

Food consumption of children aged six to 24 months living in Pernambuco during the SARS-COV-2 pandemic

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Abstract

Objectives: analyze the food consumption of children aged 6 to 24 months in Pernambuco before, during, and after the COVID-19 pandemic.

Methods: analytical study using data from the Food and Nutrition Surveillance System (SISVAN) from 2019 to 2023. Indicators of recommended and non-recommended eating habits were assessed. Differences between years were tested using analysis of variance (ANOVA), with $p \leq 0.05$ considered significant.

Results: the number of records ranged from 9,086 children in 2020 to 42,709 in 2023, an increase of 78.7%. Among the recommended indicators, continued breastfeeding rose from 30% in 2021 to 56% in 2023 ($p < 0.05$), and the consumption of foods rich in vitamin A increased from 38% to 66% ($p < 0.05$). Iron intake remained low but rose from 11% in 2021 to 24% in 2023 ($p < 0.05$). Among the non-recommended items, the consumption of ultra-processed foods declined from 49% in 2019 to 35% in 2023 ($p < 0.05$), and the intake of sweetened beverages dropped from 30% in 2019 to 20% in 2023 ($p < 0.05$).

Conclusion: there was a recovery of healthy eating indicators after the decline observed in 2021, although deficiencies in iron and vitamin A intake and a high prevalence of ultra-processed foods persist. These findings highlight the need for public policies that promote appropriate eating practices and reduce nutritional inequalities.

key words Child nutrition, Food intake, Covid-19



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Introduction

The early years of life are characterized by rapid growth and development, where nutrition plays an essential role. Suboptimal eating practices and nutritional deficiencies can compromise infant health, with repercussions in adulthood.^{1,2}

In Brazil, an increase in ultra-processed food consumption and a reduction in unprocessed food intake is observed, resulting in micronutrients deficiencies.^{3,4} The early introduction of these products is associated with a greater risk of chronic non-communicable diseases (CNCDs), such as obesity, hypertension and diabetes.^{3,4} In 2016, over 41 million children under five years old were overweight or obese worldwide, and it is estimated that this number will reach 70 million by 2025.^{5,6}

The high energy density and poor nutritional quality of ultra-processed products also increase the risk of malnutrition in vulnerable groups, thereby exacerbating health inequalities.⁷ Early exposure to sugar-sweetened beverages and sweet snacks fosters a preference for sweet foods throughout life, intensifying the CNCD risk.⁷ Industry marketing, low cost and high palatability contribute to their wide dissemination.^{1,4}

Socioeconomic factors influence children's food consumption: lower income and education levels are associated with higher consumption of ultra-processed products, while the school environment and nutritional education modify dietary patterns.⁴

During SARS-CoV-2 pandemic, social distancing measures restricted access to fresh foods, prompting the consumption of processed and canned foods, which contributed to overweight and obesity in children.^{2,8,9}

Given this scenario, the present study analyzed the food consumption and nutritional profile of children aged six to 24 months in Pernambuco, as registered in the Food and Nutrition Surveillance System (SISVAN – Portuguese acronym) between 2019 and 2023, covering the pandemic period, with the goal of informing prevention and control strategies for nutritional issues.

Methods

This is an analytical study based on secondary data using information from public-domain databases, such as Sisvan-Web, the *Bolsa Família* Program Management System and the *e-Sistema Único de Saúde Atenção Básica* (e-SUS AB, Unified Health System – Primary Healthcare). The study analyzed data on children aged six to 24 months, residing in the state of Pernambuco, including data for both sexes across the following periods: January – December

2019 (pre-pandemic), January 2020 – December 2022 (during SARS-CoV-2 pandemic) and January – December 2023 (the immediate post-SARS-CoV-2 pandemic period).

Data collection on food consumption followed this search strategy: reference year (2019, 2020, 2021, 2022 or 2023), reference month (all), state (PE), and health region (all). The following categories were selected: age group (child), life stage (six to 24 months), and type of report (continued breastfeeding, minimum dietary diversity, minimum frequency and appropriate consistency, consumption of iron-rich foods, consumption of Vitamin A-rich foods, consumption of ultra-processed foods, consumption of hamburgers and/or processed meats, consumption of sugar-sweetened beverages, consumption of instant noodles, consumption of salty snacks and crackers, consumption of filled cookies, candies and sweet snacks) for both genders.

