47)	(22)	(4)		(3)	(47)	(15)	(10)	
Place of residence																								
Urban	100,0	87,8	88,0		25,0	77,0	80,0		100,0	87,0		100,0	75,0		100,0	87,2	85,4	100,0		25,0	77,5	79,0	76,2	
	(3)	(115)	(22)		(1)	(77)	(16)		(13)	(127)		(4)	(90)		(7)	(82)	(41)	(10)		(1)	(62)	(15)	(16)	
Rural	0,0	12,2	12,0	1,000	75,0	23,0	20,0	0,092	0,0	13,0	0,178	0,0	25,0	0,325	0,0	12,8	14,6	0,0	0,652	75,0	22,5	21,1	23,8	0,156
	(0)	(16)	(3)		(3)	(23)	(4)		(0)	(19)		(0)	(30)		(0)	(12)	(7)	(0)		(3)	(18)	(4)	(5)	
Race/Color*																								
White	0,0	6,9	4,0	1,000	0,0	9,0	5,0	0,237	7,7	6,2	0,713	25,0	7,5	0,360	0,0	7,6	6,3	0,0	1,000	0,0	10,0	5,3	4,8	0,069

	(0)	(9)	(1)		(0)	(9)	(1)		(1)	(9)		(0)	(7)	(3)	(0)		(8)	(1)	(1)					
Brown	100,0	90,1	96,0		100,0	90,0	85,0		92,3	91,1		75,0	90,0		100,0	89,4	91,7	100,0		75,0	90,0	94,7	85,7	
	(3)	(118)	(24)		(4)	(90)	(17)		(12)	(113)		(3)	(108)		(7)	(84)	(44)	(10)		(3)	(72)	(18)	(18)	
Black	0,0	3,1	0,0		0,0	1,0	5,0		0,0	2,7		0,0	1,7		0,0	3,2	2,1	0,0		25,0	0,0	0,0	4,8	
	(0)	(4)	(0)		(0)	(1)	(1)		(0)	(4)		(0)	(2)		(0)	(3)	(1)	(0)		(1)	(0)	(0)	(1)	
Mother's education#																								
E.S	0,0	2,3	8,0		0,0	3,0	0,0		7,7	2,7		0,0	2,5		14,3	2,1	2,1	10,0		0,0	2,5	5,3	0,0	
	(0)	(3)	(2)		(0)	(3)	(0)		(1)	(4)		(0)	(3)		(1)	(2)	(1)	(1)		(0)	(2)	(1)	(0)	
E.M	66,7	44,3	28,0		25,0	42,0	40,0		38,5	42,5		50	40,8		14,3	46,9	37,5	40,0		50,0	45,0	21,1	42,9	
	(2)	(58)	(7)		(1)	(42)	(8)		(5)	(62)		(2)	(49)		(1)	(44)	(18)	(4)		(2)	(36)	(4)	(9)	
E.F.C	33,3	47,3	60,0	0,397	25,0	47,0	45,0	0,192	46,2	49,3	0,450	25,0	46,7	0,411	57,1	45,8	56,3	40,0	0,215	25,0	43,8	63,2	42,9	0,422
	(1)	(62)	(15)		(1)	(47)	(9)		(6)	(72)		(1)	(56)		(4)	(43)	(27)	(4)		(1)	(35)	(12)	(9)	
E.F.I	0,0	3,8	0,0		25,0	7,0	10,0		7,7	2,7		25,0	7,5		14,3	2,1	2,1	10,0		25,0	7,5	5,26	9,5	
	(0)	(5)	(0)		(1)	(7)	(2)		(1)	(4)		(1)	(9)		(1)	(2)	(1)	(1)		(1)	(6)	(1)	(2)	
None	0,0	2,3	4,0		25,0	1,0	5,0		0,0	2,7		0,0	2,5		0,0	3,2	2,1	0,0		0,0	1,25	5,3	4,8	
	(0)	(3)	(1)		(1)	(1)	(1)		(0)	(4)		(0)	(3)		(0)	(3)	(1)	(0)		(0)	(1)	(1)	(1)	

Source: The authors.

Legend: E.S = Higher Education; E.M = High School; E.F.C. = Complete Elementary School; E.F.I = incomplete elementary school; B = Low weight-for-age; A = Appropriate weight for age; E = High weight for age; B = Short height for age; A = Appropriate height for age; M = Thinness; E = Eutrophy; SP = Overweight; O = Obesity.

Total number of preschool children analyzed: 159.

Total number of schoolchildren analyzed: 124.

Total sample number: 283.

*: The classification of very low weight for age was not considered for the tabulation of the data.

