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Factors associated to the consumption of ultra-processed foods and sugar-sweetened beverages in infants under 24 months of age

Fatores associados ao consumo de alimentos ultraprocessados e bebidas açucaradas em lactentes menores de 24 meses

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ABSTRACT

Objective
To review the consumption of ultra-processed foods and sugar-sweetened beverages among children under 24 months of age in an Amazonian municipality.

Methods
A cross-sectional study was carried out during the National Vaccination Campaigns in the years 2016 and 2017 using a two-stage cluster sampling approach. The survey instrument was based on the questionnaire from the II Breastfeeding Prevalence Survey issued by the Ministry of Health, Brazil. Data collection was carried out with the mothers or caregivers. Poisson regression with robust variance was used, with a significance level set at less than 5%.

Results
A total of 688 children were evaluated. The consumption of ultra-processed foods was 98.9% and that of sugar-sweetened beverages was 72.7%. Factors associated with such consumption were low paternal education, lower total family income, living in rural areas, and the child's age range between 6 and 11 months.

Conclusion
The consumption of ultra-processed foods and sugar-sweetened beverages was high considering the recommendations of the Brazilian Ministry of Health. The factors identified as contributing to this practice emphasize the necessity of supporting the development of interventions to promote healthy eating habits.

Keywords: Artificially sweetened beverages. Industrial food. Infant. Infant feeding.

RESUMO

Objetivo
Analisar o consumo de alimentos ultraprocessados e bebidas açucaradas em crianças menores de 24 meses em um município da Amazônia.

Métodos
Estudo transversal realizado durante as Campanhas Nacionais de Vacinação nos anos de 2016 e 2017. O cálculo amostral foi feito por conglomerados em dois estágios. O instrumento de pesquisa teve como base o questionário da II Pesquisa de Prevalência de Aleitamento Materno do Ministério da Saúde. A coleta de dados foi realizada com as mães ou acompanhantes das crianças. Utilizou-se o modelo de regressão de Poisson com variância robusta, considerando um nível de significância menor de 5%.

Resultados
Foram avaliadas 688 crianças. O consumo de alimentos ultraprocessados foi de 98,9% e de bebidas açucaradas foi de 72,7%. Os fatores associados ao consumo desses alimentos foram a baixa escolaridade paterna, menor renda familiar total, residir na zona rural e idade entre 6 e 11 meses.

Conclusão
O consumo de alimentos ultraprocessados e bebidas açucaradas estão elevados frente às recomendações do Ministério da Saúde. Os fatores que contribuíram para essa prática reforçam a necessidade de subsidiar o desenvolvimento de intervenções de promoção da alimentação saudável.

***Palavras-chave**: Bebidas adoçadas artificialmente. Alimento industrializado. Lactente. Alimentação infantil.*

INTRODUCTION

Feeding practices in the first years of life are an important milestone in the development of a child's habits. The Brazilian Ministry of Health (BMoH) recommends Exclusive Breastfeeding (EBF) until the age of six months, and breastfeeding together with the introduction of complementary foods after the child reaches six months of age and until the age of two [1]. With the food classification, according to the extent and purpose of industrial processing, included in the food guide for the Brazilian population [2], the BMoH enhanced that the diet of children under two years of age should be based on fresh or minimally processed foods, avoiding processed and Ultra-Processed Foods (UPF) [1].

UPFs are those produced from industrial formulations, in several processing stages, with high amounts of ingredients added such as salt, sugars, fats, preservatives and additives, making them highly palatable and attractive, but high in caloric density and poor in micronutrients and fiber [2]. Recent studies link early consumption and great participation of UPFs in the diet to health problems such as obesity in preschool and adolescent children [3,4] and cancer in adults [5].

Sugar-sweetened beverages classified as UPFs are industrial beverages, such as soft beverages, fruit-based beverages with or without soy, syrups, teas or natural juices when sweetened, soft beverages or carbonated beverages. These beverages are not recommended for children because, besides sugar, they may contain sodium and chemical additives. In addition, this practice conditions children to hydrate only with sugary or flavored liquids, increasing the risk of excess weight, tooth

decay and diabetes. Therefore, the BMoH recommends hydrating children only with water when introducing complementary foods [1].

