Effect of Breastfeeding on Head Circumference of Children from Impoverished Communities

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Abstract

Objective: This study investigated the effect of exclusive breastfeeding on head circumference (HC) among children living in impoverished communities.

Subjects and Methods: A cross-sectional study was conducted among children 12–60 months old from the 39 *quilombos* located in the State of Alagoas, Brazil. HC deficit was defined by a z-score of less than -2 from the median (based on the 2006 World Health Organization growth standards). Prevalence ratio and 95% confidence interval (95% CI) were estimated using Poisson regression with robust adjustment of the variance, and estimates were adjusted for possible confounders (anthropometric, socioeconomic, demographic, and health-related variables).

Results: We evaluated 725 children (365 boys and 360 girls). The prevalence of HC deficit was 13.3% among those children who were exclusively breastfed for less than 30 days, 10.6% among those exclusively breastfed for 30–119 days, and 5.8% among those who were exclusively breastfed for 120 days or more. Even after controlling for possible confounding variables, exclusive breastfeeding for ≥ 4 months decreased the risk of HC deficit (prevalence ratio, 0.48; 95% CI 0.24, 0.99).

Conclusions: Exclusive breastfeeding for ≥ 4 months was associated with a larger HC in children exposed to great social vulnerability in impoverished communities.

Introduction

HEAD CIRCUMFERENCE (HC), which is positively correlated with brain volume,¹ has been frequently used to assess postnatal growth of the brain.^{2,3} Increased head growth is associated with reduced rates of delayed psychomotor development,⁴ cerebral palsy, poor school performance,⁵ and adult dementia.⁶

One of the main cause of HC deficit in populations exposed to food insecurity is primary undernutrition.⁷ Therefore, adequate nutrition is of great importance for the prevention of impaired head growth.⁷ Donma and Donma⁸ observed that HC values at 6 months of mixed-fed and formula-fed infants were well below those of breastfed infants.

Human milk is the healthiest food for young babies and is ideal for optimal growth and development of the central nervous system because it contains nutrients such as *n-3* polyunsaturated fatty acids and antibodies and is less likely to be contaminated by bacteria or other non-nutrient substances.^{4,9} Therefore, promotion of exclusive breastfeeding

should be a priority, especially in communities where food insecurity is highly prevalent.

Despite these considerations, in our literature review, we were not able to locate any study that assessed whether breastfeeding promotes normal brain growth in children exposed to conditions that favor chronic undernutrition, such as those living under poor socioeconomic conditions.

The present study aimed to assess the association between exclusive breastfeeding and HC of preschool children undergoing great social vulnerability in impoverished communities in the State of Alagoas, northeastern Brazil.

Subjects and Methods

Study population

We studied children 12–60 months old living in the 39 *quilombolas* communities in Alagoas, northeast Brazil, which are distributed in 26 municipalities. The studied population lived in communities formed by descendants of escaped African slaves who hid in remote rural areas of Brazil within

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the so-called *quilombos*. In most cases, the lands occupied by the *quilombolas* are not regulated with respect to property ownership, being objects of dispute between the occupants and the farmers of the region. For this reason, there is no adequate estimate of the size of the population being studied. Therefore, it was decided to include all children in the target age range found by researchers within the limits of all *quilombolas* communities of Alagoas.

A cross-sectional survey was carried out between July 2008 and November 2008. Data collection was carried out at schools, governmental health units, and community centers. Children who could not attend the initial calls were later visited in their homes. In each community, we identified the possible eligible children through visits to all households within the existing boundaries of the locality.

Children diagnosed by the pediatrician of the research team with neurological alterations or syndromes and those presenting anatomical deformities that would hamper anthropometric evaluation were excluded.

Data collection

A precoded and tested questionnaire was used to gather information on socioeconomic status, demographics, environmental conditions, health conditions, breastfeeding, and access to public services from the parents or legal guardians of the children. Each anthropometric measurement was performed in duplicate, and the mean of both measurements was used in the study.

