



## BODY WEIGHT AT 12 AND 24 MONTHS OF LIFE AND ITS RELATIONSHIP WITH TYPE OF BREASTFEEDING: A COHORT STUDY

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### ABSTRACT

**Objective:** to identify the deviations in body weight at 12 and 24 months of life and their association with the breastfeeding practice. **Method:** a cohort study conducted with children treated in the Primary Care services of a municipality in northeastern Paraná, Brazil. The data were collected from March to October 2020 and referred to 401 children's first two years of life. Data analysis was performed by means of chi-square and logistic regression tests. **Results:** it was verified that 66.3% and 44.6% of the children presented adequate body weight at 12 and 24 months, respectively; with adequacy values of 93% and 83% for exclusive breastfeeding, of 53.6% and 29% for breastfeeding, and of 64.6% and 32.3% for those who were not breastfed. Among the children with inadequate weight there was 60% prevalence of excess weight. **Conclusion:** these results may come to subsidize nurses' performance during follow-up of the children's growth and development in the Primary Health Care scope.

**DESCRIPTORS:** Nursing; Breastfeeding; Nutritional Status; Assistance related to Food; Pediatric Obesity.

### HOW TO REFERENCE THIS ARTICLE:

Nass EMA, Marcon SS, Teston EF, Ichisato SMT, Toso BRG de O, Furtado MD, et al. Body weight at 12 and 24 months of life and its relationship with type of breastfeeding: a cohort study. *Cogitare Enferm.* [Internet]. 2022 [accessed "insert day, month and year"]; 27. Available from: [http://dx.doi.org/10.5380/ce.v27i0.80860\\_en](http://dx.doi.org/10.5380/ce.v27i0.80860_en).

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## INTRODUCTION

Among the care actions for children's health, exclusive breastfeeding (EBF) up to the age of six months old stands out, and it must be complemented at least up to 24 months of life<sup>1</sup>. As recommended by the World Health Organization (OMS), the goal to be achieved in relation to EBF is 50% by 2025<sup>2</sup>. The second most important action is follow-up of the children's growth and development, implemented by the assessment of indices such as weight, height and cephalic perimeter. These must be analyzed according to the developmental references for the age attained, by evaluating what is expected in each phase<sup>2</sup>.

The promotion of breastfeeding (BF) as a strategy for the prevention of childhood obesity turns encouragement of this practice into an indispensable tool in the fight against nutritional changes. This fact is evidenced in clinical and experimental trials, developed in the initial stages of human growth, which identified that nutritional and metabolic factors interfere with health programming\* in adulthood. The authors assert that food exerts an influence on the human genome, through indirect effects on the gene and protein expressions and, consequently, on metabolism. Throughout life, this interaction intervenes in the physiological functions and defines a person's health status<sup>3</sup>.

In this way, BF is indicated as a protective factor against excess weight among children aged between three and six years old<sup>4</sup>, whose EBF time of less than four months was associated with excess weight in the preschool phase<sup>5-6</sup>. This multicenter study conducted in 12 countries emphasized that breastfeeding can be a predictive factor for obesity and for high body fat content in children aged from nine to 11 years old<sup>7</sup>. Thus, the following question emerges: Does breastfeeding have any implication on the constitution of adequate body weight at 12 and 24 months of life?

A nutritional transition has been taking place in the national epidemiological scenario, as shown by the results found in a study carried out in the state of Pará with children from zero to two years of age, which pointed to 11.1% prevalence of overweight children, even in socially vulnerable populations<sup>8</sup>. The correct food introduction practice is considered fundamental in combating deviations in nutritional status since, from six months of life onwards, other food options should be part of the children's meals<sup>1</sup>. Thus, the period between six and 24 months of life is particularly critical, as it can interfere with growth speed in the medium- and long-term, with consequences for the child's development and health<sup>3,5</sup>.