Food consumption data registered in the system were obtained from the “markers of food consumption) in Sisvan records. The following markers of consumption and healthy eating habits were evaluated: (1) continued breastfeeding (CBF), (2) minimum dietary diversity, (3) minimum frequency and adequate consistency, (4) consumption of iron-rich foods, (5) consumption of Vitamin A-rich foods. Furthermore, we assessed the markers of non-recommended consumption: (1) consumption of ultra-processed foods, (2) consumption of hamburgers and/or processed meats, (3) consumption of sugar-sweetened beverages, (4) consumption of instant noodles, salty snacks, or crackers, and (5) consumption of filled cookies, candies and sweet snacks.

Finally, all information extracted from Sisvan was tabulated to create a database using Microsoft Office Excel 2013. Data were analyzed using calculations of percentage, standard deviation, and mean, alongside analysis of variance (ANOVA) via GraphPad Prism 10 software. The latter utilized a statistical significance level $p < 0.05$.

Results

Between 2019 and 2023, Sisvan registered 42,709 children aged six to 24 months in Pernambuco, showing an upward trend in registrations, with the lowest number observed in 2020 (9,086). Regarding food consumption, among the markers of consumption and healthy eating habits (Table 1), continued breastfeeding remained stable in 2019–2020 (48%), with a decline in 2021 (30%), and then significantly increased in 2023 (56%, $p < 0.05$). The minimum dietary diversity parameter, in contrast, varied from 72% in 2019 to 73% in 2020, dropped to 68% in 2021 and stabilized between 2022–2023 (70% and 69%, respectively).

Table 1

Markers of Healthy Food Consumption and Eating Habits Among Children Aged 6 to 24 Months in Pernambuco State, 2019–2023.					
Markers	Year	N	SD	%	p
Continued Breastfeeding	2019	6,248	± 389.8	48.0	
	2020	4,401	± 271.0	48.0	
	2021	3,503	± 199.0	30.0	
	2022	7,550	± 422.9	48.0	
	2023	24,121	± 1.581.4	56.0	*
Minimum Dietary Diversity	2019	9,418	± 732.1	72.0	
	2020	6,624	± 489.7	73.0	
	2021	7,804	± 519.8	68.0	
	2022	11,082	± 751.0	70.0	
	2023	29,535	± 2.148.7	69.0	*
Minimum frequency and Adequate Consistency	2019	11,464	± 862.3	87.0	
	2020	7,950	± 579.4	87.0	
	2021	6,182	± 458.6	54.0	
	2022	13,463	± 887.4	85.0	
	2023	36,698	± 2.601.2	86.0	*
Iron-rich Food Consumption	2019	2,408	± 214.6	18.0	
	2020	1,752	± 140.9	19.0	
	2021	1,260	± 104.7	11.0	
	2022	2,454	± 175.0	16.0	
	2023	10,077	± 874.7	24.0	*
Vitamin A-rich Food Consumption	2019	6,861	± 559.0	52.0	
	2020	4,673	± 350.4	51.0	
	2021	4,366	± 321.0	38.0	
	2022	8,296	± 572.1	53.0	
	2023	28,210	± 2,177.7	66.0	*

N = Number of children registered for the marker; SD = Standard Deviation; % = percentage in relation to the total number of children registered in that year; The asterisk (*) represents a $p < 0.05$, indicating a significant difference according to the ANOVA Test. Specifically, a difference was observed in the 2023 value compared to the other years.

Minimum frequency and appropriate consistency was high in 2019–2020 (87%), decreased in 2021 (54%) and returned to similar levels in 2022–2023 (85% and 86%). The consumption of iron-rich foods remained low throughout the entire period, recording a significant decline in 2021 (11%) and a relative improvement in 2023 (24%, $p < 0.05$). Conversely, the consumption of Vitamin A-rich foods dropped from 52% in 2019 to 38% in 2021, recovering sharply in 2023 (66%, $p < 0.05$).

Regarding the non-recommended eating habits (Table 2), the consumption of ultra-processed foods was high in 2019–2020 (49% and 48%), decreased in 2021 (27%), increased in 2022 (41%) and decreased again in 2023 (35%, $p < 0.05$). This oscillation pattern was similar for the consumption of hamburgers and/or processed meats, which stood at 13% in 2019–2020, declined to 8% in 2021, and subsequently varied between 12% (2022) and 10% (2023, $p < 0.05$).

Sugar-sweetened beverage consumption remained constant in 2019–2020 (30%), decreased to 16% in 2021, increased to 25% in 2022 and subsequently fell to 20% in 2023 (a significant difference compared to 2019–2020, $p < 0.05$). Similarly, the consumption of instant noodles, salty snacks, or crackers stood at 24% in 2019–2020, dropped to 14% in 2021, rebounded in 2022 (21%), and decreased again in 2023 (17%, $p < 0.05$).