Despite the relevance of the recommendations to avoid offering UPFs and sugar-sweetened beverages to children under two years of age, the 2nd Breastfeeding Prevalence Survey in the Brazilian Capitals and the Federal District in 2008 reported a high consumption of soft beverages, cookies and/or snacks among children aged 9 to 12 months, with higher rates in the northern region of the country [6]. After a decade, data from the *Estudo Nacional de Alimentação e Nutrição Infantil* (ENANI 2019, National Study of Child Food and Nutrition) indicated that 80.5% of children between 6 and 23 months of age consumed UPFs, with a higher prevalence of children in the northern region (84.5%) [7].

A cohort study of 774 children under one year of age in Cruzeiro do Sul, Acre, identified a prevalence of 87.5% of children consuming at least one UPFs and 40.5% consuming at least three of those foods. Greater consumption of UPFs was associated with lower maternal education, below-average wealth index and teenage mother, indicating low understanding of the food guidelines for children under two years of age [8].

The differences between the consumption of UPFs and sugar-sweetened beverages in the same region of the country [6] reveal that the consumption of such foods is associated with social, economic, cultural, family and childhood characteristics of each population [9-11]. However, in this connection, little is known about children under two years of age in the northern region, especially in the city of Cruzeiro do Sul, which justifies further studies on this topic in the area [8].

Therefore, the objective of the present study was to evaluate the use and factors associated with the consumption of UPFs and sugar-sweetened beverages in children aged 6 to 23 months in a municipality in the Western Brazilian Amazon.

METHODS

This is a cross-sectional study carried out in the municipality of Cruzeiro do Sul, the second largest city in the state of Acre. The population was estimated at 89,760 people in 2021. The *Índice de Desenvolvimento Humano Municipal* (IDHM, Municipal Human Development Index) was 0.664 in 2010. Cruzeiro do Sul is considered the economic hub of the Juruá region; one of the municipality main economic activities is the cassava flour production. It is connected to the state capital, Rio Branco, distant 648 km, by the highway BR 364 [12].

The inclusion criteria were children aged between six and 23 months and 29 days who were taken to the 2016 National Multi-Vaccination Campaign and the 2017 National Influenza Campaign, by their mothers or guardians who could answer questions about the child's breastfeeding and feeding practice in the previous 24 hours. The exclusion criterium was: mother or guardian under 18 years of age.

The methodology used was cluster sampling with two-stage draws and the probability of cluster draw proportional to its size. The parameters used were a sampling error of 5%, either way, a 95% confidence interval, a design effect (deff) of 1.5, and the assumed non-response rate was 1 in 10 approaches (10%). The sample calculation was based on the total of 2,714 doses of polio vaccine administered in the 2015 campaign, shared by 22 Basic Health Units (BHU) [13]. Since there was no information on the outcome variables rates, a 50% generic indicator value was used, which would be the case with the largest possible variance and, consequently, the largest sample size, the other parameters being fixed. From the initial sample, 2,714 doses were administered. After the adjustments,

a sample of 770 children was obtained in the city of Cruzeiro do Sul. Of the 18 BHU in the sample, three were located in rural areas, and the number of Primary Health Care (PHC) was reduced to have a similar probability of clusters; hence the PHC with few doses administered in 2015 were combined.

The survey instrument was based on the questionnaire used in the 2nd Breastfeeding Prevalence Survey in Brazilian capitals and the Federal District of the Ministry of Health in 2008 [6], which was adapted for this study, as the instrument did not have direct questions about the consumption of sugar-sweetened beverages or consumption of UPFs. Thus, the indicators were constructed from the combination of different questions from the questionnaire, based on the guidelines for evaluating food consumption markers in Primary Care [14].

Two dependent variables were constructed: consumption of UPFs and consumption of sugar-sweetened beverages. For the first variable, the calculation was performed according to the proportion of children aged 6 to 23 months and 29 days who had consumed UPFs in the last 24 hours divided by the total number of children aged 6 to 23 months and 29 days, following the guidelines for evaluating food consumption markers in Primary Care [14]. This variable was constructed from the combination of the following questions listed in the questionnaire: Did you drink liquid or powdered industrial juice? Did you drink soda? Did you drink yogurt like "*Danoninho*"? Did you eat cookies, biscuits or packaged snacks? Did you eat sausage or *calabresa* sausage? Did you eat chocolates, lollipops or other sweets? Did you eat instant noodles (like *miojo*)? Was the food offered the same as home cooking? Prepared exclusively for children? Industrial food?

