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MATERNAL EATING BEHAVIOR PATTERNS AND WEIGHT STATUS OF CHILDREN

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ABSTRACT

Objective: To evaluate the effects of maternal dietary patterns of cognitive restriction, emotional eating, and lack of food control on the nutritional status of children at 9 years of age. Materials and Methods: This is a cross-sectional study, which is part of a larger cohort study, covering 144 pairs of mothers and their children. For this study, sociodemographic, economic and anthropometric characteristics of the pair and the mother's dietary patterns will be evaluated. Results: The predictor variables: maternal nutritional status, nutritional status at birth and children who were born large for gestational age were significantly ($p<0.05$) associated with the nutritional status of children at nine years of age. In addition, cognitive restriction eating behavior was significantly higher among children who were overweight when compared to children ≤P85th percentile. Conclusions: The mother's eating behaviors negatively influence the child's weight status and are a potential risk factor for excess body weight in children.

Key words: Cognitive restriction. Emotional eating. Eating disorder. Eating Behavior. Excess body weight.

RESUMO

Padrões de comportamento alimentar materno e estado nutricional da criança

Introdução: As mudanças nos padrões e comportamentos alimentares têm evidenciado dados alarmantes e significativos. Dentre estes, aspectos como restrições alimentares, alimentação emocional e descontrole alimentar manifestam significativos prejuízos ao indivíduo. Objetivo: Avaliar os efeitos dos padrões alimentares de restrição cognitiva, alimentação emocional e descontrole alimentar maternos no estado nutricional da criança aos 9 anos de idade. Materiais e Métodos: Trata-se de um estudo transversal, que faz parte de um estudo maior, de coorte, abrangendo 144 pares de mães e seus filhos. Para este estudo foram avaliadas características, sociodemográficas, econômicas e antropométricas do par, e dos padrões alimentares da mãe. Resultados: As variáveis preditoras: estado nutricional materno, estado nutricional ao nascer e crianças que nasceram grandes para a idade gestacional foram significativamente ($p<0,05$) associados ao estado nutricional da criança aos nove anos de idade. Além disso, o comportamento alimentar restrição cognitiva foi significativamente maior entre as crianças que apresentaram excesso de peso corporal quando comparadas às crianças ≤P85 percentil. Conclusão: Os comportamentos alimentares da mãe influenciam negativamente o peso da criança e são um potencial fator de risco para excesso de peso corporal em crianças.

Palavras-chave: Restrição cognitiva. Alimentação emocional. Descontrole alimentar. Comportamento Alimentar. Excesso de peso corporal. Obesidade.

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INTRODUCTION

The global prevalence of overweight and obesity has increased exponentially over the last five decades (Blüher, 2019).

Obesity is a multifactorial disease that is associated with different risk factors, including genetic, socioeconomic and sociocultural factors, lifestyle habits (Skelton et al., 2011), physical inactivity (Blüher, 2019), inadequate sleep habits (Schultz et al., 2021), and family influences such as parental food choices (Sentalin et al., 2019).

Food is an important factor for the child's health, and it is not difficult to understand that the eating behavior of the mother strongly influences the child's diet and food choices (Hu et al., 2019).

Eating habits often become so complex that mothers themselves are susceptible to developing eating disorders (Arnold et al., 2019), which can also interfere with the child's nutritional status (Saltzman et al., 2016).

Indeed, the patterns of maternal dysfunctional eating behaviors such as cognitive restraint, emotional eating, and uncontrolled eating have been associated with the child's nutritional status (Val-Laillet, et al., 2015; Jacobi, Schmitz and Agras, 2008).

There seems to be a positive relationship between maternal food restriction and the child's body mass index (BMI) (Pesch, et al., 2018).

The patterns of eating behavior have different characteristics, and the effect of a mother's dysfunctional eating behavior can generate distinctive responses in the child. For example, cognitive restraint of eating is a mental position chosen by the individual with regard to food and meals and is aimed at reducing calorie intake (Coffino, Orloff and Hormes, 2016).

This mental position is characterized by impositions and strict dietary obligations in order to maintain or lose weight (Zambrowics, et al., 2019).