All data were obtained by eight nutritionists who had been previously trained and standardized for performing all the procedures established in the research project.

Data on breastfeeding were obtained from the mother by recall using a pretested questionnaire. Mothers were asked to respond three questions concerning breastfeeding: (1) "Was the child fed on breastmilk for any length of time?" If the answer was yes, (2) "For how long the child was breastfed?" and (3) "For how long was the child fed exclusively on breastmilk, that is, without any solid food or liquid and even tea or water?"

Exclusive breastfeeding was defined according to the guidelines proposed by the World Health Organization as no liquid or solid food other than breastmilk.¹⁰

HC was measured from the maximum cephalic perimeter (frontal occipital circumference) of each child by a trained examiner using a nonextendable tape graduated in 0.1-cm divisions. The tape was carefully positioned above the supraorbital crest and over the maximum projection of the occipital protuberance, with the tape being pressed down firmly in order to minimize the effect of hair volume.⁷ Reliability of HC measures was confirmed in a random sample of 10% of the children by a senior author (A.F.S.X.Jr.). Differences greater than 0.5 cm between the duplicate measurements were considered as inadequate, although none of the value pairs recorded presented discrepancies of this magnitude. Children were classified on the basis of HC-for-age z-scores using reference values proposed by the World Health Organization.¹¹

Body weight and height were assessed according to standard techniques.¹² Digital scales (model PP180; Marte, São Paulo, Brazil) with a precision of 100 g were used to measure body weight, whereas height was evaluated with the aid of a

portable stadiometer comprising a nonextendable 2-m measuring tape graduated in 0.1-cm divisions. Children up to 24 months old were measured in the supine position, whereas older children and mothers were measured in an orthostatic position.

Height-for-age and weight-for-height z-scores were estimated using the 2006 World Health Organization growth standards.¹¹ Mothers were classified with respect to nutritional status on the basis of body mass index (BMI) (low weight, BMI <18.5 kg/m²; overweight, BMI ≥25 kg/m²) as recommended by the World Health Organization.¹³

Socioeconomic level was determined using the Associação Brasileira de Empresas de Pesquisa classification,¹⁴ which is based on a score that considers achieved schooling of the head of the household, the ownership of household appliances, the presence of a bathroom in the household, and the presence of a housemaid.

Statistical analysis

Descriptive analyses included mean of the continuous variables and their standard errors. Depending on the type of analysis used, HC-for-age was treated as a continuous (expressed as z-scores) or as a dichotomic variable. HC deficit was defined by a z-score of less than -2. Duration of exclusive breastfeeding was coded in three categories (in days): 0 to <30, 30–119, and ≥120.

In unadjusted analysis, prevalence of HC deficit was compared according to the independent variables categories by using the χ^2 test. Analysis of variance with Bonferroni's correction was conducted to compare the mean of the HC across the different groups.

All variables with $p < 0.2$ in the initial analysis were included in the multivariate analysis in order to obtain measures of association (prevalence ratio and respective 95% confidence interval [CI]) adjusted for potential confounders. Poisson regression with robust adjustment of the variance was used in the multivariate analysis.

Statistical analysis was carried out using Stata[®] software (Stata Corp., College Station, TX). In all situations, the differences were considered as statistically significant when $p < 0.05$.

The Ethics Committee of the Federal University of Alagoas approved the study (protocol number 022354/2008-11). Written informed consent was obtained from the parents or guardians of the children who participated prior to the commencement of the study.

Results

We identified 766 children eligible for the study, but 41 were excluded from the analysis (loss of 5.3%). These losses were due to anthropometric measurements considered as biologically implausible¹³ ($n = 6$), children whose measurements could not be obtained ($n = 11$), and children who were not located at the time of data collection ($n = 24$).