The consumption of sugar-sweetened beverages was another dependent variable calculated according to the proportion of children aged 6 to 23 months and 29 days who had consumed sugar-sweetened beverages in the last 24 hours of the assessment divided by the total number of children aged 6 to 23 months and 29 days, according to the guidelines for assessing food consumption markers in PHC [14]. This variable was constructed from the combination of the following questions in the questionnaire: Did milk have sugar or chocolate in it? Did you drink liquid or powdered processed juice? Did you drink soda? Did you drink "*Danoninho*" type yogurt?

The predictor variables evaluated were; (i) sociodemographic: area of residence, mother's age, mother's marital status, mother's education, father's education, mother's occupation, total family income (in minimum wages); (ii) child: child's age, gender, birth weight and gestational age at birth (child data were obtained from the child's booklet) and (iii) breastfeeding practice.

Data were collected at the BHU on the "D" day, as well as on the days preceding and following it. The interviews were conducted after the children had been vaccinated. The questionnaire was completed by a team consisting of the main investigator, 35 nursing students from the Federal University of Acre – Campus Floresta, and 7 volunteer nurses who were not employed at the time of the data collection. The collaborating team was previously trained by the main investigator.

Statistical Analysis

To describe the sample, absolute numbers and percentages were used for the categorical variables, and mean and Standard Deviation (SD) were used for the quantitative variables. The association between the study factors and the indicator of UPFs and sugar-sweetened beverages was tested using a Poisson regression model with robust variance. Initially, a model was estimated for each predictor variable. Then, the statistically significant variables at or below 20% were selected for multiple regression. Independent variables with a p-value greater than or equal to 5% were excluded one by one in order of significance (backward method). For all statistical tests, a significance level of less than 5% was adopted. The statistical software used for the analysis was STATA 12.

This study was submitted and approved by the Ethics Committee of the Federal University of São Paulo under opinion number 1,624,216.

RESULTS

The information collected from 688 children was reviewed. The data in Table 1 show the sociodemographic characteristics of the children and their families. Most of the children lived in urban areas (80.8%), with mothers over 19 years of age (87.6%), married or with a partner (79.9%), housewives (77.0%), multiparous (60.7%) and with total family income less than one minimum wage (54.6%) (Table 1).

Table 1 – Description of sociodemographic characteristics of families. Cruzeiro do Sul (AC), Brazil, 2017.

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Variables	N	%
Area of residence	688	
Urban	556	80.8
Rural	132	19.2
Mother's age (years)	620	
18 to19	77	12.4
>19	543	87.6
Mother's marital status	621	
Married or living with a partner	496	79.9
Single or living without a partner	125	20.1
Maternal education	621	
Illiterate	15	2.4
Incomplete elementary school	148	23.8
Complete elementary school	57	9.2
Incomplete high school	106	17.1
Complete high school	210	33.8
Incomplete higher education	31	5.0
Complete higher education	35	5.6
Postgraduate	19	3.1
Paternal education	555	
Illiterate	38	6.9
Incomplete elementary school	131	23.6
Complete elementary school	36	6.5
Incomplete high school	69	12.4
Complete high school	192	34.6
Incomplete higher education	34	6.1
Complete higher education	45	8.1
Postgraduate	10	1.8
Mother's occupation	621	
Housewife	478	77.0
Working outside the home	121	19.5
Studies	22	3.5
Total family income (minimum wage)	590	
<1	322	54.6
1 to 2	201	34.0
3 or more	67	11.4
Parity	621	
Primiparous	244	39.3
Multiparous	377	60.7
Child's age (months)	688	
6 to 11	242	35.2
12 to 23	446	64.8

Table 1 – Description of sociodemographic characteristics of families. Cruzeiro do Sul (AC), Brazil, 2017.

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Variables	N	%
Child's gender	688	
Female	362	52.6
Male	326	47.4
Birth weight	647	
<2,500 g	49	7.6
2,500 g or more	598	92.4
Gestational age at birth (weeks)	517	
<37	70	13.5
37 to 41	436	84.4
42 or more	11	2.1
Breastfeeding	688	
Yes	452	65.7
No	236	34.3

The average age of the children was 13.6 (±4.9) months; the majority was between 12 and 23 months of age (64.8%), female (52.6%) and were born with adequate weight (92.4%) and at proper gestational age (84.4%). Regarding breastfeeding, 65.7% of the children were still breastfeeding at the time of the survey.

