

# BREASTFEEDING FOR 30 DAYS OR MORE IS A PROTECTIVE FACTOR AGAINST OVERWEIGHT IN PRESCHOOL CHILDREN

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## ABSTRACT

**OBJECTIVE.** Assessing the effects of breastfeeding on the occurrence of anthropometric deviations among preschool children of the semiarid region of Alagoas (Brazil) and possible associated factors.

**METHODS.** In a probabilistic sample of 716 1-5 year-old children, anthropometric, socioeconomic, demographic and health data were collected. The dependent variables were stunting (height-for-age < -2 SD) and overweight (weight-for-height > 2 SD) relative to the WHO-2006 standard. Children were categorized into "breastfed" (breastfeeding ≥ 30 days) and "not breastfed" (breastfeeding < 30 days). Data were submitted to bivariate (c2) and multivariate (logistic regression) analyses.

**RESULTS.** Prevalence of stunting and overweight were 11.5% and 6.3% respectively. Although 87.3% belonged to the lower economic classes (D and E), 44.3% of mothers had a BMI ≥ 25 kg/m<sup>2</sup>. Among the 716 children studied, 489 (68.3%) were breastfed, 65 (9.0%) were not breastfed and 162 (22.7%) were still breastfeeding. Among those of the breastfed group, 213 (43.5%) received breast milk for more than 12 months. In bivariate analysis the prevalence of overweight was higher among the not breastfed group (12.7% vs. 6%; CI95% = 1 to 5.5). Factors independently associated with stunting were lower birth weight, living in rural areas and mother not living with a partner. Overweight was associated with no breastfeeding, maternal smoking during pregnancy and birth weight ≥ 4.0 kg.

**CONCLUSION.** Breastfeeding for a minimum period of 30 days had a protective effect against overweight in preschool children of the semiarid region of Alagoas.

**KEY WORDS:** Breastfeeding. Anthropometry. Overweight. Growth and development. Mother-child health (public health)

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## INTRODUCTION

Economic, social, and demographic changes that have been occurring in developing countries created a contradictory scenario of nutritional problems, characterized by reduction of malnutrition and progressive increase of obesity and other chronic diseases, a phenomenon known as nutritional transition.<sup>1</sup> This transition may be configured as a process composed by four consecutive stages, started with the kwashiorkor control, followed by the disappearing of nutritional marasmus. Soon after that, the overweight/obesity binomial increases in importance. Finally, stunting correction.<sup>2</sup>

In Brazil, stunting prevalence in children, even if reduced from 13.5%, in 1996, to 6.8% in 2006,<sup>3</sup> keeps representing a problem for public health. On the other hand, obesity prevalence has acquired epidemic proportions, having already exceeded the steeple occupied by malnutrition. According to recent data disclosed from the National Research on Children and Women

Health, around 7% of Brazilian children have excessive body weight in relation to their respective age and sex.<sup>4</sup>

Alagoas, one of the country's poorest states, where the worst social indexes prevail,<sup>5</sup> has also been going through this transition process, so the prevalence of malnutrition and obesity are in the same level, reaching around 10% of children.<sup>6</sup>

In face of this epidemiological scenario, an emphasis must be put on the development of actions that prevent both malnutrition and obesity, since both conditions, in the long haul, determine harmful consequences to health. Obesity in childhood seems to increase the probability of morbidity due to cardiovascular diseases.<sup>7</sup> Malnutrition, on the other hand, is associated to a higher incidence of infectious diseases and lower disposition for physical work.<sup>8</sup>

The planning of public policies must prioritize the development of simple and low cost measures and mainly that attend to the diversity of the current epidemiological picture. In this

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sense, incentive to breastfeeding seems to represent a very satisfactory alternative, which might have a favorable impact in children's nutritional state.<sup>2</sup> Breastfeeding is widely recognized as an effective action to the prevention to child malnutrition.<sup>9</sup> On the other hand, some studies have evidenced that breastfed children have are less liable to becoming obese,<sup>10-12</sup> while others have not arrived at the same conclusion,<sup>13,14</sup> suggesting that other variables, prevailing in specific epidemiological contexts, might interfere in this process. In Alagoas, and more specifically in its semiarid region, where social vulnerability is bigger,<sup>15</sup> there are no studies on the effects of exposition to breastfeeding on the occurrence of anthropometric deviations in children, as well as on what would be the possible factors associated. This study was undertaken with the finality of meeting this need.