In this respect, food restrictions can be considered harmful or beneficial, depending on how they are conducted (Bellisle, 2009).

In the case of individuals with a cognitive restrained eating pattern who exercise it with self-control and in a flexible and adaptable way, food restriction can help with diet and weight control (Bellisle, 2009).

However, individuals who adopt a rigid eating pattern and are exposed to negative situations tend to lose control at some point and, consequently, consume more food than they need (Bellisle, 2009).

Negative situations include the exposure of the individual to a forbidden food, eliciting cravings and a desire for that food (Linardon, 2018); stressful circumstances (Wallis and Hetherington, 2004), and drugs/stimulants and licit or illicit substances such as alcoholic beverages that interfere with conscious choices and self-control (Polivy and Herman, 2020).

Emotional eating occurs mainly in overweight and obese women (van Strien, Herman and Verheijden, 2012) and reflects unpleasant emotions such as feeling depressed (Heo et al., 2006), tense, anxious, and stressed (Epel et al., 2001).

In these cases, the adoption of a restrictive diet can exert a negative influence on dietary self-control and can thus lead to overweight or obesity (van Strien, 2018).

By eating less, the body acts as if it were weakened and in starvation mode: the metabolic rate decreases, hunger and appetite rise, and emotional hunger arises (Jacquet et al., 2020; MacLean et al., 2017).

Another important aspect of this eating behavior is the inexistence or low perception of the physiological sensations of hunger and satiety (van Strien, 2018).

This pattern may represent an escape from the emotions or conflicts that the person experiences, thus providing relief (Spoor et al., 2007).

Emotional eating may also be associated with low awareness of physical needs and the difficulty of recognizing and expressing feelings (van Strien, et al., 2005).

Finally, uncontrolled eating is related to the individual's neuronal sensitivity to reward (Vainik, García-García and Dagher, 2019).

When eating a palatable food, the body generates the desire to eat more food and individuals may eventually lose control of their satiety (Vainik, García-García and Dagher, 2019).

This effect is triggered by the release of the neurotransmitter dopamine, which is associated with a decrease in cognitive control, influencing behavior (Nestler and Lüscher, 2019).

The release of dopamine after food intake is an important factor for uncontrolled eating (Nestler and Lüscher, 2019; Agüera et al., 2021).

Some authors have reported a positive correlation between impulsivity and uncontrolled eating (García-García et al., 2022), a characteristic behavior of overweight/obese individuals (Benbaibeche, Bounihi and Koceir, 2021).

Taken together, the analysis of eating behavior patterns is important from a public health perspective since the mother's behavior may be a potential modifiable factor in the nutritional status of the child. In other words, inappropriate maternal behaviors in the first years of a child's life can have negative consequences for the health of children throughout their lives.

Therefore, in the present study we investigated the association of maternal eating behavior patterns with the child's weight status at 9 years of age.

MATERIALS and METHODS

Study Design and Participants

This is a cross-sectional study that used data collected from the Predictors of Maternal and Infant Excess Body Weight (PREDI) Study, a birth cohort study conducted in Joinville, State of Santa Catarina, southern Brazil.

The present study used data from all participants in the fourth follow-up, 144 adult women and their children nine years after delivery, between July and October 2021. However, four mothers no longer lived with their children, and it was not possible to collect eating behavior data.

Regarding the recruitment process at birth, at baseline (2012), all women over the age of 18 years who gave birth to a full-term singleton (between 37 and 42 weeks of gestation) were invited to participate in the study with their children (Mastroeni, et al., 2016; Sales, et al., 2015).

Exclusion criteria included plans for adoption immediately after delivery, the presence of an infectious contagious disease (acquired immune deficiency syndrome, hepatitis, syphilis, and toxoplasmosis), birth defects, Down syndrome, and preeclampsia.-

This study was approved by the Research Ethics Committee of the University of Joinville Region (Protocol No. 107/2011), and all participants gave their informed consent prior to inclusion in the study.