The prevalence of UPFs consumption was 98.9% and of sugar-sweetened beverages was 72.7%. The most frequently reported UPFs and sugar-sweetened beverages were: sweetened milk or chocolate milk (56.4%), cookies, biscuits or packaged snacks (60.1%), artificial juice (24.4%), chocolates, lollipops or other sweets (31.9%) and "*Danoninho*" type yogurt (45.2%) (Data not shown in tables).

Table 2 shows the results of the crude Poisson regression analysis for the consumption of ultra-processed foods. The predictor variables selected in this initial model were: area of residence, mother's age, maternal education, paternal education, mother's occupation, total family income, birth weight and gestational age at birth.

Table 2 – Prevalence and results of simple Poisson regression models for consumption of ultra-processed foods in children aged 6 to 23 months. Cruzeiro do Sul (AC), Brazil, 2017.

1 of 2

Variables	Crude Prevalence Ratio	
	Estimate (95% CI)	*p*
Area of residence		0.008
Urban	Ref.	
Rural	1.014 (1.003 - 1.024)	
Mother's age (years)		0.008
18 to 19	1.014 (1.004-1.024)	
>19	Ref.	
Mother's marital status		0.639
Married	Ref.	
Single	0.994 (0.969-1.019)	
Maternal education		0.030
Illiterate	1.066 (1.008-1.127)	0.025
Incomplete elementary school	1.066 (1.008-1.127)	0.025
Completed elementary/incomplete secondary	1.066 (1.008-1.127)	0.025
Secondary education	1.055 (0.996-1.118)	0.069
Higher education or more	Ref.	

Table 2 – Prevalence and results of simple Poisson regression models for consumption of ultra-processed foods in children aged 6 to 23 months. Cruzeiro do Sul (AC), Brazil, 2017.

Variables	Crude Prevalence Ratio	
	Estimate (95% CI)	*p*
Paternal education		0.072
Illiterate	1.037 (0.995-1.081)	0.084
Incomplete elementary school	1.037 (0.995-1.081)	0.084
Completed elementary/incomplete secondary	1.027 (0.981-1.075)	0.256
Secondary education	1.019 (0.974-1.067)	0.412
Higher education or more	Ref.	
Mother's occupation		0.030
Housewife	1.00	
Works outside the home	0.972 (0.939-1.007)	0.115
Studies	1.007 (0.999-1.014)	0.084
Total family income (minimum wage)		0.050
<1	Ref.	
1 to 2	0.979 (0.958-0.999)	0.046
3 or more	0.969 (0.927-1.012)	0.158
Parity		0.861
Primiparous	Ref.	
Multiparous	1.002 (0.983-1.020)	
Child's gender		0.825
Male	1.002 (0.986-1.018)	
Female	Ref.	
Birth weight		0.008
<2,500 g	1.013 (1.003-1.022)	
2,500 g or more	Ref.	
Gestational age at birth (weeks)		0.026
<37	1.012 (1.001-1.023)	0.025
37 to 41	Ref.	
42 or more	1.012 (1.001-1.023)	0.025
Child's age (months)		0.587
6 to 11	0.995 (0.977-1.013)	
12 to 23	Ref.	
Breastfeeding		0.289
No	0.990 (0.971-1.009)	
Yes	Ref.	

Note: CI: Confidence Interval; Ref: Reference.

Table 3 presents the analysis adjusted for the consumption of ultra-processed foods. Children living in rural areas had a prevalence of consumption of UPFs 0.8% higher than children living in urban areas. Additionally, those whose families had a family income between one and two minimum wages had a prevalence of consumption 2% lower than those whose families had an income of up to one minimum wage.

Table 4 shows the results of the crude Poisson regression analysis for the consumption of sugar-sweetened beverages. The predictor variables selected in this initial model were: area of residence, mother's age, maternal education, paternal education, mother's occupation, total family income, parity and child's age.