Among the 725 children studied, 365 were boys, and 360 were girls. As seen in Table 1, the studied population has a low socioeconomic level, given the large proportion of individuals in Class E (80.3%), low maternal schooling (47.9% achieved 3 or fewer years), and the large numbers of households with a reduced number of rooms. Because of this social vulnerability, 79.4% of the families relied on the financial

TABLE 1. PREVALENCE RATIOS OF DEFICIT IN HEAD CIRCUMFERENCE ACCORDING TO SOCIOECONOMIC AND ENVIRONMENTAL VARIABLES OF CHILDREN 12–60 MONTHS OLD LIVING IN THE *QUILOMBO* COMMUNITIES OF THE STATE OF ALAGOAS, BRAZIL, IN 2009

Variable, category	n	%	HC deficit prevalence (%)	PR (95% CI)	p value	Adjusted PR (95% CI)
Economic class (ABEP) of family ^a						
Classes C and D	143	19.7	7.7	1		1
Class E	582	80.3	11.2	1.45 (0.79, 2.68)	0.233	0.90 (0.49, 1.68)
Enrollment with Family Grant Program (<i>Programa Bolsa Família</i>) ^b						
Yes	573	79.4	11.0	1.26 (0.71, 2.23)		
No	149	20.6	8.7	1	0.426	NA
Number of compartments in house						
1–3	394	54.5	12.4	1.52 (0.97, 2.37)		0.93 (0.78, 1.10)
≥4	329	45.5	8.2	1	0.068	1
Schooling of head of household (years completed)						
0–3	424	62.5	12.3	1.63 (0.99, 2.71)		
≥4	254	37.5	7.5	1	0.054	NA ^c
Type of construction material predominant in house						
Masonry	545	75.2	9.9	1		
Other different of masonry	180	24.8	12.2	1.23 (0.77, 1.97)	0.38	NA
Treatment for drinking water						
Yes	291	40.4	9.6	1		
No	430	59.6	11.2	1.16 (0.75, 1.80)	0.510	NA
Mother's schooling (years completed)						
0–3	344	47.9	13.4	1.72 (1.11, 2.68)		1.67 (1.03, 2.70)
≥4	374	52.1	7.8	1	0.016	1

^aAccording to the classification of the Brazilian Association of Research Institutes (Associação Brasileira de Empresas de Pesquisa [ABEP], 2008). A lower score indicates higher poverty level.

^bFederal program of direct income transference that benefits families in poverty conditions throughout the country (www.mds.gov.br/bolsafamilia).

^cExcluded from adjusted analysis because of its autocorrelation with maternal education.

CI, confidence interval; HC, head circumference; NA, not analyzed because $p > 0.20$ in nonadjusted analysis; PR, prevalence ratio.

support given by the government to guarantee their subsistence and were enrolled in the Family Grant Program (*Programa Bolsa Família*). Nevertheless, Table 2 shows that almost half (48.2%) of the mothers had excess body weight. On the other hand, 16.4% had short stature, an indicator of chronic undernutrition during their first years of life.

Regarding nutritional status (Table 3), 6.6% of the children presented low birth weight (<2,500g), 46.6% were anemic (hemoglobin, <11 g/dL), and 7.5% had excess body weight. The prevalence of HC deficit was 10.5%, similar to the frequency of linear deficit (10.8%). The mean HC-for-age z-score was -0.70 ± 1.04 , and the distribution (Fig. 1) was displaced to the left of the World Health Organization reference curve.¹¹

As for exclusive breastfeeding (Table 4), 41.4% of the children never received human milk as the only nourishment source or did not complete 1 month on this feeding regimen. The proportion of children who were exclusively breastfed for ≥4 months was 26.2%.

In unadjusted analysis, the prevalence of HC deficit among children who were breastfed exclusively for ≥4 months was 5.8%, a proportion significantly lower than that observed among those children who were exclusively breastfed for 0–29 days (13.3%) or 30–119 days (10.6%). Furthermore, the mean HC was 0.33 z-scores (95% CI 0.14, 0.52) higher among children who had been exclusively breastfed for at least 120 days in relation to those who were exclusively breastfed for <30 days. After adjustment for confounding variables, this increment decreased but remained statistically significant.