Measures

A trained team of health professionals performed the anthropometric assessment and collected demographic, biological, maternal eating behavior, and socioeconomic data individually in a private room of the family's home using a previously tested structured questionnaire. Postpartum (until 48 hours after delivery, in the maternity hospital) height was measured to the nearest 0.1 cm using a portable stadiometer (WCS®, Compact model, Curitiba, Brazil) mounted on a wall without skirting. The postpartum weight was measured on a digital scale (G-Tech®, Glass 7 model, Zhongshan, China) with a capacity of 180 kg to the nearest 0.1 kg, with the subject wearing light clothing and no shoes or accessories (jewelry, watches, coats). The gestational weight gain was obtained by subtracting the mother's self-reported pre-pregnancy weight from the weight at delivery (measured on the day of delivery in the maternity hospital). The adequacy of gestational weight gain was assessed according to the 2009 Institute of Medicine guidelines, which state that underweight women should gain between 12.5 and 18.0 kg, women with adequate BMI (weight [kg]/height [m^2]) between 11.5 and 16.0 kg, overweight women between 7.0 and 11.5 kg, and obese women between 5.0 and 9.0 kg (Rasmussen and Yaktine, 2009).

The children's birth weight and length were collected from the hospital records. Birth weight was classified into three categories according to gestational age and gender: small for gestational age (SGA; <10^{th} percentile), adequate for gestational age (AGA; 10 – 90^{th} percentile), and large for gestational age (LGA; >90^{th} percentile) according to INTERGROWTH-21^{st} standards (Villar, et al., 2014).

Breastfeeding duration (in months) was self-reported by the mothers. The child's weight was measured using the same equipment and procedures as employed at baseline. Height was measured to the nearest 0.1 cm using a portable ultrasonic digital stadiometer (AvaNutri®, CAVA-040 Model, Rio de Janeiro, Brazil). The measurements were taken according to the Brazilian Guidelines for Collection and Analysis of Anthropometric Data in Health Services (Ministério da Saúde, 2011).

The children's nutritional status was classified into two categories according to the 2007 WHO Growth Reference Data for children and adolescents aged 5 to 19 years: BMI ≤85^{th}

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percentile as underweight/normal weight; BMI >85th percentile as overweight/obese (de Onis et al., 2007). Maternal weight status was classified using the WHO BMI cut-offs: underweight/normal weight, <25.0 kg/m^2; overweight/obese, ≥25.0 kg/m^2 (World Health Organization, 2000). All anthropometric measurements were performed in duplicate and the mean of the two measurements was used for analysis.

Eating Behavior Patterns

The eating behavior patterns were assessed using the Three-Factor Eating Questionnaire (TFEQ), a self-assessment scale used in studies of eating behavior that assesses three cognitive and behavioral domains related to eating: cognitive restraint, uncontrolled eating, and emotional eating (Stunkard and Messick, 1985). In this study we used a shortened 21-item version (TFEQ-R21), a revised three-factor structure developed with data from obese and non-obese participants (Tholin et al., 2005).

Consisting of six items, the cognitive restraint scale assesses control over food intake to influence body weight and body shape. The emotional eating scale also consists of six items and measures the propensity to overeat when experiencing negative mood states (when feeling lonely, anxious, or depressed). Finally, the uncontrolled eating scale (nine items) evaluates the tendency to lose control overeating when feeling hungry or when exposed to external stimuli (Tholin et al., 2005; Natacci and Ferreira Junior, 2011).

The response format of the TFEQ-R21 consists of a four-point response scale (ranging from 1 to 4) that evaluates items 1 to 20, and an eight-point numerical rating scale (ranging from 1 to 8) for item 21. The answers were scored as follows: questions 1 to 16: 1 = 4, 2 = 3, 3 = 2, and 4 = 1; questions 17 to 20: 1 = 1, 2 = 2, 3 = 3, and 4 = 4; question 21: 1 or 2 = 1, 3 or 4 = 2, 5 or 6 = 3, and 7 or 8 = 4. The average score of each eating behavior was calculated and transformed on a scale from 0 to 100 points. Higher scores denote a more dysfunctional cognitive restraint, uncontrolled eating, or emotional eating (Tholin et al., 2005; Natacci and Ferreira Junior, 2011). We also categorized each eating behavior into two categories according to the 50th percentile score (<p50 and ≥p50): 38.9, 22.2 and 22.2 for cognitive restraint, uncontrolled eating and emotional eating, respectively.