## METHODS

### Sample planning

This work is part of a broader study named 'Nutrition and Health of mother-child population of Alagoas semiarid region,' whose sample planning had the target of obtaining a representative sample of children younger than 5 years living in the semiarid region of the State. In order to attain that, a prevalence of 9.5% of stunting was considered for the age, according to data disclosed by Ferreira et al.<sup>16</sup> in a study conducted with a sample of 2614 children from the same region. The margin of error admitted was 2% to a confidence interval of 95%. According to calculation done in the StatCalc device of Epi-info, 825 children would be necessary. In the end of the study, a sample of 954 children was obtained. To this study, however, those younger than 12 months (n=238) were excluded, arriving at a final sample of 716 children, arising sample error from 2% to 2.15%. The exclusion of younger than 12 months was necessary for post-natal feeding having the opportunity of exerting an influence in the child's growth, allowing a better evaluation of breastfeeding on the occurrence of anthropometric deviations, taking into consideration the fact that the influence of gestational conditions on child growth is diminished only after the first year of life.<sup>17</sup>

The sample was selected through a process in multiple stages with three phases. In the first one, 14 out of 37 municipalities were selected from the semiarid region of Alagoas, with probabilities proportional to their respective populations. In the second phase, 4 census sectors for each municipality were selected; and in the third and last phase, a starting point in each sector was selected, from which 24 consecutive households were visited. All the children between 12 and 60 months of age were eligible for the study.

### Data collection

Data collection occurred in the period ranging from January to March, 2007. The field team was formed by 2 supervisors, 10 interviewers and 2 anthropometrists operationally distributed in 2 groups. All the team was properly trained and the questionnaires for data collection (demographic, socioeconomic, anthropometric, and pertaining to health) tested in a pilot study, in which there was a standardization of the anthropometrists.

Anthropometric measures were done according to recommendations of the Ministry of Health.<sup>18</sup> Mothers were weighted with light clothes and no shoes on. A portable electronic scale

with capacity for 180 kg and 100 g accuracy was used (Marte PP 180@; São Paulo, Brazil). For measuring height of the children younger than 24 months, a wooden stadiometer equipped with inextensible 100 cm tape measure subdivided in mm was used. The height of the mothers and children older than 24 months was obtained through a vertical wooden stadiometer, with a platform, equipped with an inextensible 2m tape measure with 1mm sensitivity.

### Research design

It is a household survey cross-sectional study. The outcome variables were stunting (children with height for age < -2 SD) and overweight (children with weight for height > 2SD). The anthropometric standard used was the one adopted by the World Health Organization,<sup>19</sup> pertaining to the software Anthro.

Explanatory variables were exposition to breastfeeding (breastfed, not breastfed) and the length of this exposition (in months).

Mothers were asked if the child had been breastfed and, if the answer was yes, it was asked about the age he or she stopped being breastfed. Besides those who were never breastfed, children whose breastfeeding period was inferior to 30 days were considered not breastfed.<sup>20</sup>

Aiming at identifying other factors associated to the outcomes of interest according to categories of analysis, other variables were investigated.

Variables referring to maternal characteristics were: age (in years), marital condition (living with partner or not), instruction degree (in years of study). Body Mass Index (BMI, kg/m<sup>2</sup>), and smoking during pregnancy (yes, no). Variables referring to the child were: age, sex, and birth weight.

