

## Food consumption pattern and excess weight in preschoolers: a cross-sectional study

*Padrão de consumo alimentar e excesso de peso em pré-escolares: estudo transversal*

*Patrón de consumo de alimentos y sobrepeso en niños en edad preescolar: estudio transversal*

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


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### ABSTRACT

**Background and objectives:** children's food-related lifestyle brought changes in their weight status and eating patterns. We aimed to investigate the association between food consumption pattern and excess weight in preschoolers aged six. **Methods:** a cross-sectional analysis of a prospective birth cohort, in 2004, in Feira de Santana-BA. Food consumption frequency was verified, characterized by patterns and established through a food frequency questionnaire, validated in a previous study, in pattern 1: milk, vegetables, cereals, legumes, fruits and fish; pattern 2: snacks, soda/artificial juice, oils, sweets and coffee/tea; pattern 3: sausages, fast food, ketchup/mayonnaise and egg; pattern 4: red meat and chicken. Excess weight was defined according to the World Health Organization criteria. The main association was assessed using Pearson's chi-square test and Poisson regression. **Results:** a total of 618 children were investigated. Excess weight occurred in 28.6%, and pattern 3 frequency was 68%. In the bivariate analysis, only pattern 3 was associated with children's excess weight (PR: 1.23; 95%CI: 1.01-1.63). In the multivariate analysis, the prevalence of excess weight children who consumed pattern 3 was 50% (<sub>adjusted</sub> PR: 1.50; 95%CI: 1.01-1.93). **Conclusion:** moderate/high consumption of sausages, fast food, ketchup/mayonnaise and eggs was associated with excess weight among children in the sample.

**Keywords:** Preschool. Excess weight. Food Consumption.

### RESUMO

**Justificativa e objetivos:** o estilo de vida das crianças relacionado à alimentação trouxe mudanças no estado de peso e no padrão alimentar. Objetivou-se averiguar a associação entre o padrão de consumo alimentar e o excesso de peso em pré-escolares aos seis anos de idade. **Métodos:** análise transversal, de uma coorte prospectiva de nascimento, em 2004, em Feira de Santana-BA. Verificou-se a frequência do consumo alimentar, caracterizado por padrões e estabelecido por meio do questionário de frequência alimentar, validado em um estudo prévio, em padrão 1: leite,

verduras, cereais, leguminosas, frutas e pescados; padrão 2: salgadinhos, refrigerantes/sucos artificiais, óleos, doces e cafés/chás; padrão 3: embutidos, *fast food*, *ketchup*/maionese e ovo; padrão 4: carnes vermelhas e frango. O excesso de peso foi definido segundo os critérios da Organização Mundial da Saúde. A associação principal foi avaliada mediante Teste Qui-Quadrado de Pearson e regressão de Poisson. **Resultados:** investigaram-se 618 crianças. O excesso de peso ocorreu em 28,6%, e a frequência do padrão 3 foi de 68%. Na análise bivariada, somente o padrão 3 se associou com o excesso de peso da criança (RP: 1,23; IC95%: 1,01-1,63). Na análise multivariada, a prevalência de crianças que consumiam o padrão 3 com excesso de peso foi de 50% (RP<sub>ajustado</sub>: 1,50; IC95%: 1,01-1,93). **Conclusão:** o consumo moderado/alto de embutidos, *fast food*, *ketchup*/maionese e ovo se associou com o excesso de peso entre as crianças.