In the adjusted analysis, the protective effect of exclusive breastfeeding for ≥4 months was also observed for HC deficit (prevalence ratio, 0.43; 95% CI 0.23, 0.83).

In addition to exclusive breastfeeding for ≥4 months, the variables BMI-for-age z-score greater than or equal to -1 and height-for-age z-score greater than or equal to -1 were also independently associate with a larger HC.

Discussion

This article assessed differences in HC sizes in children according to duration of exclusive breastfeeding with the perspective that this measure could be an indicator of brain growth. As shown in other studies,^{15,16} exclusive breastfeeding for ≤4 months is associated with smaller head growth, which is strongly related to functional deficits.

Bouwstra et al.¹⁷ reported that exclusive breastfeeding for >6 weeks was associated with markedly less abnormal and more normal-optimal general movements, concluding that breastfeeding for >6 weeks might improve neurological conditions in infants.

A meta-analysis conducted by Anderson et al.⁹ showed that even after adjustment for appropriate confounders, breastfeeding was associated with significantly higher scores for cognitive development.

As for nutritional aspects, human milk has a nutrient composition that is balanced and proportionally compatible with the needs of the infant during the first 6 months of life.

TABLE 2. PREVALENCE RATIOS OF DEFICIT IN HEAD CIRCUMFERENCE ACCORDING TO DISTRIBUTION OF DEMOGRAPHIC, BIOLOGICAL, AND HEALTH VARIABLES OF CHILDREN 12–60 OLD MONTHS LIVING IN THE *QUILOMBO* COMMUNITIES OF THE STATE OF ALAGOAS, BRAZIL, 2009

Variable, category	n	%	HC deficit prevalence (%)	PR (95% CI)	p value	Adjusted PR (95% CI)
Skin color						
White	38	5.6	13.2	1		
Other than white	642	94.4	10.6	0.80 (0.34, 1.88)	0.616	NA
Number of people in household						
1–5	457	63.3	9.2	1		1
≥ 6	265	36.7	12.8	1.40 (0.91, 2.14)	0.125	1.02 (0.96, 1.07)
Gender						
Male	365	50.3	9.6	1		
Female	360	49.7	11.4	1.19 (0.77, 1.82)	0.430	NA
Age (months) of child						
12–23	173	23.9	6.4	1	—	1
24–35	179	24.7	11.7	1.84 (0.92, 3.71)	0.086	1.75 (0.81, 3.79)
36–47	188	25.9	12.2	1.92 (0.97, 3.83)	0.063	2.30 (1.10, 4.79)
48–60	185	25.5	11.4	1.78 (0.89, 3.59)	0.105	1.27 (0.60, 2.70)
Mother smoked during pregnancy						
Yes	91	12.7	20.9	2.29 (1.43, 3.67)		1.60 (0.95, 2.71)
No	626	87.3	9.11	1	0.001	1
Maternal stature (cm)						
Short stature (<150.1) ^a	112	16.4	11.6	1.07 (0.61, 1.88)		
Normal stature (≥151.1)	573	83.6	10.8	1	0.807	NA
Maternal age (years)						
15–19	49	7.2	14.3	1	—	
20–35	539	79.1	9.8	0.69 (0.33, 1.43)	0.318	
≥36	93	13.7	16.1	1.13 (0.49, 2.58)	0.774	NA
Number of prenatal consultations						
0	31	4.8	22.6	1	—	1
1–4	118	18.2	13.6	0.600 (0.27, 1.33)	0.209	1.28 (0.45, 3.63)
5–8	421	64.9	10.2	0.45 (0.22, 0.92)	0.029	1.18 (0.44, 3.18)
≥9	79	12.1	7.6	0.34 (0.12, 0.92)	0.034	0.92 (0.28, 3.06)
Maternal BMI (kg/m ²)						
<18.5	17	2.5	35.3	1	—	1
18.5–24.9	337	49.3	12.8	0.36 (0.18, 0.73)	0.005	0.89 (0.35, 2.24)
≥25	329	48.2	7.6	0.22 (0.10, 0.45)	<0.001	0.55 (0.21, 1.38)

^aThis cutoff point corresponds to less than –2 z-scores of the median of the distribution of height-for-age for 19-year-old women, according to the 2007 World Health Organization reference standard,¹¹ the age at which the end of the linear growth process occurs.