Table 5 presents the analysis adjusted for the consumption of sugar-sweetened beverages. Children living in rural areas had a prevalence of sugary drink consumption 21% higher than that of children living in urban areas. Children whose parents were illiterate or had incomplete elementary education, complete elementary/incomplete high school education, and complete high school education had consumption prevalence that were 55%, 44%, 49%, and 42% higher, respectively, than

that of children whose parents had higher education or more; In contrast, children whose families had a family income between one and two minimum wages had a consumption prevalence 19% lower than that of those whose families had an income of up to one minimum wage. This prevalence was 38% lower in children whose families had an income greater than three minimum wages. Children between 6 and 11 months of age had consumption prevalence 19% lower than older children.

Table 3 – Results of initial and final multiple Poisson regression models for ultra-processed food consumption. Cruzeiro do Sul (AC), Brazil, 2017.

Variables	Initial model		Final model	
	Adjusted PR (95% CI)	*p*	Adjusted PR (95% CI)	*p*
Area of residence		0.296		0.034
Urban	Ref.		Ref.	
Rural	1.003 (0.997-1.009)		1.008 (1.001-1.015)	
Mother's age (years)		0.445		-
18 to 19	0.997 (0.989-1.005)		-	
>19	Ref.		-	
Maternal education		0.530		-
Illiterate	1.076 (0.987-1.173)	0.095	-	-
Incomplete elementary school	1.078 (0.989-1.175)	0.089	-	-
Completed elementary/incomplete secondary	1.078 (0.987-1.177)	0.093	-	-
Secondary education	1.077 (0.988-1.174)	0.090	-	-
Higher education or more	Ref.		-	-
Paternal education		0.933		-
Illiterate	0.989 (0.953-1.027)	0.580	-	-
Incomplete elementary school	0.990 (0.953-1.029)	0.607	-	-
Completed elementary/incomplete secondary	0.981 (0.929-1.035)	0.478	-	-
Secondary education	0.992 (0.949-1.036)	0.703	-	-
Higher education or more	Ref.		-	-
Mother's occupation		0.219		-
Housewife	1.00		-	-
Working outside home	1.008 (0.966-1.051)	0.710	-	-
Studies	1.037 (0.995-1.081)	0.087	-	-
Total family income (minimum wage)		0.482	-	0.050
<1	Ref.		Ref.	
1 to 2	0.993 (0.980-1.006)	0.280	0.980 (0.960-0.999)	0.047
3 or more	1.003 (0.940-1.070)	0.937	0.971 (0.929-1.014)	0.182
Birth weight		0.377		-
<2,500 g	1.008 (0.991-1.025)		-	-
2,500 g or more	Ref.		-	-
Gestational age at birth (weeks)		0.317		-
<37	1.011 (0.996-1.027)	0.154	-	-
7 to 41	Ref.		-	-
42 or more	1.008 (0.992-1.025)	0.310	-	-

Note: CI: Confidence Interval; PR: Prevalence Ratio; Ref: Reference.

Table 4 – Prevalence and results of simple Poisson regression models for consumption of sugar-sweetened beverages in children aged 6 to 23 months. Cruzeiro do Sul (AC), Brazil, 2017.

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Variables	Crude Prevalence Ratio	
	Estimate (95%CI)	*p*
Area of residence		<0.001
Urban	Ref.	
Rural	1.31 (1.19-1.45)	
Mother's age (years)		0.021
18 to 19	1.18 (1.02-1.35)	
>19	Ref.	

Table 4 – Prevalence and results of simple Poisson regression models for consumption of sugar-sweetened beverages in children aged 6 to 23 months. Cruzeiro do Sul (AC), Brazil, 2017.