Statistical Analysis

The sample size of the PREDI Study was calculated with the OpenEpi 3.02 software as previously described (Sales, et al., 2015). Data were analyzed using IBM SPSS Statistics, version 27.0 (Released 2020; IBM Corp, Armonk, NY). To examine differences between the mother-child pairs enrolled at baseline and those enrolled in this study (fourth follow-up, 2021), maternal education years, monthly household income, marital status, birth weight and child's gender were compared using the Student t test and the chi-square test. The Mann-Whitney U test was applied to compare the median and interquartile range of continuous and asymmetric variables (Table 1). The chi-square test was also used to compare the proportions of categorical variables according to weight status of the children (≤85th and >85th percentile) (Table 1).

Odds ratios (OR) and 95% confidence intervals (CI) were calculated using binary logistic regression analysis to investigate the association of the exposures (mother's eating behaviors: cognitive restraint, uncontrolled eating, and emotional eating) with excess body weight in children. Unadjusted analysis (Model 1, Table 2) was performed to estimate the crude association of each eating behavior with the outcome for children with a BMI >85th percentile compared to children with a BMI ≤85th percentile. Each exposure was examined separately in Model 1 and two exposures were not entered at once. Multivariate logistic regression analyses were adjusted for covariates with p<0.10 obtained from Table 1 by chi-square analysis (mother's BMI, child's gender, and birth weight) (Model 2, Table 2). Gamma-log regression analysis considering the outcome as a continuous variable was also performed due to the asymmetric distribution of the outcome (Table 3). The adjustments made in the models of Table 1 with the same covariates were kept in the models of Table 3.

The goodness-of-fit of the model was assessed using the -2 log likelihood, with lower values indicating a better fit. The variance inflation factor (VIF) revealed little collinearity among the independent variables (highest VIF = 1.219). All analyses were considered statistically significant when p<0.05.

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RESULTS

Demographic Characteristics

Except for maternal age, there was no significant ($p < 0.05$) difference in maternal education years, monthly household income, marital status, birth weight or child's gender between mothers/children enrolled at baseline and those considered losses in the fourth follow-up.

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Table 1 - Characteristics of the study participants according to the child's weight status (n=144).

	Child's weight status			
	≤ 85th percentile n (%) or median (IQR)	> 85th percentile n (%) or median (IQR)	Total n (%) or median (IQR)	p
Mother				
Age, y				0.749[a]
< 40	65 (73.9)	23 (26.1)	88 (61.1)	
≥ 40	40 (71.4)	16 (28.6)	56 (38.9)	
Education, y				0.704[a]
≥ 12	52 (75.4)	17 (24.6)	69 (49.3)	
9 - 12	31 (68.9)	14 (31.1)	45 (32.1)	
< 9	18 (69.2)	8 (30.8)	26 (18.6)	
Marital status				0.424[a]
Marriage/consensual union	66 (70.2)	28 (29.8)	94 (66.7)	
Other	36 (76.6)	11 (23.4)	47 (33.3)	
Monthly household income, MW				0.182[a]
≥ 5	28 (75.7)	9 (24.3)	37 (27.0)	
3 - 5	43 (66.2)	22 (33.8)	65 (47.4)	
< 3	29 (82.9)	6 (17.1)	35 (25.6)	
Parity, number of children				0.339[a]
1	17 (81.0)	4 (19.0)	21 (14.9)	
≥ 2	85 (70.8)	35 (29.2)	120 (85.1)	
Gestational weight gain				0.450[a]
Adequate	60 (70.6)	25 (29.4)	85 (59.0)	
Excessive	45 (76.3)	14 (23.7)	59 (41.0)	
Body mass index, kg/m^2				0.015[a]
< 25	39 (86.7)	6 (13.3)	45 (32.6)	
25 – 30	30 (69.8)	13 (30.2)	43 (31.2)	
≥ 30	30 (60.0)	20 (40.0)	50 (36.2)	
Breastfeeding duration, months				0.710[a]
≥ 6	37 (75.5)	12 (24.5)	49 (34.3)	
4 - 6	35 (68.6)	16 (31.4)	51 (35.7)	
< 4	32 (74.4)	11 (25.6)	43 (30.0)	
Cognitive restraint, percentile				0.006[a]
< P50	52 (83.9)	10 (16.1)	62 (44.3)	
≥ P50	49 (62.8)	29 (37.2)	78 (55.7)	
Uncontrolled eating, percentile				0.323[a]
< P50	45 (68.2)	21 (31.8)	66 (47.1)	
≥ P50	56 (75.7)	18 (24.3)	74 (52.9)	
Emotional eating, percentile				0.736[a]
< P50	42 (73.7)	15 (26.3)	57 (40.7)	
≥ P50	59 (71.1)	24 (28.9)	83 (59.3)	
Eating behavior score, range 0-100				
Cognitive restraint	33.3 (41.7)	50.0 (22.2)	38.9 (38.9)	0.047[b]
Uncontrolled eating	22.2 (33.3)	25.9 (22.2)	22.2 (29.6)	0.556[b]
Emotional eating	22.2 (44.4)	16.7 (38.9)	22.2 (44.4)	0.989[b]
Children				
Gender				0.053[a]
Boys	51 (66.2)	26 (33.8)	77 (53.5)	
Girls	54 (80.6)	13 (19.4)	67 (46.5)	
Birth weight				0.024[a]
SGA/AGA	86 (77.5)	25 (22.5)	111 (77.1)	