Finally, the consumption of filled cookies, candies, and sweet snacks fell from 29% in 2019 to 16% in 2021, rebounded to 26% in 2022, and subsequently decreased to 21% in 2023 ($p < 0.05$). In summary, the indicators for both recommended and non-recommended consumption dropped sharply in 2021, a critical year of the pandemic. This was followed by a partial recovery in 2022 and more consistent improvements in 2023, although several parameters remain below 2019 levels.

Table 2

Markers of Unhealthy Food Consumption and Non-Recommended Eating Habits Among Children Aged 6 to 24 Months in Pernambuco State, 2019–2023. Source: Author's own elaboration.

Makers	Year	N	SD	%	p
Ultra-processed Foods	2019	6,412	± 451.6	49.0	
	2020	4,330	± 308.1	48.0	
	2021	3,078	± 195.8	27.0	
	2022	6,534	± 388.4	41.0	
	2023	14,747	± 943.6	35.0	*
Hamburgers and/or Processed Meats	2019	1,605	± 114.2	13.0	
	2020	1,157	± 84.2	13.0	
	2021	917	± 65.4	8.0	
	2022	1,856	± 113.8	12.0	
	2023	4,368	± 312.3	10.0	*
Sugar-Sweetened Beverage Consumption	2019	3,994	± 295.3	30.0	
	2020	2,753	± 210.9	30.0	
	2021	1,835	± 119.7	16.0	
	2022	4,009	± 246.7	25.0	
	2023	8,347	± 535.2	20.0	#
Instant Noodles, Salty Snacks, or Crackers Consumption	2019	3,097	± 214.2	24.0	
	2020	2,210	± 162.8	24.0	
	2021	1,641	± 100.0	14.0	
	2022	3,345	± 182.5	21.0	
	2023	7,346	± 425.7	17.0	*
Filled Cookies, Candies, or Sweet Snacks Consumption	2019	3,823	± 276.9	29.0	
	2020	2,546	± 189.8	28.0	
	2021	1,832	± 127.0	16.0	
	2022	4,104	± 257.6	26.0	
	2023	9,080	± 587.1	21.0	*

N = Number of children registered for the marker; SD = Standard Deviation; % = percentage in relation to the total number of children registered in that year; The asterisk (*) represents a $p \leq 0.05$, indicating a significant difference according to the ANOVA Test. Specifically, a difference was observed in the 2023 value compared to the other years. The hash symbol (#) also represents $p \leq 0.05$, indicating a significant difference according to the ANOVA Test. Here, a difference was observed in the 2023 value compared to 2019, 2020, and 2021.

Discussion

The findings from the food consumption assessment were based on markers of healthy eating practices and on indicators of non-recommended foods. Specifically, a notable reduction was observed in the markers “Iron-rich food consumption” and “Vitamin A-rich food consumption”. This finding is concerning, as preschool-aged children are considered the most vulnerable group to iron deficiency anemia, constituting a major public health issue.¹⁰

Childhood anemia results in severe consequences for health and development, including stunted growth delay, increased susceptibility to infections, higher morbidity and mortality rates, and impaired motor and cognition development, which may persist even after treatment.^{10,11}

The present study identified an elevated consumption of ultra-processed foods, sugar-sweetened beverages and filled cookies, candies, or sweet snacks in the

study population. Studies suggest an increase of the early introduction of these products, at the expense of natural and healthy foods, in children under 24 months of age. The factors more strongly associated with this consumption were an age exceeding six months, absence of breastfeeding, households with three or fewer residents, and the presence of a primary caregiver other than the mother.¹² Nevertheless, there are divergences concerning the influence of low parental education on the early provision of these products.^{13,14}

Furthermore, the COVID-19 pandemic was also marked by a significant increase in fast-food consumption and in the screen time of children and adolescents (computers, mobile phones, and televisions).¹⁵ This combination, influenced by socioeconomic and demographic factors, negatively impacts the nutritional status, eating practices and behaviors, underscoring the need for healthy eating promotion strategies, particularly in areas of heightened vulnerability.^{15,16}

The prevalence of CBF also warrants emphasis, as it largely remained around 48% over this period, with the exception of 2020, which saw a drop to 30%. Another study using Sisvan data from 2015 to 2019, indicated that the states with higher CBF prevalence were Amapá (72%), Amazonas (67%). Conversely, Matogrosso do Sul (43%), Pernambuco and Mato Grosso (44%) registered the lowest values.¹⁷ It is noteworthy that despite this increase (from 48% in 2019 to 56% in 2023), Pernambuco has yet to reach the level observed in those states with higher CBF prevalence.