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Variables	Crude Prevalence Ratio	
	Estimate (95%CI)	*p*
Mother's marital status		0.321
Married	Ref.	
Single	1.07 (0.94-1.22)	
Maternal education		<0.001
Illiterate	1.95 (1.40-2.73)	<0.001
Incomplete elementary school	1.91 (1.44-2.54)	<0.001
Completed elementary/incomplete secondary	1.65 (1.23-2.22)	<0.001
Secondary education	1.47 (1.09-1.98)	0.012
Higher education or more	Ref.	
Paternal education		<0.001
Illiterate	2.09 (1.54-2.82)	<0.001
Incomplete elementary school	1.88 (1.40-2.53)	<0.001
Completed elementary/incomplete secondary	1.74 (1.27-2.37)	0.001
Secondary education	1.53 (1.13-2.08)	0.007
Higher education or more	Ref.	
Mother's occupation		0.003
Housewife	Ref.	
Working outside home	0.73 (0.60-0.88)	0.001
Studies	0.82 (0.55-1.22)	0.335
Total family income (minimum wage)		<0.001
<1	Ref.	
1 to 2	0.76 (0.66-0.87)	<0.001
3 or more	0.57 (0.42-0.76)	<0.001
Parity		0.055
Primiparous	Ref.	
Multiparous	1.13 (1.00-1.29)	
Child's gender		0.469
Male	0.96 (0.86-1.07)	
Female	Ref.	
Birth weight		0.443
<2,500 g	1.08 (0.89-1.30)	
2,500 g or over	Ref.	
Gestational age at birth (weeks)		0.587
<37	0.91 (0.74-1.11)	0.336
37 to 41	Ref.	
42 or more	1.08 (0.69-1.68)	0.745
Child's age (months)		0.002
6 to 11	0.80 (0.69-0.92)	
12 to 23	Ref.	
Breastfeeding		0.918
No	1.01 (0.90-1.13)	
Yes	Ref.	

Note: CI: Confidence Interval; PR: Prevalence Ratio; Ref: Reference.

Table 5 – Results of initial and final multiple Poisson regression models for sugar-sweetened beverage consumption. Cruzeiro do Sul (AC), Brazil, 2017.

1 of 2

Variables	Initial model		Final model	
	Adjusted PR (95% CI)	*p*	Adjusted PR (95%CI)	*p*
Area of residence		0.008		0.001
Urban	Ref.		Ref.	
Rural	1.18 (1.04-1.33)		1.21 (1.08-1.36)	

Table 5 – Results of initial and final multiple Poisson regression models for sugar-sweetened beverage consumption. Cruzeiro do Sul (AC), Brazil, 2017.
2 of 2

Variables	Initial model		Final model	
	Adjusted PR (95% CI)	*p*	Adjusted PR (95%CI)	*p*
Mother's age (years)		0.028		
18 to 19	1.22 (1.02-1.45)			
>19	Ref.			
Maternal education		0.903		-
Illiterate	1.06 (0.69-1.62)	0.786	-	-
Incomplete elementary school	1.05 (0.71-1.57)	0.795	-	-
Completed elementary/incomplete secondary	0.98 (0.66-1.45)	0.911	-	-
Secondary education	1.01 (0.69-1.48)	0.949	-	-
Higher education or more	Ref.	-	-	-
Paternal education		0.241		0.039
Illiterate	1.44 (1.03-2.01)	0.031	1.55 (1.13-2.11)	0.006
Incomplete elementary school	1.35 (0.98-1.87)	0.069	1.44 (1.06-1.96)	0.020
Completed elementary/incomplete secondary	1.43 (1.03-2.00)	0.034	1.49 (1.08-2.05)	0.014
Secondary education	1.40 (1.02-1.92)	0.039	1.42 (1.04-1.92)	0.025
Higher education or more	Ref.	-	Ref.	-
Mother's occupation		0.534		-
Housewife	Ref.	-	-	-
Working outside home	0.88 (0.70-1.10)	0.267	-	-
Studies	0.95 (0.60-1.50)	0.816	-	-
Total family income (minimum wage)		0.018		0.002
<1	Ref.	-	Ref.	-
1 to 2	0.83 (0.71-0.96)	0.015	0.81 (0.70-0.94)	0.005
3 or more	0.66 (0.44-1.00)	0.052	0.62 (0.43-0.89)	0.011
Parity		0.179		-
Primiparous	Ref.		-	-
Multiparous	1.11 (0.95-1.31)		-	-
Child's age (months)		0.007		0.005
6 to 11	0.81 (0.70-0.95)		0.81 (0.69-0.94)	
12 to 23	Ref.		Ref.	

Note: CI: Confidence Interval; PR: Prevalence Ratio.

DISCUSSION

The early consumption of UPFs and sugar-sweetened beverages was identified for most children evaluated in the municipality of Cruzeiro do Sul, being associated with total family income, paternal education and area of residence. The high prevalence of these foods and their associated factors reveal inadequate dietary practices and lack of guidance regarding the introduction of healthy complementary foods, being a risk for obesity and overweight both in childhood and in adulthood [15].