**: The classification of very short stature for age was not considered for the tabulation of the data.

: Risk classifications for overweight and severe obesity were not considered for data tabulation.

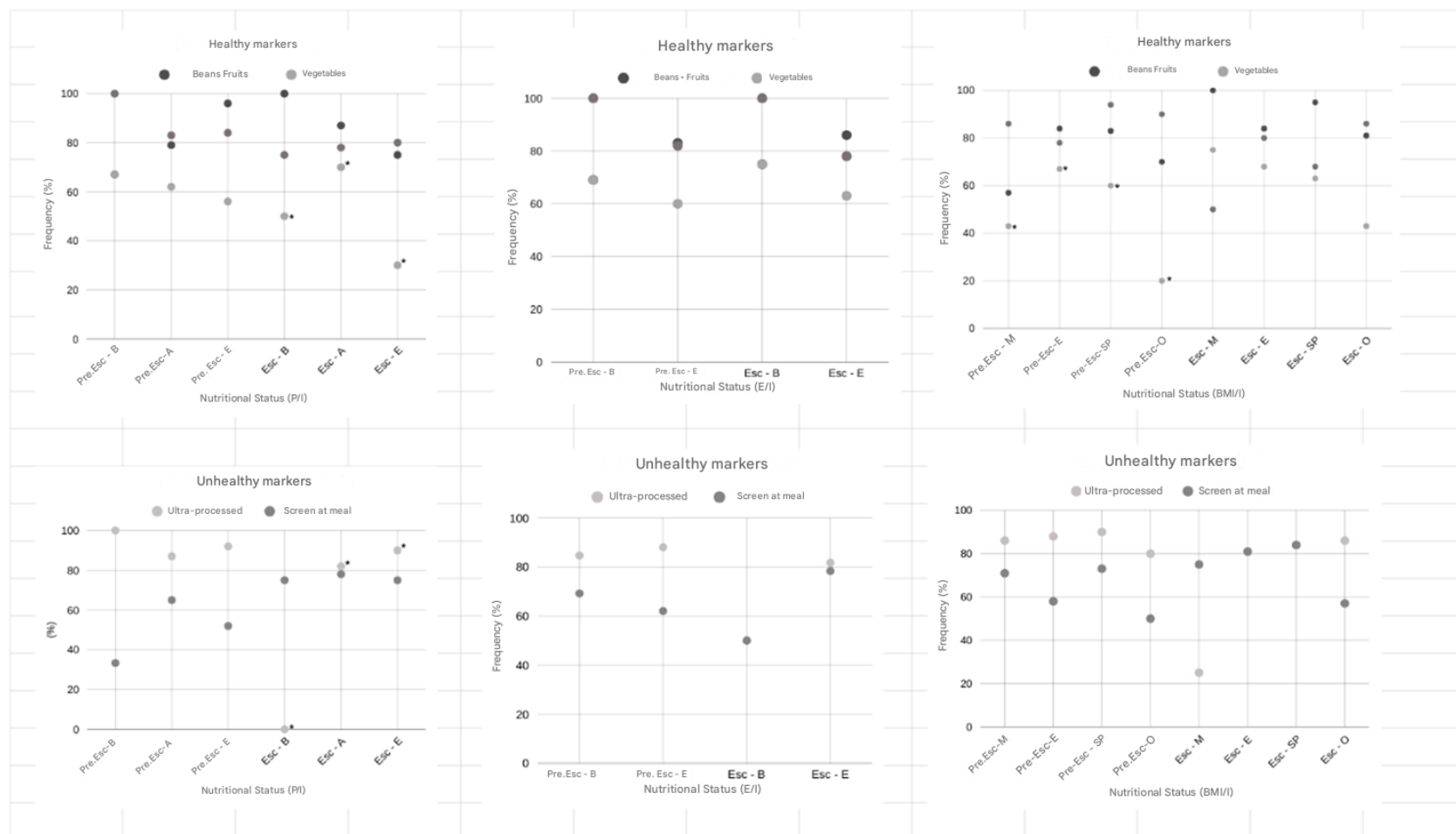
"Yellow" was not considered for data tabulation.

#: The mother's education level "not informed" was not considered in the tabulation of the data.

Bonferroni test was performed.

Figure 1

Nutritional status of preschool and school children using Primary Health Care, according to food markers, living in the municipality of Governador Valadares – MG, in 2023



Source: The authors.

Legend: Pre-Esc = Pre-School; Esc = School; B = Low weight-for-age; A = Appropriate weight for age; E = High weight for age; B = Short height for age; A = Appropriate height for age; M = Thinness; E = Eutrophy; SP = Overweight; O = Obesity.

*= $p < 0.05$