Maternal BMI was classified according to the WHO recommendation:<sup>21</sup> thinness (< 18.5 kg/m<sup>2</sup>), normal (18.5 to 24.9 kg/m<sup>2</sup>), overweight (25 to 29.9 kg/m<sup>2</sup>) and obesity (> 30 kg/m<sup>2</sup>). The infants who weighted 2500 g or less were considered low weight and those who weighted 4000 g or more at birth were considered overweight.<sup>22</sup>

Socioeconomic level was estimated based on the following variables: economic classification of the Associação Brasileira de Empresas (Brazilian Enterprises Association – ABEP),<sup>22</sup> origin and water treatment (origin: public network, mineral water, others; treatment: hypochlorite, filter, others or not treated); type of sanitary drainage system (sewage network, open sink or no system); household situation (urban or rural, according to the classification of the census sector defined by the IBGE (Brazilian Institute of Geography and Statistics)).

The ABEP<sup>23</sup> economic classification criterion establishes a score according to the head of the family's instruction degree and possession of certain domestic items, dividing the population in 5 classes: A (25 to 34 points), B (17 to 24 points), C (11 to 16 points), D (6 to 10 points) and E (0 to 5 points).

The child's age and birth weight were obtained through observing the child's chart. The other variables were obtained through the questionnaires applied to the mothers.

### Statistic analysis

Data were typed in independent double entry in a formulary created in Epi-info, version 3.3.2, and analyzed with the aid

of the SPSS, version 14.0.

In bivariate analysis, the frequency of anthropometric deviations (overweight and stunting) were compared according to the occurrence (breastfed, not breastfed), length (lower than 4 months, 4-6 months, 7-11 months, and higher than 12 months) and current breastfeeding situation (still breastfed, no longer breastfed). The frequency of these deviations were also compared in relation to other variables that could interfere in the child's nutritional state (age, BMI, and the mother's instruction degree, if she lives with the partner, smoking during pregnancy, water origin and treatment, type of sanitary drainage system, economic class, sex, age, and the child's birth weight). Bivariate analyses were done through the Chi square test. Odds Ratio (OR) and respective confidence interval 95% (CI95%) was used as association measure. Statistic significance was established from the limit of 5% ( $p < 0.05$ ).

Multivariate analysis occurred by logistic regression, aiming at identifying the main factors associated to outcomes of interest. Overweight and stunting were employed in the models as dependent variables. The other variables were considered independent (exposition to breastfeeding, age, BMI, and the mother's instruction degree, smoking during pregnancy, if she lives with the partner, water origin and treatment, type of sanitary drainage system, economic class, sex, age, and the child's birth weight) All the variables that were not associated to the anthropometric deviations with a level of significance equal to 10% ( $p < 0.1$ ) were removed from the final models by the backward process. The correlation between the variables was checked by the Pearson correlation coefficient in order to exclude one of the self-correlated variables from the analysis ( $r \geq 0.70$ ) and, therefore, eliminate the multicollinearity problem. For this reason, the variable 'breastfeeding length' was excluded, for its self-correlation with the exposition to breastfeeding. In the final model, associations whose variables presented  $p < 0.10$  were considered significant.<sup>24</sup>

Considering that in bivariate analysis stunting was associated with the variable 'still breastfed', there was the necessity of running a model including it in the analysis in order to test if breastfeeding after 12 months would represent a risk factor for such outcome or if other factors would be determining.

### Ethical aspects

The project was submitted and approved by the Research Ethics Committee of the Federal University of Alagoas (process n. 009547/2007-04). All the mothers who were invited to participate in the research accepted the invitation and signed the informed consent term.

## RESULTS

Stunting was the problem of greater magnitude (11.5%) among the children studied. The prevalence of overweight was in an intermediate position (6.3%), while the prevalence of ponderal deficit (weight for height  $< -2$  SD) was epidemiologically irrelevant, situated within the frequency observed in the reference pattern (2.3%).