**Descritores:** Pré-Escolar. Sobrepeso. Consumo Alimentar.

## RESUMEN

**Justificación y objetivos:** el estilo de vida de los niños relacionado con la alimentación trajo cambios en su estado de peso y patrones de alimentación. El objetivo fue investigar la asociación entre el patrón de consumo de alimentos y el sobrepeso en preescolares de seis años. **Métodos:** análisis transversal de una cohorte prospectiva de nacimiento, en 2004, en Feira de Santana-BA. Se verificó la frecuencia de consumo de alimentos, caracterizada por patrones y establecida a través del cuestionario de frecuencia de alimentos, validado en un estudio previo, en el patrón 1: leche, verduras, cereales, legumbres, frutas y pescado; patrón 2: bocadillos, refrescos/jugos artificiales, aceites, dulces y café/té; patrón 3: salchichas, *fast food*, salsa de tomate/mayonesa y huevo; patrón 4: carnes rojas y pollo. El exceso de peso se definió según los criterios de la Organización Mundial de la Salud, la asociación principal se evaluó mediante la prueba de chi-cuadrado de Pearson y regresión de Poisson. **Resultados:** 618 niños fueron investigados. El exceso de peso se presentó en el 28,6% y la frecuencia del patrón 3 fue del 68%. En el análisis bivariado, solo el patrón 3 se asoció con el exceso de peso del niño (RP: 1,23; IC95%: 1,01-1,63). En el análisis multivariado, la prevalencia de niños con sobrepeso que consumieron el patrón 3 fue del 50% (RP<sub>ajustado</sub>: 1,50; IC95%: 1,01-1,93). **Conclusión:** el consumo moderado/alto de salchichas, *fast food*, *ketchup*/mayonesa y huevos se asoció con sobrepeso entre los niños de la muestra.

**Palabras clave:** Preescolar. Exceso de Peso. Consumo de Comida.

## INTRODUCTION

Excess weight is a global problem on the rise: the prevalence of overweight and obesity has more than doubled since the 1980s. Data released by the Center for Disease Control (CDC) in the United States point to a prevalence of obesity of 13.9 % in children between 2 and 5 years of age and 18.4% among those aged 6 to 11 years.<sup>1</sup> Studies project that about 57% of American children will be obese by age 35.<sup>2</sup>

In Brazil, the prevalence of obesity in children varies between 11% and 38%, depending on the region of the country. In the state of Bahia, studies carried out with children, in different municipalities, found a prevalence of overweight of 15.8% in the capital and 9.3% to 17% in cities in the countryside, highlighting high rates of excess weight (overweight and obesity) in this population.<sup>3,4</sup> In a systematic review, which investigated the impact and prevalence of childhood obesity in Brazil, it was pointed out that changes in eating patterns and lifestyle habits make these results more expressive and relevant to society.<sup>5</sup>

An inadequate diet in childhood, combined with other factors, can lead to the emergence of conditions, such as overweight/obesity and its other pathophysiological repercussions, highlighting that, when started in childhood, the longer is the time of exposure to the metabolic repercussions of excess weight.<sup>6,3</sup> Among the comorbidities related to obesity in childhood are high blood pressure, lipid profile abnormalities, cardiovas-

cular diseases (CVD), among others.<sup>6,3</sup> In addition, the consequences of being excess weight extend beyond childhood, as studies show that around 40 to 80% of excess weight children become obese adults.<sup>6</sup>

The paths that lead to excess weight are multiple, but it is recognized that this results mainly in the imbalance between food intake and energy expenditure.<sup>6</sup> Since the 1990s, as a result of the nutritional transition process, the Brazilian population's dietary pattern has been changing, with the adoption of a diet based on high levels of fat, carbohydrates and salt, as well as industrialized foods in general.<sup>7</sup> Data from the last Household Budget Survey (HBS: 2017-2018) show that, in northeastern Brazil, families have an annual per capita purchase of 2.4 kg of processed foods and 14.3 kg of sugar and sweets. According to the same data, about 14.4% of the total calories related to food purchased by the family come from ultra-processed foods.<sup>8</sup>

A population's or individual's dietary pattern can be defined or characterized by the foods usually consumed. Its definition allows a general assessment of food consumption beyond nutrient analysis, producing a global perspective of a population's diet based on its usual consumption. The dietary pattern in childhood is strongly influenced by lifestyle habits, such as an inactive lifestyle, parental education, screen time, among others. Consumption based on the intake of ultra-processed foods is also associated with important metabolic repercussions,

such as appetite stimulation and changes in endocrine pathways, implying a greater risk of obesity.<sup>7,9</sup>