BMI, body mass index; CI, confidence interval; HC, head circumference; NA, not analyzed because $p > 0.20$ in non-adjusted analysis; PR, prevalence ratio.

Moreover, the greater biological availability of the components has to be emphasized because of its better digestibility, absorption, and cellular metabolism. The ω -3 and ω -6 fatty acids, particularly docosahexaenoic acid, are known to play an essential role in brain development. Intakes in pregnancy and early life affect growth and cognitive performance later in childhood. However, total fat, α -linolenic acid, and docosahexaenoic acid intakes are often low among pregnant and lactating women, infants, and young children in developing countries. As breastmilk is one of the best sources of α -linolenic acid and docosahexaenoic acid, breastfed infants are less likely to be at risk of insufficient intakes than those who are not breastfed.¹⁸

As cited by Levin,¹⁹ because maternal milk contains more fat than carbohydrate, neonates utilize fatty acids and ketone bodies as their primary energy substrates. During suckling, neonates transport ketone bodies preferentially over carbohydrates across the blood–brain barrier, and ketone bodies serve as the primary energy substrate for neuronal and glia metabolism.

In this study, multivariate analysis indicated that exclusive breastfeeding for >4 months was independently associated with a reduced frequency of HC deficit. Similar results were reported by Cockerill et al.²⁰ in a cohort study conducted between 2000 and 2004 that involved 76 babies born prematurely. These findings are important because evidence suggests that larger HC should lead to better long-term outcomes.^{9,17,21–25} These aspects can and should be used as additional argument to persuade mothers to breastfeed their children for >4 months.

The proportion of children with HC deficit was similar to that observed for stunting, with both present in about one in 10 children in the studied communities. Stunting is recognized as an indicator of long-term undernutrition.¹³ As long as these variables are interrelated,²⁶ it can be assumed that both characterize chronic undernutrition in the early life.

A survey that evaluated a representative sample of children younger than 5 years old in Alagoas observed a prevalence of

TABLE 3. CHARACTERIZATION OF HEAD CIRCUMFERENCE ACCORDING TO INDICATORS OF NUTRITIONAL STATUS OF CHILDREN
IN THE *QUILombo* COMMUNITIES OF THE STATE OF ALAGOAS, BRAZIL, 2009