A study conducted in the municipality of Mâncio Lima, neighboring Cruzeiro do Sul, found that among indigenous children aged 6 to 12 months and 13 to 23 months, there was a high prevalence of UPFs (52.6% and 28.6%, respectively) in their diet [16]. The high presence of UPFs in the diets of children under two years of age is also observed in municipalities in Brazilian states with socioeconomic and cultural profiles different from the state of Acre, such as Rio Grande do Sul [11,17], Minas Gerais [9] and São Paulo [18,19], revealing the need to enhance the use of healthy eating practices throughout the country.

Children living in rural areas had a higher prevalence of consumption of UPFs foods and sugar-sweetened beverages compared to those living in urban areas. This result reveals the

population's dietary transition, since the rural area of Cruzeiro do Sul, which also includes indigenous lands, is an area of agricultural production and, therefore, of availability of fresh foods [20]. In contrast, other studies on UPFs in Brazilian children under two years of age did not identify any difference in consumption in relation to the children's urban or rural residence [21,22].

The larger consumption of ultra-processed products and sugar-sweetened beverages in the rural area of the municipality of Cruzeiro do Sul can be explained by the ease of acquiring these products through itinerant land and river services that cater to the local food consumers relieving them from the cost of traveling to urban centers. Precisely because of the distance from the urban area, these services are limited to industrial and non-perishable products. However, we cannot rule out the persuasive marketing of UPFs producers in this country that use sales strategies without proper regulation [23].

The total family income in the sample studied showed a negative association with the consumption of ultra-processed foods; in fact, children whose families earned a family income between one and two minimum wages had a prevalence of consumption 2% lower than that of children whose families had an income of less than one minimum wage. A similar result was found in studies in Maceió (AL) [24] and in the southern region of Brazil [11,25]. Higher prevalence of consumption of UPFs in children who belonged to low-income families may be associated with the greater accessibility and availability of these foods, added to the low cost compared to foods considered more nutritious and beneficial in terms of energy supply [25].

Regarding sugar-sweetened beverages, the observed prevalence is higher than that reported in national studies. Data from the National Health Survey, 2013, with Brazilian children under two years of age indicated the consumption of soft beverages or artificial juice by one in three children under two years of age (32.3%) [21]. In the last National Child Nutrition Survey, 2019, the consumption of sugar-sweetened beverages prevalence among children aged 6 to 23 months was 24.5%, but the prevalence was even higher in the age group of 18 to 23 months of age (37.7%) [7].

Paternal education was inversely associated with sugar-sweetened beverages intake. This result was observed in a study on family influence on the consumption of sugar-sweetened beverages in Brazilian children under two years of age, which identified a lower consumption of such beverages among children whose adults resident in the household had a higher level of education [22]. These results were consistent with those of a systematic review, which collected data from several countries. It was evidenced that a lower socioeconomic status of parents, such as income, was associated with higher consumption of these beverages in children [26].

This study has some limitations. First, collection of food consumption data, which was restricted to the past 24 hours, and cannot clarify what kind and how much of the different kind of foods are part of the children's eating habits. However, this model of food survey has been increasingly used in epidemiological studies to reduce memory biases, being useful to identify the presence of consumption markers [7,21]. The second limitation refers to the total family income variable, which, given the nature of the study, was chosen to be retrieved in terms of minimum wages to minimize information inaccuracies. However, the closed collection of these data limits the estimate of the per capita income that would indicate the value of total income per family member. Another limitation is the external validity of our findings, since the data refer to a municipality in the Western Amazon region, and are not representative of other regions of the country with sociocultural frameworks different from those of this study.

Our study has also some strong points that should be highlighted, as they represent a step forward in understanding and reducing the health and nutrition issues in the interior of the Amazon

region. Many national studies are mostly centered on state capitals or macro-regions, and do not cover smaller municipalities. Furthermore, the field surveyors were trained to carry out the interviews, which ensured standardization in the data collection process.

CONCLUSION

This study identified a high prevalence of UPFs and sugar-sweetened beverages consumption by children under two years of age in the municipality of Cruzeiro do Sul and found that families living in rural areas, with a total family income of less than one minimum wage and lower paternal education had a higher prevalence of unhealthy foods consumption.

Knowing the prevalence of unhealthy foods and their associated factors in the diet of children under two years of age is important to support the development of interventions to promote healthy eating and prevent future untoward effects, such as childhood obesity.

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