Table 1 describes the sample characteristics. Data presented indicate that the population is exposed to precarious socioeconomic conditions, a fact highlighted by the proportion of mothers

with low instruction degree (58.5%) and of families belonging to classes D and E (87.3%), in addition to improper waste destination (35.8%) and not satisfactory coverage of the public water supply network (65.2%). Despite that, almost half of the mothers (44.3%) were overweight or obese (BMI  $\geq 25$  kg/m<sup>2</sup>).

Still in Table 1, it is possible to observe that most children (54%) were in the age group of 1-3 years and were male (52%). In relation to birth weight, 7% were born with low weight ( $\leq 2500$  g) and 8% with weight above desired ( $\geq 4000$  g). In relation to breastfeeding, 9% of the children were not breastfed and 22.7% were still breastfeeding. Among the children who were no longer receiving maternal milk, 43.5% were breastfed for one year or more. Therefore, in this population, most children received maternal milk for more than 12 months (52.4%).

The frequency of anthropometric deviations according to exposition to breastfeeding is presented in Table 2. There was a frequency of overweight significantly higher among the children who were never breastfed or were for less than one month in relation to those who were breastfed for more than 30 days (12.7% vs 6%; OR = 2.3; CI95% = 1 to 5.5;  $p = 0.049$ ). Stunting remained similar among these two categories ( $p = 0.3$ ).

The length of breastfeeding did not interfere in the prevalence of anthropometric deviations. Nevertheless, it was observed that the children who were still being breastfed presented a higher prevalence of stunting when compared to children who had already stopped breastfeeding (15.6% vs 9.8%; OR = 1.7; CI95% = 1 to 2.85;  $p = 0.046$ ). It is important to highlight that this association disappeared after multivariate analysis.

Table 3 presents the variables associated to anthropometric deviations. According to bivariate analysis, stunting was associated to lower mother's instruction degree (less than 4 years of study), maternal smoking during pregnancy, household situated in rural area, absence of sanitary drainage system, and low birth weight. The child's overweight was associated to overweight and obesity in the mother.

The results of logistic regression analysis, presented in the column  $p^b$  of Tables 2 and 3, revealed the factors which remained associated to anthropometric deviations after the models' final adjustments. In relation to frequency of anthropometric deviations according to the exposition to breastfeeding (Table 2), it is observed that the children who did not receive maternal milk are more exposed to overweight ( $p = 0.09$ ) when compared to those who did receive it; but the fact of being breastfed did not interfere in stunting. Breastfeeding length was not included in the models, because it was correlated ( $r > 0.7$ ) to the exposition to breastfeeding.

Factors associated to stunting after multivariate analysis were, mainly, those related to socioeconomic conditions and related to access to health care services: low birth weight ( $p < 0.001$ ), living in rural area ( $p = 0.08$ ) and mother not living with the partner ( $p = 0.09$ ). Overweight, on its turn, was associated to higher birth weight ( $p = 0.03$ ), to the presence of smoking during pregnancy ( $p = 0.07$ ), and not breastfeeding ( $p = 0.09$ ).

**Table 1 – Socioeconomic, demographic, and health characteristics of mothers and 1-5 year-old children in Alagoas semiarid region, 2007**