Complementary feeding is initiated at increasingly early ages, on average at 5.3 months old and with high consumption of processed food products, according to a study carried out with children aged from one to three years old in Pelotas, Rio Grande do Sul<sup>9</sup>. The parents' or guardians' excessive and extra-domestic work, associated with the need to consume fast-foods, has contributed to the fact that children consume ultra-processed foods and become obese at increasingly early ages<sup>10</sup>.

Considering that childhood obesity can persist into adulthood and trigger diseases and complications, it is important to carry out studies in the most diverse parts of the country, in order to produce localized evidence that can be used by health professionals in the micro and macro contexts. It is noted that, in the scope of Primary Care, nurses have a role in monitoring children's growth and development through childcare consultations, and this diverse evidence may support their practice with the children, allowing assistance

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\* Programming = Induction, deletion or impairment of the development of a permanent somatic structure or adjustment of a physiological system by a stimulus or aggression that occurs in a susceptible period (e.g., early life phases), resulting in long-term consequences for the physiological functions (WEFFORT et al., 2018, p.13).

to be more in line with the specific needs of the population.

Given the above, the following study objective was defined: to identify the deviations in body weight at 12 and 24 of life and their association with the breastfeeding practice.

## METHOD

A cohort study, which was based on a matrix research developed in the two hospitals that offer delivery services through the Unified Health System (Sistema Único de Saúde, SUS) in a municipality from the 15<sup>th</sup> Health Region of the state of Paraná. The objective of the matrix study was to assess gestational weight gain and postpartum weight maintenance. Data referring to the children of the mothers included in that study were collected for this research. The Strengthening the Reporting of Observational studies in Epidemiology (STROBE) guidelines<sup>11</sup> were taken into account to prepare the study description.

The following was considered to define the sample size: the 30.2% prevalence of weaning before 180 days of life<sup>12</sup>, the number of live births in 2017 in the municipality (N=5,157) identified in the Information System on Live Births (Sistema de Informações sobre Nascidos Vivos, SINASC-DATASUS), 5% significance level, 95% confidence interval and an error of 5%, which resulted in a minimum sample of 334 children, with a 20% addition for possible losses and discontinuity, totaling 401 children.

The neonates included in the study were those who lived in the municipality under study, as well as those who were born with term gestational ages ( $\geq 37$  weeks) and who were on EBF during the immediate puerperium. Twin children were excluded, as well as those who had to interrupt BF before hospital discharge, due to their own health problems or those of their mother.

In the current study, data from the matrix survey were used, obtained during hospitalization for delivery<sup>13</sup>, and consultation of the child's electronic medical record was carried out in the Managing system of the Municipal Health Secretariat, 24 months after birth. The medical charts were consulted between March and October 2020, only after the children had turned 24 months old. Data related to all of the children's attendances to the municipality's health services were collected.

The dependent variables were as follows: weight in kilograms at 12 and 24 months of life and age in years old. In turn, among the independent variables, gender (male/female) and race/skin color (white, black, brown, Asian and indigenous) were considered; as well as variables with dichotomous answers (yes/no): breastfeeding in the delivery room; breastfeeding in the first hour of life; problems with breastfeeding in the hospital; exclusive breastfeeding at six months; mixed breastfeeding and no breastfeeding.

The data were entered into an Excel 2010 spreadsheet and submitted to descriptive and inferential analysis with the aid of the Statistica program, version 13.2. To analyze the data related to the children's weight, the growth charts from zero to two years old were used, according to gender (boys/girls); the standard z-score  $\geq -2$  and  $\leq +2$  was considered adequate weight for the age, and inadequate weight was determined when it was high for the age ( $> +2$ ), low for the age ( $\geq -3$  and  $< -2$ ) and very low for the age ( $< -3$ ), as recommended by the WHO14. The chi-square association test was applied between the independent variables and that of interest. The variables were included in the binary logistic regression model. Odds Ratio (OR) was used as association measure, with a 95% confidence interval. Significance was established when  $p < 0.05$  for all the tests.

The research project was approved under opinion number 4,426,302.