Variable	n (%)	Z-score (mean ± SE)	HC			
			Mean difference (95% CI)	Deficit prevalence (%)	PR (95% CI)	p value Adjusted PR (95% CI)
HC-for-age (z-score)						
Deficit (z < -2.0)	76 (10.5)	-2.46 ± 0.04 ^a	Reference	—	—	—
Risk of deficit (z -1.01 to -2.0)	206 (28.4)	-1.41 ± 0.20 ^b	1.04 (0.88, 1.20)	—	—	—
Eutrophy (z ≥ -1.0)	443 (61.1)	-0.07 ± 0.03 ^c	2.39 (2.24, 2.54)	—	—	—
Statistics		a < b < c				
Birth weight (g)						
Low (<2,500)	48 (6.6)	-1.13 ± 0.13 ^a	Reference	16.7	1	1
Insufficient (2,500-2,999)	121 (16.7)	-0.86 ± 0.09 ^b	0.27 (-0.07, 0.62)	13.2	0.79 (0.36, 1.73)	1.25 (0.55, 2.82)
Normal (3,000-3,999)	490 (67.6)	-0.66 ± 0.05 ^c	0.47 (0.16, 0.78)	10.0	0.60 (0.30, 1.19)	1.25 (0.56, 2.80)
High (>4,000)	66 (9.1)	-0.37 ± 0.11 ^d	0.77 (0.38, 1.15)	4.6	0.27 (0.08, 0.98)	0.70 (0.18, 2.65)
Statistics		d = c; d > b, a; c > a				
Body mass index-for-age (kg/m ²) (z-score)						
Wasting (< -2.0)	9 (1.3)	-1.41 ± 0.46 ^a	Reference	44.4	1	1
Risk of wasting (-1.01 to -2.0)	48 (6.6)	-1.27 ± 0.15 ^b	0.14 (-0.55, 0.83)	22.9	0.52 (0.21, 1.26)	0.57 (0.16, 2.00)
Eutrophy (-1.0 to 1.0)	444 (61.6)	-0.86 ± 0.04 ^c	0.55 (-0.09, 1.19)	10.8	0.24 (0.11, 0.53)	0.26 (0.08, 0.85)
Risk of obesity (1.1 a 2.0)	166 (23.0)	-0.43 ± 0.07 ^{d,*}	0.98 (0.33, 1.63)	6.0	0.14 (0.05, 0.35)	0.17 (0.05, 0.67)
Obesity (z > 2.0)	54 (7.5)	0.32 ± 0.15 ^{c,*}	1.72 (1.04, 2.41)	3.7	0.08 (0.02-0.39)	0.11 (0.02, 0.64)
Statistics		e > d > c = b = a				
Height-for-age (z-score)						
Deficit (z < -2.0)	78 (10.8)	-1.13 ± 0.12 ^a	Reference	20.5	1	1
Risk of deficit (-1.01 to -2.0)	194 (26.7)	-0.01 ± 0.07 ^b	0.12 (-0.14, 0.38)	15.5	0.75 (0.43, 1.30)	0.73 (0.39, 1.39)
Eutrophy (≥ -1.0)	453 (62.5)	-0.49 ± 0.05 ^{c,*}	0.64 (0.40, 0.88)	6.6	0.32 (0.18, 0.56)	0.36 (0.19, 0.69)
Statistics		c > a = b				
Anemia						
Yes (hemoglobin <11 g/dL)	338 (46.6)	-0.63 ± 0.05	0.13 (-0.02, 0.28)	8.9	0.75 (0.48, 1.16)	1
No (hemoglobin ≥ 11 g/dL)	387 (53.4)	-0.76 ± 0.05	Reference	11.9	1	0.70 (0.44, 1.11)
Statistics		NS				

*Statistically significant difference ($p < 0.05$ by analysis of variance with Bonferroni's correction).
HC, head circumference; NS, not significant; PR, prevalence ratio obtained by Poisson regression with robust adjustment of variance.

FIG. 1. Distribution of the head circumference-for-age (HCA) z-scores of children (12–60 months) in the *quilombo* communities of the State of Alagoas, Brazil, in comparison with the reference distribution of HCA z-scores established by the World Health Organization (WHO).

stunting of 10.3%,²⁷ similar to that found in this study. This suggests that, in spite of the poor environmental and socioeconomic conditions under which the communities live, the population is undergoing a stage of nutritional transition similar to that experienced by the entire State of Alagoas. In the last 20 years, the prevalence of stunting in this area of Brazil has decreased, although the current level observed remains somewhat higher than to the country as a whole (7.0%).²⁸ Anyway, one cannot fail to recognize that the problem of undernutrition has evolved favorably in the State of Alagoas and possibly in its *quilombolas* communities.

Nevertheless, the number of individuals affected by HC deficit cannot be neglected, especially when it is noted that all of the children studied, analyzed as a whole, demonstrated a left deviation compared with the reference distribution. This suggests that the population has some deficit in brain growth.