Variables	n	%
Mother's age (years)		
15-35	564	78.7
36-55	152	21.2
Mother's instruction degree (years of study)		
0-4	419	58.5
>4	297	41.5
Smoking habit during pregnancy		
Yes	146	20.4
No	570	79.6
Mother lives with a partner		
Yes	603	84.2
No	113	15.8
Maternal BMI (kg/m <sup>2</sup> )		
<18.5	26	3.6
18.5 – 24.9	373	52.1
25 – 29.9	194	27.1
≥ 30	123	17.2
Localization		
Urban	304	42.5
Rural	412	57.5
Origin of drinking water		
Public network/ spring/ mineral	467	65.2
Well/ river / lagoon / other	249	34.8
Treatment given to drinking water		
Boiling/ filter/ hypochlorite	414	57.8
Not treated	302	42.2
Sanitary drainage		
Sewage network/ closed sink	460	64.2
Other places/ no specific place	256	35.8
Socioeconomic classification (ABEP)		
A+B+C	91	12.7
D+E	625	87.3
Child's age (years)		
1.0 – 3	386	54
3.1 – 5	330	46
Sex		
Male	371	52
Female	345	48
Birth weight (kg)		
≤ 2.5	50	7.0
2.6 – 2.99	102	14.3
3 – 3.99	503	70.2
≥ 4	61	8.5
Breastfed child		
Yes (breastfed for 30 days or more)*	489	68.3
No (was never breastfed or was for less than 30 days)	65	9
Still being breastfed	162	22.7
Breastfeeding length (in months)		
<4	140	28.6
4-6	89	18.2
7-11	47	9.6
≥ 12*	213	43.5

\* Children who were still being breastfed excluded

## DISCUSSION

Stunting was the problem of greatest magnitude in the studied sample, while overweight was in an intermediate position. A similar result was found by Ferreira et al.<sup>16</sup> in a study conducted in the same region. However, in evaluating the State of Alagoas as a whole, Luciano<sup>6</sup> discovered that stunting and obesity prevailed with identical magnitude. Probably the lower socioeconomic development existent in the semiarid region can explain this disparity.

Data presented evidenced that breastfeeding for more than 30 days represents a protection factor against overweight in 1-5 year-old children. Breastfeeding in the first weeks of life is of great importance, because this is a critical period for the expression of the protective effect of breastfeeding against excessive weight.<sup>25</sup>

Siqueira et al.<sup>26</sup> found that, during school age, high socioeconomic level Brazilian children who were never breastfed had a higher risk of being obese than those who were breastfed, after adjustment for possible confusing factors. However, as in this work, the association between breastfeeding length and obesity was not investigated.

Three meta-analyses done mainly from studies conducted in developed countries<sup>10,11,27</sup> suggest that breastfeeding protects against obesity. Nevertheless, a cohort study done with Brazilian children did not arrive at the same conclusion.<sup>14</sup> According to Owen et al.,<sup>28</sup> the difference in obesity prevalence observed between breastfed and not breastfed children is small, and probably influenced by the publishing bias and confusing factors. It is, therefore, a controversial issue. The World Health Organization positions itself in favor of breastfeeding being a preventive factor against childhood obesity.<sup>29</sup>

Possible mechanisms through which there would be a lower overweight risk in breastfed children would be the presence of bioactive composites in human milk and differences in the satiety regulation and protein ingestion.<sup>30</sup> These mechanisms, acting in a sensitive developmental period, can be permanently programmed and have long term effects.<sup>31</sup>

Leptin is a bioactive composite present in maternal milk, which, by appetite regulation and energetic balance, may be one of the factors responsible for protection against obesity in breastfed children.<sup>32</sup> On the other hand, excessive protein ingestion, common in children fed with infantile formulas, may lead to obesity. Protein ingestion above needed may stimulate insulin secretion and of the growth factor similar to insulin 1 (IGF 1), which may increase adipogenic activity and adipocytes differentiation.<sup>31</sup>

In relation to stunting, in this study there was no difference in prevalence between breastfed and not breastfed children. However, in identifying the factors associated to stunting in children younger than 5 years, Oliveira et al.<sup>33</sup> discovered that the absence of breastfeeding was one of the predictors of linear growth deficit.