## RESULTS

A total of 401 children participated in the study, of which 231 (57.6%) were male, 202 (50.4%) were of white race/ethnicity, with birth weights greater than 2,500 kg (335, 83.5%), and 237 (59.1%) were born by cesarean section. Few of them maintained EBF up to six months of life (112, 27.9%) and more than half received mixed BF (224, 55.9%). The data referring to breastfeeding and to the assessment of the weight deviation at 12 months are described in Table 1 below.

Table 1 - Characterization of breastfeeding and of the weight deviation at 12 months of life. Maringá, PR, Brazil, 2020

Variable	Body weight at 12 months of life							
	Adequate (n=266)		Inadequate (n=135)		OR	CI (95%)	P	
	n	%	n	%				
BF in delivery room								
Yes	46	17,3	22	16,3	0,869	0,472	1,601	0,802
No	220	82,7	113	83,7				
BF during the first hour								
Yes	79	29,7	43	31,8	1,027	0,53	1,989	0,658
No	187	70,3	92	68,2				
Prob. BF at the hospital								
Yes	40	15	23	17	0,896	0,439	2,217	0,603
No	226	85	112	83				
EBF								
Yes	104	39,1	8	5,9	0,82	0,038	0,178	0,0001*
No	162	60,9	127	94,1				
BF								
Yes	120	45,1	104	77	0,634	0,348	1,155	0,0001*
No	146	54,9	31	23				
No BF								
Yes	224	84,2	112	83	0,6	0,523	1,593	0,749
No	42	15,8	23	17				

Key: \*Significant p-value; OR (Odds Ratio), CI (Confidence Interval), P (p-value), BF (Breastfeeding), EBF (Exclusive Breastfeeding). Source: Research data, 2019-2020.

At 12 months of life, more than half of the children presented adequate weight for the age (266, 66.3%). The adequacy ratio was higher for those with EBF (104, 92.9%), followed by those on BF (120, 53.6%) and those who were not breastfed (42, 64.6%). Among those with inadequate weight, there was predominance of excess weight in 102

(75.6%), of which eight (5.9%) were on EBF; and of low weight for the age in 33 (24.4%), of which four (3%) were on EBF.

EBF was a protective factor for changes in the weight standard deviations for a large number of the children (OR: 0.82 and  $p < 0.0001$ ) and BF was a protective factor in more than half of the cases (OR: 0.634 and  $p < 0.0001$ ), both with a statistically significant correlation. Table 2 presents the relationship between the breastfeeding practice and the assessment of the weight standard deviation at 24 months of life.

Table 2 - Characterization of breastfeeding and of the weight deviation at 24 months of life. Maringá, PR, Brazil, 2020

Variable	Body weight at 24 months of life							
	Adequate (n=179)		Inadequate (n=222)		OR	CI (95%)	p	
	n	%	n	%				
BF in delivery room								
Yes	30	16,8	38	17,1	0,826	0,459	1,487	0,925
No	149	83,2	184	82,9				
BF during the first hour								
Yes	52	29,1	70	31,5	1,025	0,525	2,001	0,591
No	127	70,9	152	68,5				
Prob. BF at the hospital								
Yes	30	16,8	33	14,9	0,717	0,384	1,134	0,604
No	149	83,2	189	85,1				
EBF								
Yes	93	52	19	8,6	0,84	0,48	0,147	0,0001*
No	86	48	203	91,4				
BF								
Yes	65	36,3	159	71,6	0,894	0,49	1,632	0,0001*
No	114	63,7	63	28,4				
No BF								
Yes	21	11,7	44	19,8	0,538	0,306	0,943	0,029
No	158	88,3	178	80,2				

Key: \*Significant p-value; OR (Odds Ratio), CI (Confidence Interval), P (p-value), BF (Breastfeeding), EBF (Exclusive Breastfeeding).  
Source: Research data, 2019-2020.

At 24 months of age, the proportion of weight adequacy for the age was significant for EBF (93, 83%), not remaining in the BF cases (65, 29%) or for those who were not breastfed (21, 32.3%). Among those with inadequate weight, excess weight for the age prevailed in 185 (83.3%), of which 19 (8.5%) were on EBF; and there were few cases of low weight for the age (37, 16.7%), of which 12 (5.4%) were on EBF.