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LGA	19 (57.6)	14 (42.4)	33 (22.9)

Legend: IQR indicates interquartile range; P50, 50th percentile; MW, minimum wage (1 MW = US$ 207.00 in 2021); SGA, small for gestational age; AGA, adequate for gestational age; LGA, large for gestational age. Bold values denote statistical significance at the p < 0.05 level.
[a]Chi-square test; [b]Mann-Whitney U test.

Table 2 - Mother's eating behavior as a determinant of excess body weight in children nine years after delivery according to gender (n=142).

Characteristic	Model 1[a]		Model 2[b]	
	OR (95% CI)	p	OR (95% CI)	p
Boys and girls				
Cognitive restraint				
< P50	Reference		Reference	
≥ P50	3.08 (1.36-6.97)	0.007	1.94 (0.75-5.00)	0.169
-2 Log likelihood	157.729		151.254	
Uncontrolled eating				
< P50	Reference		Reference	
≥ P50	0.69 (0.33-1.45)	0.325	0.54 (0.24-1.21)	0.138
-2 Log likelihood	164.674		150.964	
Emotional eating				
< P50	Reference		Reference	
≥ P50	1.14 (0.53-2.43)	0.736	0.94 (0.42-2.11)	0.890
-2 Log likelihood	165.534		153.179	
Boys				
Cognitive restraint				
< P50	Reference		Reference	
≥ P50	1.77 (0.65-4.82)	0.265	1.11 (0.33-3.66)	0.869
-2 Log likelihood	96.373		94.046	
Uncontrolled eating				
< P50	Reference		Reference	
≥ P50	0.72 (0.28-1.88)	0.506	0.62 (0.23-1.70)	0.352
-2 Log likelihood	97.206		93.200	
Emotional eating				
< P50	Reference		Reference	
≥ P50	1.26 (0.48-3.31)	0.643	1.01 (0.36-2.86)	0.978
-2 Log likelihood	97.432		94.072	
Girls				
Cognitive restraint				
< P50	Reference		Reference	
≥ P50	7.86 (1.58-39.17)	0.012	4.66 (0.79-27.58)	0.089
-2 Log likelihood	56.146		48.712	
Uncontrolled eating				
< P50	Reference		Reference	
≥ P50	0.56 (0.16-1.93)	0.355	0.36 (0.09-1.53)	0.167
-2 Log likelihood	63.727		50.107	
Emotional eating				
< P50	Reference		Reference	
≥ P50	1.03 (0.29-3.60)	0.96	1.07 (0.26-4.40)	0.923
-2 Log likelihood	64.600		52.071	

Legend: OR indicates odds ratio; CI, confidence interval; P50, 50th percentile. Bold values denote statistical significance at the p<0.05 level. [a]Model 1: Unadjusted odds ratio. [b]Model 2: Adjusted for birth weight and mother's body mass index.