The construction of dietary patterns, through the definition of certain foods consumed by a population, is considered by the World Health Organization (WHO) as the most appropriate method for assessing food groups, together, identifying consumption profiles based on daily intake.<sup>10</sup>

Thus, lower consumption of dietary patterns consisting of foods considered obesogenic (or with Western characteristics) may reduce the risk of developing obesity.<sup>11,12</sup> Thus, food consumption is a modifiable risk factor for the development of excess weight. Efforts should be directed towards understanding this phenomenon in pediatric age groups, since this problem is still little studied in preschoolers. Thus, this study aimed to investigate the association between food consumption pattern and excess weight in preschoolers at six years of age.

## METHODS

This study is part of a longitudinal study, based on a population-based cohort of live births, which began in 2004 in the city of Feira de Santana, Bahia. Details on the procedures for collecting data from the birth cohort can be found in another publication.<sup>13</sup>

The current article is a cross-sectional analysis of information collected at six years of age from children. A sample calculation was performed using the Epi Info™ 7.0 software, considering the following parameters: power of 80%; sampling error of 5%; 95% Confidence Interval; 1:1 ratio; and 5.3% prevalence of the outcome for combined prevalence of obesity.<sup>14</sup> Thus, the sample size calculation comprised 232 individuals. However, all individuals followed up at six years and who had available information on the outcome analyzed in this article were included (n=618 pairs of mothers and their children). The sample size calculation was performed to ensure that the number of individuals was sufficient for the study to have a minimum power of 80%.

Food consumption was the main independent variable, assessed through the application of a food frequency questionnaire (FFQ) validated in a previous study applied to mothers or guardians of children.<sup>15</sup> The FFQ consisted of 133 foods. This variable was subdivided according to the dietary patterns identified from the application of exploratory factor analysis. In this regard, items grouped under each factor were strongly correlated with each other. More details about the origin and validity of the questionnaire used, in addition to the factorial loads and the total percentage of dietary variability for each pattern, can be obtained in another publication.<sup>15</sup>

For the current study, with six-year-old children, they were assessed regarding the frequency of consumption permanence between patterns. Food consumption patterns were categorized into never/low consumption (food consumption 1 to 2 times a week) and moderate/high (food consumption 3 times or more a week), according to a previous study, using information from the

same birth cohort.<sup>13</sup> Pattern 1 was characterized by the predominance of consumption of milk and derivatives, vegetables and tubers, cereals, legumes, fruits and fish. In pattern 2, snacks, soft drinks/artificial juices, sweets, oils and fats, and coffee/tea predominated. Pattern 3 consisted of sausages, fast food, ketchup/mayonnaise and eggs. Pattern 4 was characterized by the highest frequency of consumption of red meat and chicken.

For the present study, children's excess weight was considered as an outcome, identified through the Body Mass Index's (BMI) growth chart related to sex and age (A) (The BMI was calculated based on the weight and height data obtained, with the objective of assessing the studied population's nutritional status). Therefore, in this research, children were characterized as: eutrophic, when  $BMI/A \leq 85^{\text{th}}$  percentile, and excess weight, when value  $>$  the  $85^{\text{th}}$  percentile.<sup>3,16</sup>

Children's sex was defined as male and female. The WHO classifies measurements of low birth weight  $\leq 2,500$  g, underweight between 2,501 g and 2,999 g and adequate birth weight  $\geq 3,000$  g. In the present study, underweight was defined as children grouped into the underweight and insufficient weight categories, i.e.,  $< 3,000$  g.<sup>17</sup>

Gestational age was categorized according to the WHO classification into preterm ( $< 37$  weeks) and term ( $\geq 37$  weeks).<sup>17</sup> The breastfeeding variable was estimated as yes (exclusively breastfed up to 6 months of age) and no (not exclusively breastfed up to 6 months of age).

Residents per household were defined as up to 4 persons per household and 5 persons or more. The practice of physical activity performed by children at school (characterized by their participation in practical physical education classes) was dichotomized into yes and no.