EBF was a protective factor for changes in the weight standard deviations for most of the children at 24 months of life (OR: 0.84 and  $p < 0.0001$ ). BF alone was a protective factor for a large number of children (OR: 0.894 and  $p < 0.0001$ ), both with a statistically significant correlation. Through the association test, adequate weight was significant in children on EBF (93, 52%), and inadequate in those on BF+formula (159, 71.6%).

## DISCUSSION

The data show that most of the mothers did not have problems with breastfeeding in the hospital environment, which favored EBF; however, factors such as low BF rates in the delivery room (220, 82.7%) and in the first hour of life (187, 70.3%) may have impacted its maintenance. According to the WHO, the establishment of a bond and intimate contact at this first moment includes a primary strategy for BF promotion, since after delivery the newborn (NB) begins an adaptation process that includes changes, stimuli and challenges; hence the importance that the conditions are favorable for the emergence of the intimate and special bond between mother and child, so that breastfeeding is strengthened<sup>2</sup>.

In this context, a study carried out with 244 postpartum women admitted to a hospital accredited with the title of Baby-Friendly Hospital in Recife-PE identified that the BF practice in the first postpartum hour was associated with some factors such as the presence of the nurse in the delivery room, NB weight equal to or greater than 3,000 g, vaginal delivery, delayed umbilical cord clamping and occurrence of skin-to-skin contact between mother and infant<sup>15</sup>.

Another study carried out in Haryana, India, highlighted the need to consider some factors that increased the likelihood of late initiation of breastfeeding, such as cesarean delivery, overweight/obese mothers and postpartum women who did not receive guidelines on the importance of BF or immediate postpartum evaluation, in relation to preparation for breastfeeding. Finally, it was suggested that the educational programs for pregnant women should be focused on the benefits of BF in the pre- and postpartum periods<sup>16</sup>.

It should be noted that breastfeeding plays an important role in reducing the prevalence of late obesity in children, especially with regard to the behavioral and hormonal mechanisms and to the intake of macronutrients. This is due to the high concentration of plasma insulin in formula-fed children when compared to breast milk (BM) children, leading to early development of adipocytes<sup>16</sup>.

In addition, protein intake and the amount of energy metabolism are lower in breastfed than in formula-fed children; there is a significant association between early protein intake in the first moments of life and increased risk of later obesity. Likewise, protein availability during fetal and postnatal development exerts a long-term effect on glucose metabolic programming and on the future body composition. These ways, either alone or in combination, provide viable explanations for a predictive effect of EBF against obesity<sup>17</sup>.

The difference found in the current study in relation to weight among children who had EBF, most of whom were not obese in the first two years of life, reinforces the protective action of BF on the prevalence of excess weight. This result corroborates that of a study carried out in the capital city of Piauí, which identified that only 10.5% of the children who were breastfed were overweight; while 26.3% of those who did not receive BM developed excess weight, and children not breastfed were 2.5 times more likely to be overweight when compared to those who received BM<sup>4</sup>. These studies are corroborated by a survey conducted in the United States, which followed-up children from 24 months old to sixth grade and found a low prevalence of obesity in those who were exclusively breastfed for six months when compared to those who were breastfed for shorter periods of time or who

were not breastfed<sup>18</sup>.

In this study, among the children with inadequate weight for their age, the majority presented excess weight. Obesity is characterized by excess of body fat accumulation, with harms to health in all age groups, especially during the first years of life. The global prevalence of obesity standardized by age rose from 0.7% in 1975 to 5.6% in 2016 in girls, and from 0.9% in 1975 to 7.8% in 2016 in boys<sup>19</sup>.

The effects of excess weight and obesity for health are countless. A cohort study carried out in England between 2003 and 2018 identified that childhood obesity contributed to 617,000 hospital admissions in the 2016/2017 period, an 18% increase when compared to the previous year (2015/2016). It was also verified that 22% of the children aged four and five years old and that 34% of those aged from 10 to 11 were classified as with excess weight or obesity<sup>20</sup>.