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The characteristics of the study participants are presented in Table 1.

Among the 144 mother/child pairs included in the study, 39 (27.1%) children had excess body weight, and 78 (55.7%), 74 (52.9%) and 83 (59.3%) mothers had cognitive restraint, uncontrolled eating, and emotional eating ≥P50, respectively (Table 1).

Mother's BMI, cognitive restraint and birth weight were significantly associated with the child's weight status (Table 1).

The proportion of children with excess body weight was higher among mothers who had a BMI ≥25 kg/m^2 (36.7%) and cognitive restraint ≥p50 (37.2%) and among children who were born LGA (42.3%) compared to mothers with a BMI <25 kg/m^2 and cognitive restraint <p50 and children who were born SGA/AGA. The median maternal cognitive restraint score was also significantly higher (50.0) among children with excess body weight (>p85) compared to children with a BMI <25 kg/m^2 (Table 1).

Logistic Regression Models

In the logistic regression analysis, the unadjusted model (Model 1, Table 2) showed that the odds of excess body weight were higher for children born to mothers who had cognitive restraint ≥p50, especially for girls.

The odds of excess body weight were about three times higher for children born to mothers classified with cognitive restraint ≥p50 compared to mothers with cognitive restraint <p50 (OR = 3.08, 95% CI: 1.36-6.97, p= 0.007). This result seems to be more significant for girls born to mothers with cognitive restraint ≥p50, who were almost eight times more likely to be overweight (OR = 7.86, 95% CI: 1.58-39.17, p=0.012).

The linear regression depicted in Figure 1 also shows that the weight status of girls is more sensitive to maternal cognitive restraint than that of boys. However, although the goodness-of-fit of the models improved after adjusting for birth weight and mother's BMI ("boys and girls": -2 log likelihood, from 157.729 to 151.254; "girls": -2 log likelihood, from 56.146 to 48.712 for unadjusted and adjusted models, respectively), the mother's cognitive restraint was no longer a significant predictor of the child's weight status for either gender category (Model 2, Table 2).