The maternal age variable was categorized into two groups,  $\leq 30$  years and  $> 30$  years, based on and adapted from the WHO classification scale for young adults and recognized in *Marco Legal*, Ministry of Health's manual.<sup>18,19</sup> Maternal excess weight was estimated when BMI values were  $\geq 25.0$  kg/m<sup>2</sup>.<sup>16</sup> Maternal education was dichotomized into two extracts: less than or equal to elementary school and equal to or greater than high school. Paternal obesity was a self-reported measure. Family income was categorized as less than or equal to 1 minimum wage and more than or equal to 2 minimum wages.

The selection of interaction variables was based on a presumed causal relationship between food consumption and excess weight. Thus, a conceptual theoretical framework was used, and the following confounding covariates were selected: maternal BMI, father's obesity and physical activity by children. The presence of effect modification was investigated using the Likelihood Ratio Test ( $p \leq 0.05$ ). For those covariates in which the presence of effect modification was not identified, the presence of confounders was tested using the backward strategy, a covariate being considered confounding when producing a change of at least 10% in the measure of association.

The databases were typed, with double entry, by two independent typists. Comparison of files was carried out using the Validate Epi Info 7.0 package, with correc-

tions for differences, according to the original forms. Data were analyzed using the statistical package Statistical Package for the Social Sciences (SPSS), version 20.0, and Stata, version 7.0.

Descriptive statistics were used to characterize the sample, through relative and absolute frequencies. In the bivariate analysis, the association between excess weight and dietary patterns was estimated using Pearson's chi-square test ( $\chi^2$ ), with calculation of the Prevalence Ratio (PR) and respective 95% Confidence Intervals.

In the multivariate analysis, Poisson regression with robust error variance was applied. The variables were entered into the model using the backward method, using  $p$ -value  $\leq 0.25$  as a criterion in the bivariate analyzes. Variables with prediction that should remain in the model were selected, keeping those with  $p$ -value  $\leq 0.20$  obtained by adjusting the model using the Likelihood Ratio Test. In the final model, the same method was used, considering as statistically significant the associations whose variables presented  $p$ -value  $< 0.05$ .

The study complied with the ethical and legal aspects provided for in Resolution 196/96 of the Brazilian National Health Council, with the study protocol approved by the Research Ethics Committee (REC) of the *Universidade Estadual de Feira de Santana* (UEFS) (CAAE (Certificado de Apresentação para Apreciação Ética - Certificate of Presentation for Ethical Consideration) 0074.0.059.000-06) at the beginning of the cohort (2004) and, in a new assessment (CAAE 82991318.0.0000.0053), after the updates of ethical resolutions for research with human beings, Resolutions 466/12 and 510/16. Participants signed the Informed Consent Form (ICF), also giving consent on behalf of minors, as they were newborns at baseline.

## RESULTS

A total of 618 children (51.7% boys) were assessed. Mother and child characteristics are shown in Table 1. Most mothers declared a family income greater than or equal to two minimum wages (51.3%). Regarding residents per household, 36.5% reported living with five people or more. Only 26.9% of children practiced some type of physical activity. Excess weight was identified in 28.6% of children. Regarding food consumption patterns, consumption was moderate/high in all four patterns, with values above 60%, highlighting the moderate to high food consumption pattern 3, with 68.0%.

In the bivariate analysis (Table 2), only pattern 3 was associated with children's BMI. Thus, there was a prevalence of 23% of excess weight in children who consumed moderate to high food consumption pattern 3 (95%CI: 1.01-1.63), when compared to normal weight congeners.

In the multivariate analysis, the moderate to high dietary intake of pattern 3 met the criteria for inclusion in the model. There was a prevalence of 53% of excess weight children who consumed a moderate to high diet of sausages, fast food, ketchup/mayonnaise and eggs ( $\text{PR}_{\text{unadjusted}}$ : 1.53; CI95%: 1.03 – 2.00;  $\text{PR}_{\text{adjusted}}$ : 1.50; 95%CI:

**Table 1.** Sociodemographic characteristics of children at six years of age and maternal reproductive health, Feira de Santana – BA, 2018.