In bivariate analysis it was observed that the children who kept on being breastfed for a period higher to 1 year had a bigger chance of developing stunting. Nevertheless, after multivariate analysis this association did not remain significant, which suggests that other factors would be determining this outcome. To arrive at more accurate conclusions on this issue, it would

**Table 2 – Anthropometric deviations frequency according to breastfeeding indicators in 1-5 year-old children living in Alagoas semiarid region, 2007**

Variables	Stunting (height-for-age < -2 SD)			Overweight (weight-for-height > 2 SD)		
	%	OR (CI 95%) <sup>a</sup>	p <sup>b</sup>	%	OR (CI 95%) <sup>a</sup>	p <sup>b</sup>
Breastfed child						
No	14	1.5 (0.7; 3.2) <sup>ns</sup>	ns	12.7	2.3 (1; 5.5)**	0.09*
Yes†	9.8	1.0		6.0	1	
Still being breastfed	15.6	1.7 (1; 2.85) **	ns	4.5	0.73 (0.3; 1.7) <sup>ns</sup>	ns
<i>Breastfeeding length (months)†</i>			c			c
< 4	7.3	0.81 (0.36; 1.82) <sup>ns</sup>		5.9	0.88 (0.35; 2.19) <sup>ns</sup>	
4-6	13.6	1.62 (0.74; 3.53) <sup>ns</sup>		5.7	0.85 (0.29; 2.47) <sup>ns</sup>	
6.1-11.9	13.3	1.58 (0.59; 4.24) <sup>ns</sup>		4.6	0.68 (0.15; 3.14) <sup>ns</sup>	
≥ 12	8.8	1		6.6	1	

†Children who were still being breastfed not included

<sup>a</sup>Statistic analysis done through the Chi square test.

<sup>b</sup>statistic analysis done through multiple logistic regression

<sup>c</sup> variable removed from multivariate analysis for its being correlated ( $r > 0.7$ ) with exposition to breastfeeding

ns = not significant ( $p \geq 0.1$ ); \* =  $p < 0.1$ ; \*\* =  $p < 0.05$

**Table 3 – Stunting and overweight frequency in 1-5 year-old children, according to maternal, socioeconomic and child's variables in Alagoas semiarid region, 2007**

	Stunting (height-for-age < -2 SD)			Overweight (weight-for-height > 2 SD)		
	%	OR (CI 95%) <sup>a</sup>	p <sup>b</sup>	%	OR (CI 95%) <sup>a</sup>	p <sup>b</sup>
Mother's age (years)						
15 – 35	11.8	0,82 (0.47-1.40) <sup>ns</sup>	ns	5.6	0.66 (0.3-1.3) <sup>ns</sup>	ns
36 – 55	13.3	1		8.2	1	
Mother's instruction degree (years of study)						
0-4	13.6	1.81 (1.1-3)**	ns	6.0	0.88 (0.5-1.6) <sup>ns</sup>	ns
> 4	8.0	1		6.7	1	
Smoking habit during pregnancy						
Yes	17.6	1.91 (1.1-3.2)**	ns	10.5	1.80 (0.9-3.5)*	0.07*
No	10.0	1		5.5	1	
Mother lives with a partner						
Yes	10.8	0.66 (0.4-1.2) <sup>ns</sup>		6.1	0.95 (0.4-2.2) <sup>ns</sup>	ns
No	15.4	1	0.09*	6.3	1	
Maternal BMI (kg/m2)						
<25	12.6	1.00	ns	4.4	1.00	
≥ 25	9.5	0.73 (0.4-1.2) <sup>ns</sup>		8.6	2.03 (1.9-3.9)**	ns
Localization						
Urban	7.4	1		7.3	1.36 (0.7-2.5) <sup>ns</sup>	ns
Rural	14.6	2.14 (1.3-3.7)***	0.08*	5.6	1	
Origin of drinking water						
Public network/ spring/ mineral	11.4	1	ns	6.7	1	ns
Well/ river / lagoon / other	12	1.06 (0.7-1.7) <sup>ns</sup>		5.5	0.21 (0.4-1.6) <sup>ns</sup>	
Treatment given to drinking water						
Boiling/ filter/ hypochlorite	11.6	1	ns	6	1	ns
Not treated	12.2	1.06 (0.7-1.7) <sup>ns</sup>		6.8	1.15 (0.6-2.2) <sup>ns</sup>	
Sanitary drainage						
Sewage network/ closed sink	9	1	ns	6.2	1	ns
Other places	16	1.91 (1.2-3)***		6.4	1.03 (0.5-1.9) <sup>ns</sup>	
Socioeconomic classification (ABEP)						
A + B + C	6.1	1	ns	8.7	1	ns
D + E	12.6	2.22 (0.9-5.7)*		6.2	0.68 (0.3-1.6) <sup>ns</sup>	
Child's age (years)						
1.1 – 3	11.8	1.07 (0.7-1.7) <sup>ns</sup>	ns	7.2	1.46 (0.8-2.8) <sup>ns</sup>	ns
3.1 – 4.9	11.4	1		5.1	1	
Sexo						
Male	13.4	1.48 (0.9-2.4)*	ns	7.6	1.6 (0.9-3.0) <sup>ns</sup>	ns
Female	9.4	1		4.8	1	
Birth weight (kg)						
≤ 2.5	35.7	4.74 (2.4-9.5)****	0.00****	-	-	
2.6 – 3.99	10.4	1		6.6	1	
≥ 4.0	-	-		13	2.1 (0.8-5.3)*	0.03**