Brain growth is faster in the first 2 years of life. From this age on, a stabilization occurs that lasts until puberty. In this research there was a tendency for a higher prevalence in HC-for-age deficit in age groups older than 24 months. These data reinforce the premise that a low HC-for-age in children younger

than 2 years is correlated with irreversible cerebral deficit⁵ and provide support for the existence of a critical period for growth and development of the central nervous system.^{29,30}

The period from the start of a mother's pregnancy through her child's second birthday is a critical window when the child's brain and body are developing rapidly, and good nutrition is essential to lay the foundation for a healthy and productive future. If children do not get the right nutrients during this period, the damage is often irreversible. The right nutrition during this window can have a profound impact on a child's ability to grow, learn, and rise out of poverty. According to the 2012 Save the Children Report, children whose physical and mental development are stunted by undernutrition will earn less on average as adults, and this represents a loss of human potential associated with a wage reduction of around 20%.²¹ Furthermore, evidence suggests that promotion of growth among children under 2 years of age has long-term consequences on human capital,^{22–24} whereas it does not increase the risk of cardiovascular disease.²⁵

This study was conducted in a population that survives in great environmental and socioeconomic precariousness, but

TABLE 4. CHARACTERIZATION OF HEAD CIRCUMFERENCE ACCORDING TO DURATION OF EXCLUSIVE BREASTFEEDING OF CHILDREN FROM THE *QUILOMBO* COMMUNITIES OF THE STATE OF ALAGOAS, BRAZIL, 2009

Duration of exclusive breastfeeding (days)	Sample n (%)	Cumulative frequency (%)	Head circumference					Adjusted PR (95% CI)
			Z-score (mean ± SE)	Mean difference (95% CI)	Prevalence of deficit (%)	PR (95% CI)	p value	
0 to <30	300 (41.4)	41.4	−0.83 ± 0.06 ^a	Reference	13.3	1	–	1
30–119	235 (32.4)	73.8	−0.70 ± 0.07 ^b	0.13 (−0.05, 0.31)	10.6	0.80 (0.50, 1.28)	0.346	1.02 (0.63, 1.67)
≥120	190 (26.2)	100.0	−0.50 ± 0.07 ^{c,*}	0.33 (0.14, 0.52)	5.8	0.43 (0.23, 0.83)	0.011	0.48 (0.24, 0.97)
Statistics			c > (b = a)					
Total	725 (100.0)		−0.70 ± 1.04		10.5			

*Statistically significant difference ($p < 0.05$ by analysis of variance with Bonferroni's correction).

CI, confidence interval; PR, prevalence ratio obtained by Poisson regression with robust adjustment of variance.

that is in the process of nutritional transition.²⁷ This argument is based on the fact that the prevalence of stunting found among *quilombola* children was very similar to that found for children in the State of Alagoas, where the prevalence of undernutrition has been showing significant decreases and the prevalence of obesity evolves in a worrisome manner.²⁷ Another aspect that reinforces this consideration relates to the high prevalence of overweight among mothers of the children studied. Previous studies have shown that significant numbers of these women were victims of undernutrition in early life, a fact evidenced by the smaller stature of both *quilombola* women and women of the State of Alagoas, compared with Brazilian women overall.^{31,32} The high prevalence of overweight would be explained by the so-called metabolic imprint, a term that describes a phenomenon whereby an early nutritional experience during a critical period of development can cause a lasting effect persisting throughout an individual's life, predisposing that person to certain outcomes, such as obesity and cardiovascular diseases.³³

The data presented here reinforce the importance of implementation of actions to promote breastfeeding in order to ensure, among many other functions, adequate brain growth. However, considering the precarious environment in which these children survive, it is necessary that they receive appropriate stimuli to cognitive development. Several studies^{34–36} have shown that programs of psychosocial stimulation bring about significant increases in cognitive development, even in children previously subjected to severe malnutrition.

In conclusion, exclusive breastfeeding for >4 months was associated with a significant increase in HC. For children exposed to great social vulnerability in an impoverished community this is an especially important consideration.

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