Variables	N
Children's BMI*	
Excess weight ( $\geq$ 85th percentile)	177 (28.6)
Not excess weight ( $<$ 85th percentile)	441 (71.4)
Children's sex	
Female	298 (48.3)
Male	320 (51.7)
Weight at birth	
Inadequate weight ( $<$ 3,000 g)	158 (25.6)
Adequate weight ( $\geq$ 3,000 g)	460 (74.4)
Gestational age	
Preterm ( $<$ 37 weeks)	22 (3.6)
Term ( $\geq$ 37 weeks)	596 (96.4)
Food consumption pattern 1	
Moderate/high consumption	407 (65.9)
Never/low consumption	211 (34.1)
Food consumption pattern 2	
Moderate/high consumption	410 (66.4)
Never/low consumption	208 (33.6)
Food consumption pattern 3	
Moderate/high consumption	420 (68.0)
Never/low consumption	198 (32.0)
Food consumption pattern 4	
Moderate/high consumption	404 (65.3)
Never/low consumption	214 (34.6)
Exclusive breastfeeding at 6 months	
No	154 (25.0)
Yes	464 (75.0)
Maternal BMI*	
Excess weight ( $\geq$ 25.0)	245 (39.7)
Normal weight ( $\geq$ 18.5 and $<$ 24.9)	373 (60.3)
Maternal age	
$>$ 30 years	153 (24.8)
$\leq$ 30 years	465 (75.2)
Father's obesity history	
Yes	129 (20.8)
No	489 (79.2)
Maternal education	
Up to elementary school	207 (33.5)
Equal or higher than high school	411 (66.5)
Family income	
Less than or equal to 1 MW**	300 (48.7)
More than or equal to 2 MW**	318 (51.3)
Residents per household	
Up to 4 people	392 (63.5)
5 or more people	226 (36.5)
PA*** practice by children	
No	452 (73.1)
Yes	166 (26.9)

Caption: \* Body Mass Index; \*\*minimum wage; \*\*\*physical activity.

1.01 – 1.93) (Table 3). No modification relationship was identified in the main variables, although the covariates with potential interaction factor were included in the analyzes (based on the literature).

**Table 2.** Bivariate analysis between the sociodemographic characteristics of excess weight children aged six years and maternal reproductive health, Feira de Santana– BA, 2018.

Variables	Child's BMI* classification PR (95%CI)**	P**
Children's sex		
Female	1.04 (0.81 – 1.33)	0.75
Male	-	
Weight at birth		
Inadequate weight (< 3,000 g)	0.98 (0.73 – 1.30)	0.89
Adequate weight (≥ 3,000 g)	-	
Gestational age		
Preterm (< 37 weeks)	0.96 (0.50 – 1.83)	0.90
Term (≥ 37 weeks)	-	
Food consumption pattern 1		
Moderate/high consumption	0.92 (0.71 – 1.19)	0.55
Never/low consumption	-	
Food consumption pattern 2		
Moderate/high consumption	0.87 (0.67 – 1.13)	0.31
Never/low consumption	-	
Food consumption pattern 3		
Moderate/high consumption	1.23 (1.01 – 1.63)	0.04
Never/low consumption	-	
Food consumption pattern 4		
Moderate/high consumption	1.06 (0.80 – 1.39)	0.66
Never/low consumption	-	
Maternal BMI*		
Excess weight (≥ 25.0)	1.10 (0.77 – 1.29)	0.20
Normal weight (≥ 18.5 and < 24.9)	-	
Exclusive breastfeeding for up to 6 months		
No	1.07 (0.81 – 1.42)	0.61
Yes	-	
Maternal age		
> 30 years	0.98 (0.74-1.31)	0.92
≤ 30 years	-	
Father's obesity history		
Yes	1.16 (0.84 – 1.60)	0.20
No	-	
Maternal education		
Up to elementary school	1.00 (0.65 – 0.69)	0.51
Equal or higher than high school	-	
Family income	1.00 (0.68 – 0.72)	
Less than or equal to 1 MW**	-	0.27
More than or equal to 2 MW**	-	
Residents per household	1.15 (0.72 – 1.82)	
Up to 4 people	-	0.55
5 or more people	-	
PA*** practice by children	1.17 (0.71 – 1.93)	
No	-	0.53
Yes	-	