The association between the protective aspect of breastfeeding and excessive body weight throughout life was evidenced in a study carried out in Santa Catarina, which found that children not exclusively breastfed presented a higher risk of excessive body weight at 13-24 months of age<sup>21</sup>. In view of this, strategies that favor EBF and support its maintenance, as it positively impacts children's growth and development in the long term, need to be established since prenatal care, maternity and childcare, in order to contribute to preventing early weaning. In addition, during the consultations it becomes important to instruct on breastfeeding maintenance as a prevention factor against childhood obesity.

According to the Brazilian Association for the Study of Obesity and Metabolic Syndrome<sup>22</sup>, more than 15% of the Brazilian children are in the range of excess weight and obesity. In the South region of the country, of the children aged between five and nine and between 10 and 19 years old, 35.9% and 24.6% present these conditions, respectively. It is believed that obesity is not only influenced by genetics, but also by environmental factors – at increasingly earlier ages, children have free access to inadequate food, offered by their own parents or by the places they frequent, as most of them encourage children to overconsumption of fast-food and processed food products<sup>3</sup>.

Excess weight can also trigger psychological and psychiatric problems, exerting a negative influence on the emotional state. Children with nutritional deviations are frequently rejected at school and in their groups of friends, thus being excluded from routine activities, such as games and physical activities. Consequently, body image problems are common, as well as anxiety, stress, mood disorders and depression, in addition to feelings of sadness and inferiority. All these effects can extend into adulthood, often causing even more severe diseases<sup>24</sup>.

Development of healthy eating habits can provide adequate growth and development, avoiding nutritional deficits and preventing health problems such as systemic arterial hypertension, type 2 diabetes mellitus, cardiovascular diseases, osteoporosis and obesity. Thus, these habits must be conceived even in the first years of life, as is the case of sustained EBF and BF up to the age of two years old or more<sup>25</sup>.

Inadequate child growth can compromise the child's health in the short- and long-term and, therefore, there is a need to prioritize activities to promote and improve maternal and child services, in order to change the scenario in question. In this sense, health professionals play an important role in advising the families on feeding in the first year of life, reinforcing the superiority of BM and discouraging the introduction of milk formulas, as well as the incorrect inclusion of complementary feeding.

In the scope of Primary Health Care, nurses work directly in the assistance provided to the children and must seek the necessary means so that all of them have their right to be breastfed guaranteed. Consequently, this practice must be encouraged from prenatal care, through the provision of diverse information that allow the future mother to make informed decisions. In addition, it must be reinforced during the follow-up consultations

regarding the child's growth and development. Furthermore, professionals need to be available to clarify doubts and assist in the resolution of complications that may arise during the breastfeeding process, in order to prevent early weaning.

As a limitation of the study, the impossibility of knowing other factors that may have influenced the children's growth stands out, such as the type of complementary feeding adopted, as well as genetic factors. However, the results reiterate the importance of the strategies for EBF encouragement and maintenance as a protection factor against excess weight.

## CONCLUSION

The results showed that BF was associated with adequate weight at 12 and 24 months, and that this adequacy at both moments was significantly higher in children who were exclusively breastfed.

However, EBF proved to be below the recommended levels, making it indispensable to adopt measures to encourage its promotion and healthy eating habits, in addition to offering comprehensive care to overweight children, with a view to reducing this condition and its consequences in this vulnerable population.

## ACKNOWLEDGEMENTS

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001

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\*Article extracted from the PhD thesis entitled "Breastfeeding in the first two years of life and associated factors". Universidade Estadual de Maringá, 2020.

Received: 03/05/2021

Approved: 11/02/2022

Associate editor: Tatiane Herreira Trigueiro

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Role of Authors:

Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - Nass EMA; Drafting the work or revising it critically for important intellectual content - Nass EMA, Marcon SS, Teston EF, Ichisato SMT, Toso BRG de O, Furtado MD, Divino E do A; Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - Marcon SS. All authors approved the final version of the text.

ISSN 2176-9133



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