<sup>a</sup>Statistic analysis done through the Chi square test;

<sup>b</sup> statistic analysis done through multiple logistic regression

ns = not significant ( $p \geq 0.1$ ); \* =  $p < 0.1$ ; \*\* =  $p < 0.05$ ; \*\*\* =  $p < 0.01$ ; \*\*\*\* =  $p < 0.001$

be necessary to develop studies that investigated, additionally, the appropriateness of complementary feeding to the age group, which was not the objective of this investigation. Improper introduction of complementary foods is a risk factor both to stunting and to overweight.<sup>34</sup>

As for this study's limitations, it can be mentioned that information on breastfeeding was obtained retrospectively and, therefore, was memory-biased. It was also not possible to analyze the prevalence of anthropometric deviations in relation to exclusive breastfeeding, for there was a difficulty by the mothers to inform the exact age of introduction of other foods, including water and teas. Another limitation was the impossibility of including the variables on the children's feeding and physical activity patterns in the analysis. However, the authors believe that those obstacles have not had an important interference in the results obtained due to the sample's homogeneity in regard to its socioeconomic and cultural and, consequently, feeding level. On the other hand, the main variables involved in determining the anthropometric deviations analyzed were controlled.<sup>10,33</sup>

## CONCLUSION

Drawing upon data presented, it can be concluded that breastfeeding represents a protection factor against childhood overweight. Risk factors associated to this condition in the population studied, in addition to absence of breastfeeding, were maternal smoking habit during pregnancy and higher birth weight. Other studies have also identified the association between these factors and childhood obesity.<sup>35-37</sup>

The association between smoking during pregnancy and overweight may appear to be surprising, since this condition represents a risk factor for low birth weight.<sup>41</sup> However, these children present, after birth, a ponderal evolution more accelerated in relation to the expected rhythm, a process known as catch up, that can predispose to overweight. Von Kries et al.<sup>37</sup> conducted a cohort study involving 6,483 five to seven year-old children and found an association of the dose-response type between smoking during pregnancy and obesity in the children, thus eliminating possible confusing factors that could be seen as responsible for such association. Besides that, experimental models suggest that exposition to nicotine during intrauterine life alters the appetite control and feeding behavior.<sup>37</sup>

Higher birth weight has also represented a risk factor for overweight, as observed by Simon et al.<sup>24</sup>. Monteiro et al.,<sup>38</sup> in studying children at birth, at 20 and 40 months of life and 15 and 16 years, concluded that birth weight is linearly and positively associated to overweight.

In relation to stunting, improper socioeconomic and environmental conditions were its main determining factors.

Stimulus to breastfeeding must be a primary option to promote health, since its benefits respond to specificities of the existing epidemiological scenery in Alagoas semiarid region, as well as in various regions that are going through the nutritional transition process.

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