Caption: \* Body Mass Index; \*\* Prevalence Ratio; Confidence Interval; Pearson's chi-square test ( $p < 0.05$ ); \*\*\* physical activity, \*\*\*\* minimum wage.

## DISCUSSION

This investigation showed an association between dietary intake pattern and excess weight in six-year-old children, based on a birth cohort. Dietary patterns were established for this population in the study by Gomes et al. (2012). However, in the present investigation, consumption frequency and permanence in (previously established) patterns were verified with the same population, in addition to the relationship with other variables (not previously analyzed).<sup>15</sup>

The results showed that the frequency of moderate to high consumption of sausages, fast food, ketchup/mayonnaise and eggs increased the probability of being excess weight in these children, compared to a low consumption of these foods. Previous studies have already reported the association between the type of diet and weight status in childhood.<sup>20,10</sup>

Food plays an important role in people's lives, but the investigation of food consumption is still considered a very complex subject. Eating behavior is formed in the first years of life, and adult eating habits are directly associated with experiences learned in childhood.<sup>21</sup>

The knowledge of food consumption pattern in childhood must be done through food and nutritional surveillance, in a way that allows the observation of behavior or pattern that characterizes positive and/or negative markers of food.<sup>18</sup> In childhood, food consumption habits are being acquired and consolidated, and it is in this phase that the main interventions must be planned.<sup>21</sup>

Environmental factors, such as the type of diet of parents and caregivers, can also influence their children's eating habits and experience, reinforcing that family eating practices play an important role in forming healthy eating habits in children.<sup>21,22</sup>

The responsibility of parents in developing good eating habits and child behavior is very relevant, including controlling food supply and availability. Studies show that sitting at the table to eat can contribute to reducing overweight/obesity rates, since meals eaten in front of the television draw attention away from the food, causing people to eat more than necessary.<sup>22</sup> Therefore, it is in early childhood that parents should influence and guide their children regarding the benefits of healthy eating, as the family is considered the main generator of good or bad life and eating habits in children and adolescents.<sup>22</sup>

**Table 3.** Multivariable analysis between food consumption pattern 3 and excess weight in children at six years of age, using Poisson regression. Feira de Santana – BA, 2018.

Classification of children's BMI***	unadjusted PR*	95%CI**	P-value	adjusted PR*	95%CI**	P-value
Food consumption pattern 3: Moderate/high consumption	1.53	1.03 - 2.00	0.03	1.50 <sub>a</sub>	1.01-1.93	0.01

Caption: p-value: significance level ≤ 0.05; a adjusted for the mother's BMI; father's obesity and physical activity; \*Prevalence Ratio; \*\*Confidence Interval; \*\*\*Body Mass Index.

A longitudinal investigation carried out in Japan with 541 children of preschool age found that, after one year of increased fast food consumption, 8.1% of children had a change in weight, with a 38% increase in the risk of weight gain with each additional intake per week, and that frequent intake of this type of food can be even more problematic for children who are already excess weight.<sup>20</sup> Similarly, in a study carried out in Brazil, a 10% increase in caloric intake from ultra-processed food consumption by preschoolers was observed.<sup>23</sup>

The Brazilian population's eating habits were becoming more and more similar to those of developed countries, with a tendency to consume foods with high energy density, rich in salt and sugars, and at low cost, making them accessible to all social classes.<sup>8</sup> The emerging process of urbanization and industrialization contributed to characterize the preference for food consumption such as fast food, frozen food, preserves, canned goods (considered quick, comfortable meals, taking less time), consumed outside the home. This change had a negative impact on the population's nutritional status.<sup>8,24</sup>