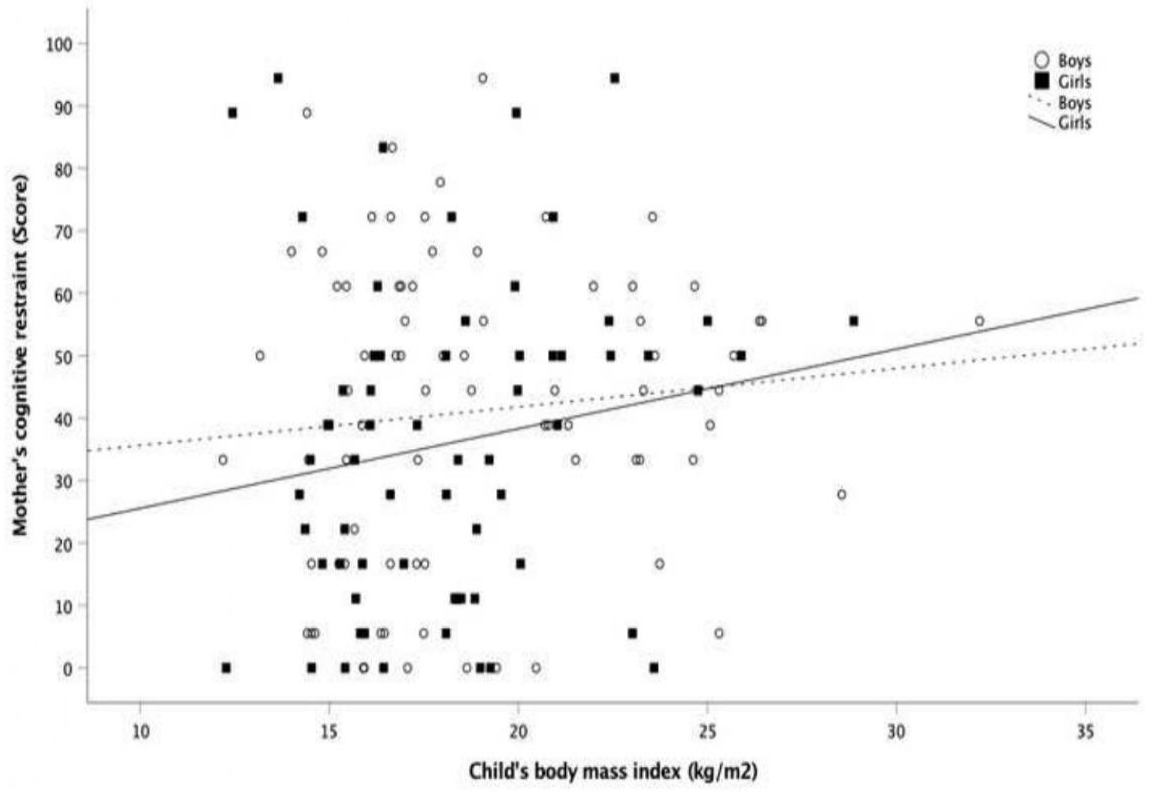

Figure 1 - Relationship between mother's cognitive restraint and child's BMI.

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Gamma-log Regression Models

Gamma-log regression analysis is depicted in Table 3. Considering the child's BMI to be a continuous variable, none of the three maternal eating behavior patterns was associated with the child's weight status (Models 1 and 2).

Table 3 - Gamma-log regression models for body mass index of children according to gender. The "Blinded for Review" Study, 2021.

	Child's weight status			
	Model 1[a]		Model 2[b]	
	β (95% CI)	p	β (95% CI)	p
Boys and girls				
Cognitive restraint	0.001 (0.000; 0.002)	0.075	-0.001 (-0.002; 0.001)	0.335
Uncontrolled eating	0.001 (0.000; 0.002)	0.076	0.005 (-0.001; 0.001)	0.425
Emotional eating	0.001 (0.000; 0.003)	0.082	0.000 (-0.0021; 0.001)	0.792
Boys				
Cognitive restraint	0.001 (-0.001; 0.003)	0.278	-0.001 (-0.002; 0.001)	0.505
Uncontrolled eating	0.001 (0.000; 0.003)	0.096	0.000 (-0.002; 0.002)	0.987
Emotional eating	0.002 (0.000; 0.004)	0.065	0.001 (-0.002; 0.002)	0.758
Girls				
Cognitive restraint	0.001 (-0.001; 0.003)	0.214	-0.001 (-0.003; 0.001)	0.357
Uncontrolled eating	0.001 (-0.001; 0.002)	0.393	-0.001 (-0.002; 0.000)	0.164
Emotional eating	0.001 (-0.001; 0.002)	0.498	-0.001 (-0.002; 0.001)	0.498

Legend: β indicates beta-coefficient (slope coefficient of the regression line); CI, confidence interval. [a]Model 1: Unadjusted odds ratio. [b]Model 2: Adjusted for birth weight and mother's body mass index.

DISCUSSION

In the current study we found that maternal cognitive restraint was associated with excess body weight of the child at nine years of age. Uncontrolled eating or emotional eating was not associated with the child's weight status. Additionally, our results demonstrated that girls were significantly more sensitive to maternal cognitive restraint than boys.

The relationship between cognitive restraint of the mother and her nutritional status is well established in the literature. Women who restrict food groups or calorie intake tend to gain about 2 kg more weight over time than women who do not perform this behavior (Savage, Hoffman and Birch, 2009).

It seems that restrictive dieting facilitates initial weight loss (Freire, 2020). However, it is difficult to continue losing weight or even to maintain an adequate weight over time (Mann et al., 2007).

Dietary restriction can induce a desire for foods and trigger physical or emotional hunger that lead to overeating or binge eating and consequent weight gain (Bello and Hajnal, 2010).

Stronger cravings also lead to more binge eating regardless of restraint (Hagerman et al., 2021).

Some authors have shown that restrictive and rigid eating behaviors can lead to failure in the effort to lose weight when compared to the adoption of a balanced diet (Polivy and Herman, 2020).

Another important characteristic of food restriction is the possibility of triggering other eating disorders such as anorexia nervosa, bulimia nervosa, and binge eating disorder (batista et al., 2018), indicating that the consequences of dysfunctional eating behavior go beyond the outcome of excess body weight.