While the mother's physical presence at home during the pandemic may initially suggest greater opportunities to sustain CBF, the present findings indicate that variable alone is insufficient to ensure the practice. Recent evidence suggests that emotional factors – such as anxiety, depression and maternal stress – intensified by the COVID-19 context, negatively impact both motivation and milk supply, consequently reducing the duration of breastfeeding, even among mothers who remained at home.^{18,19}

Clinical symptoms such as pain, nipple fissures, and mastitis hinder the CBF process, necessitating support from partners, family members, or health professionals.^{20,21} However, social distancing and the suspension of in-person services in Primary Healthcare Units (UBS – Portuguese acronym) limited the access to specialized technical support, which plays a crucial role in addressing these difficulties.²⁰⁻²⁴

The support network provided by the UBS was similarly weakened, given that health teams were required to prioritize COVID-19 cases.²³ This environment undermined the provision of maternal and child health programs and campaigns, a critical component for nutritional education and awareness focused on the importance of breastfeeding.²²

Another relevant aspect is that, during lockdown, the domestic environment was often unfavorable to CBF, as many mothers faced an accumulation of multiple roles, including full-time childcare, household tasks, and in some cases, remote work. This physical and mental overload may have contributed to the early breastfeeding cessation. Therefore, the decrease in CBF observed during the pandemic period reflects the multifactorial nature of this practice, which relies not only on the mother's presence, but also on emotional well-being, social support and access to adequate health services.²⁴

Overall, all food consumption markers showed a decline from 2019 to 2021, followed by an increase in 2022. This pattern can be attributed to two aspects: the decrease in recorded entries during pandemic and concurrent the rise in food insecurity, also resulting from the pandemic. Broadly, psychological factors (anxiety,

fear, and stress) and shifts in eating behaviors, in the food availability, food logistics, and global supply chains significantly influenced the modifications of eating patterns observed during COVID-19 pandemic.²⁵

The present study's results indicated a decrease in the food consumption parameters – both recommended and non-recommended – particularly in 2021. This finding can be attributed to food insecurity in Brazilian households, which was amplified significantly with the advent of COVID-19 pandemic. Populations in contexts of social vulnerability were further exposed to negative effects of the pandemic due the pre-existing social inequality, which was exacerbated by the dismantling of social protection policies in Brazil, including the extinction of the National Council for Food and Nutritional Security.²⁶

Data from the II National Survey on Food Insecurity also help explain the low levels of levels observed in markers for both recommended and non-recommended eating habits in 2021. The survey indicated that the Northeast region recorded the second-highest rates of food insecurity in the country, with prevalences of 29.6% for the mild, 17.4% for moderate, and 21% for severe food insecurity.²⁷ These findings, in conjunction with the data from the current study, indicate a global deterioration of the population's nutritional status during the pandemic.

Overall, studies generally suggest that COVID-19 significantly exacerbated global food insecurity. These impacts are associated with reduced household income, food inflation, trade restrictions and health crises. Thus, it is pertinent to highlight that food insecurity heightens the risk of developing chronic and acute diseases, as well as increasing morbidity and mortality.^{28,29}

The study contains limitations, including the inherent weaknesses of Sisvan (such as technical issues and inadequate system training) and restricted population coverage. Nonetheless, this research is relevant as it is one of the first state-level surveys to assess, using a recent time series, the pandemic's impact on food consumption and CBF among children in primary healthcare settings in the state of Pernambuco. Despite these restrictions, the use of population-based data allowed the identification of significant fluctuations and generated evidence for the planning of public policies and strategies aimed at promoting healthy eating and breastfeeding in the post-pandemic period.

The results highlight the complexity of dietary patterns and their effects on child health, particularly the persistent low intake of iron- and vitamin A-rich foods. The high prevalence of iron deficiency anemia and elevated ultra-processed food consumption underscore the need for effective policies that encourage healthy eating practices from early childhood, thereby promoting adequate development and reducing nutritional inequalities in Brazil.

Authors' contribution

Cavalcanti CAT: conceptualization, investigation, methodology development and original draft preparation. Santos YM, Assunção BCC, Fonseca da Silva FAM: investigation. Crispim JG: formal analysis, editing of the original manuscript. Andrade LASS: validation, review and editing of the manuscript. Lira PIC: formal analysis, review and editing of the manuscript. Pinto-Tavares FCL: supervision. All authors approved the final version of the article and declared no conflicts of interest.

Data availability

All datasets supporting the result of this study are included in the article.

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