Understanding the role of ultra-processed foods, including ready-made sauces, ketchup, mayonnaise and fast foods, significantly contributes to high consumption of sodium, simple sugars and chemical additives, such as preservatives and dyes, with a positive association between their consumption and the increased prevalence of childhood obesity and/or chronic diseases.<sup>24</sup>

Thus, targeting interventions, such as adopting a healthier lifestyle, may represent one of the main factors in promoting child health, since, due to its multifactorial etiology, excess weight in childhood is related to eating habits and sedentary behavior, which can interfere with endocrine mechanisms that regulate metabolism and appetite.<sup>25</sup>

Although in food consumption pattern 3, which remained associated with excess weight children, there was the egg food, this does not corroborate with the findings in the literature, which bring evidence in the direction of a protective food. A study with children carried out in Ecuador showed a 47% reduction in the prevalence of short stature in the group that received the egg, in addition to a 74% reduction in the prevalence of underweight. The weight-for-age and BMI curves for this group also showed improvements when eggs were consumed.<sup>25</sup> However, it is important to emphasize that the effects of foods, individually included in children's diet, were not sufficient for the causal relationship between food and health.<sup>20</sup>

The present study did not find associations between some of researched variables and excess weight in children, which are usually mentioned in other studies, such as history of paternal obesity, maternal excess weight, protective effect of breastfeeding, inadequate birth weight, prematurity and higher maternal age at the time of child birth and practice of physical activity.<sup>13</sup>

The prevalence found may have been influenced by survival bias, due to loss of follow-up of the cohort, although the sample size is adequate to estimate excess weight. This study has some methodological limitations, such as the technique used to estimate food consumption.

The FFQ used memory-dependent self-reported data, and the questions' complexity may have hampered food accuracy and quantity, because it involves a subjective judgment in determining the number of factors, their interpretation and rotation selection. Moreover, as it is a cross-sectional analysis, it makes it impossible to establish a causal relationship in the order of events. The study does not cover other factors that could influence the association between food consumption pattern and excess weight, including other socioeconomic aspects, such as screen time, meal consumption in front of television, among others.

Despite this, the investigation has strengths: the information has high accuracy and quality, as it originates from data from a birth cohort. In addition to this, internal consistency in identifying the cohort's dietary patterns, its reliability, data accuracy and robust sample size of children allows the findings to be extrapolated to other populations of the same age group.

The manuscript provides relevant information that can raise useful hypotheses in identifying problems and preventing injuries associated with eating patterns considered unhealthy. Children's nutritional status and their dietary pattern deserve special attention from public health, because it is at this stage of life that habits and body characteristics are acquired that can perpetuate for a lifetime, impacting on their morbidity and mortality.

Moderate to high consumption of sausages, fast food, ketchup/mayonnaise and eggs was a factor associated with excess weight among six-year-old children. The current study expands the understanding of the consequences of an unhealthy diet in preschoolers, in addition to reinforcing the established knowledge of the need for intervention measures against the high prevalence of excess weight.

Faced with global findings and concerns regarding food consumption pattern in societies and their repercussions in determining the emergence of health problems, it is evident that preventive measures, in this direction, are of fundamental importance for the control, reduction and combat of chronic diseases, being an effective solution for this condition, which represents a high cost for public health and that compromises individuals' quality of life.

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**Jessica Santos Passos Costa** - Development and design, data analysis and interpretation, review and approval of the final version of the article; **Mara Viana Cardoso Amaral and Gabriela Cintra Dos Santos** - Development of writing the manuscript, review and approval of the final version of the article; **Tatiana De Oliveira Vieira** - Review and approval of the final version of the article; **Gilmar Mercês De Jesus** - Data analysis and interpretation, review and approval of the final version of the article; **Graciete Oliveira Vieira** - Development and design, review and approval of the final version of the article; **Ana Mayra Andrade De Oliveira** - Review and approval of the final version of the article.

All authors approved the final version to be published and are responsible for all aspects of the work, including ensuring its accuracy and integrity.