Additionally, food restriction is also related to low self-esteem, depression and impulsivity (Bellisle, 2009), and situations that undermine self-control are more strongly associated with overeating among individuals with higher dietary restraint (Hagerman et al., 2021).

The association between eating behaviors of parents and children has been well established in the literature (Martini, Barona-Martinez and Micali, 2020; Balantekin, 2019).

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However, studies evaluating the association of maternal eating behaviors with children's weight status are still scarce. Indeed, our results agree with other authors that reported a significant association between maternal cognitive restraint and the child's weight status (Saltzman et al., 2016; Pesch et al., 2018; Czepczor-Bernat and Brytek-Matera, 2019).

The maternal cognitive restraint score tends to be higher among children with excess body weight compared to eutrophic mothers, with a potential gender difference. According to our results and those reported by other authors, it seems that girls are more aware of the effect of maternal cognitive restraint than boys (Pesch et al., 2018; Czepczor-Bernat and Brytek-Matera, 2019).

In general, analysis according to gender shows a higher prevalence of cognitive restraint in women compared to men (Keski-Rahkonen and Mustelin, 2016).

The explanation for the daughter's excess body weight when the mother performs cognitive restrained eating is complex.

However, some hypotheses can be suggested:

1) the mother/woman is always an example for her daughter. In this respect, the daughter may have been affected by the mother's problems in controlling her diet and loses control over her own food intake.

In general, the mother transfers her weight preoccupation to her daughter and projects the imposition of the diet; this excessive control of food minimizes the child's ability to self-regulate the physical sensations of hunger and satiety, leading to weight gain (Francis and Birch, 2005).

2) Penalized by her cognitive restrained eating behavior, the mother inadvertently transfers the desire to eat more food to the child. The mother's restrictive diet can decrease her daughter's exposure to forbidden foods. However, the daughter can be induced to overeat when food is available and, eventually, to eat beyond satiety (van der Horst and Sleddens, 2017).

Some mothers misclassify overweight children as being lower than their measured weight status. Indeed, mothers are more likely to identify daughters who are at risk of overweight as being "overweight" than they are sons (Maynard et al., 2003), probably because of the socially imposed beauty standards of thinness on women Mothers restricting their diets tend to consider thinness to be the ideal beauty standard (Balantekin, 2019), a characteristic that further impairs the child's understanding of a eutrophic condition.

3) Finally, the mother restricts her eating but can use food as a reward mechanism to trigger appropriate behaviors in her daughter, conditioning food to pleasure and gratification.

At the same time, the restrictive diet image that the daughter absorbs from her mother may induce the child to develop the same restrictive diet behavior over the years, generating a vicious cycle and favoring the establishment of overweight in girls.

In fact, more studies are needed to understand the effect of maternal eating behaviors on children's physical and mental health throughout their development. Since excess body weight is a multifactorial disease, several other characteristics of both the mother and her child need to be equally evaluated in this process.

Our study has several strengths. Data came from a nine-year cohort study consisting of mother–child pairs evaluated at the same time by most members of the same team, ensuring the quality of the information. However, some limitations must also be mentioned.

First, although there were no significant differences between mothers and children enrolled at baseline and those participating in the fourth follow-up, we acknowledge that the relatively low response rate in the fourth follow-up may limit the generalization of our findings.

Finally, our results came from a relatively small cohort of mothers and their children living in southern Brazil; therefore, caution is necessary when comparing the results to other populations.

Geolocation Information

Data for this study were collected in the city of Joinville, in the northeastern region of the state of Santa Catarina, Brazil.

Implications for research and practice

Although more studies investigating maternal eating behaviors are needed to better understand the causal relationship with the child's weight status, our results are important to help mothers develop and maintain healthy daily habits to prevent excess body weight in the mother-child pair. Public policies that

encourage mothers to seek specialized care in situations of discomfort with their nutritional status can have a significant impact on the health of the whole family.

Data availability statement

Due to the nature of the research, due to ethical restrictions, supporting data is not available.

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The authors report there are no competing interests to declare.

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