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Trends and patterns of exclusive breastfeeding for under-6-month-old children

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Abstract

Objective: To study the trends and patterns of exclusive breastfeeding (EBF) for under-6-month-old infants in the city of Bauru, southeastern Brazil.

Methods: We compared data from three cross-sectional surveys, using similar methodologies, which were part of a project for monitoring breastfeeding indicators in the state of São Paulo, Brazil. The sample included infants aged 0 to 6 months who attended one of the two rounds of the nationwide infant vaccination campaign in 1999, 2003 and 2006 (respectively: 496, 674 and 509 infants). Descriptive statistics were used to compare the prevalence of EBF according to age (in months) and group of children under 6 months of age. Differences in prevalence were expressed as percentage-points and submitted to statistical analysis (Pearson's chi-square and tendency), and the level of significance was set at $p < 0.05$. Factors associated with EBF interruption in 2006 were evaluated by univariate and multivariate analyses.

Results: An increase in the prevalence of EBF was observed in under-6-month-old infants: 1999-2003, increase of 9.1 percentage-points; 2003-2006, increase of 6.6 percentage-points, resulting in an annual increase rate of 2.3 percentage-points for the first period and 2.2 percentage-points for the second period. Significant inverse association was observed between EBF and the use of pacifiers (prevalence ratio = 2.03; 95% confidence interval 1.44-2.84).

Conclusion: EBF prevalence in under-6-month-old infants in the city of Bauru, southeastern Brazil, increased almost threefold over the period studied, from 8.5% in 1999 to 24.2% in 2006, a total increase of 184.7%. The use of pacifiers was the only factor strongly associated with the interruption of EBF.

J Pediatr (Rio J). 2009;85(3):201-208: Breastfeeding, epidemiology, cross-sectional studies, child nutrition, human milk.

Introduction

Exclusive breastfeeding (EBF) during the infant's first 6 months of life is essential for its healthy development. It is well known that the introduction of food other than breast milk hinders nutrient absorption and bioavailability, increasing the risk of infection, and may reduce breast milk intake, leading to decreased body weight gain.[1]

The knowledge gained over the last decades, synthesized by Réa,[2] indicates that discontinued EBF is associated with several problems, such as necrotizing enterocolitis, diabetes, allergies and pneumonia, and that exclusively breastfed preterm and low birth weight infants are more likely to show increased intelligence and visual acuity.

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Thus, new evidence about long-term benefits of EBF or risks associated with its early cessation corroborates earlier evidence that justified, in the beginning of the present century, the World Health Organization (WHO) recommendation of breast milk for infant feeding during the first 6 months of life.[3]

Despite current scientific evidence and the growing trend toward EBF observed in Brazil,[4] early EBF cessation remains an important public health problem in the country,[2,5,6] indicating a strong need for continuous monitoring of indicators, searching for modifiable determinants and designing interventions and new studies.

An original and successful initiative in public health surveillance in Brazil is the "Breastfeeding and Municipalities" (*Amamentação e Municípios* - AMAMUNIC) project, which has taken place in the state of São Paulo, southeastern Brazil, since 1998, under the supervision of São Paulo State Health Department and coordination of the Institute of Public Health.[7] The main goal of this project was to turn surveys of infant-feeding practices in the first year after birth into a useful tool to help leaders reflect, plan and evaluate actions to support and encourage breastfeeding in their municipalities.

In the city of Bauru, state of São Paulo, the first survey, as part of this project, was conducted in 1999, and additional surveys were conducted in 2003 and 2006; however, no analysis of EBF trends and patterns for under-6-month-old infants has been performed so far. The objective of the present study was to analyze EBF trends in the 1999-2006 period and identify patterns of EBF interruption in the infant's first 6 months of life in 2006.

Methods

Prevalence rates of EBF for under-6-month-old children were calculated and compared in three cross-sectional surveys carried out in the city of Bauru, southeastern Brazil, using similar methodologies, in 1999, 2003 and 2006. As previously mentioned, these surveys were conducted as part of a project for monitoring breastfeeding indicators, which has taken place in the state of São Paulo, southeastern Brazil, since 1988.[7]

The study sample included infants aged 0 to 6 months who attended one of the two rounds of the nationwide infant vaccination campaign in 1999, 2003 and 2006. In the three surveys, two-stage cluster sampling was used, according to the method proposed by Silva.[8]

As the children were not homogeneously distributed in the various immunization centers, allocation was done using a random numbers table in two stages (probability was proportional to the size of the cluster): in the first stage, immunization centers were selected by random numbers, and in the second stage, children from each immunization center were selected by random numbers, in a systematic approach. The sample was formed by equiprobability distribution or as a self-weighted sample, since the sample fraction remains constant from the expression: $f = f_1 \times f_2$, i.e., all children have the same chance of selection. Larger centers are more likely to be selected in the first stage (f_1), and children from smaller centers are more likely to be selected in the second stage (f_2).

In the 1999 campaign, it was estimated that 4,987 children were aged 0 to 1 year; in 2003, 4,724 children; and in 2006, 3,998 children. Valid data on infant feeding from 1,021 under-1-year-old children were obtained in 1999; of 1,256 children in 2003; and of 996 children in 2006. Given our focus on EBF, the present analysis included only under-6-month-old children: 496, 674 and 509 infants, respectively in 1999, 2003 and 2006.

WHO definitions on current infant-feeding practices were adopted for the present study.[9] To describe the child's situation in relation to EBF, dependent variable of interest, we gathered information on birth date, infant-feeding practice (breastfeeding: yes or no) and whether, during such practice, the infant was given liquids (water, water with sugar, tea, powdered or fresh milk, or juice: yes or no) and solids (porridge, baby food, soups, cooked foods, fruit, and other solid foods: yes or no) on the day of data collection. This model, based on a single 24-hour recording of infant feeding, has been recommended by WHO for population-based surveys since 1992.[10]

We also collected information on the mother's age, schooling and working status, parity, birth weight, mode of delivery, use of pacifiers, hospital of delivery, and place of child care in order to describe both the children and mothers and investigate EBF-associated factors.

Across the three surveys, data were collected by the health department staff in the city of Bauru (dentists, dental assistants, physicians, social workers, receptionists, psychologists, nutritionists, community-based health agents, occupational therapists, and pharmacists), previously trained by a field supervisor. The supervisor received training coordinated by the research staff of the Institute of Public Health. In 1999, 52 interviewers received training and participated in data collection conducted in 17 immunization centers. In 2003, 65 trained interviewers participated in the survey in 23 immunization centers, and in 2006, 62 interviewers in 24 immunization centers.

Frequency of EBF for children according to age (months) and year of survey was calculated and compared. Differences were expressed as percentages comparing periods 1999-2003, 2003-2006 and 1999-2006. Annual variation rates were also calculated, as percentages, for the first two periods. In all comparisons, differences were submitted to statistical analysis (Pearson's chi-square and tendency), and the level of significance was set at $p < 0.05$.

In order to identify factors possibly associated with EBF interruption in under-6-month-old infants, we considered individual variables, per mother and children, such as mother's age, schooling and working status, parity, birth weight, mode of delivery, use of pacifiers, hospital of delivery, and place of child care, based on the 2006 survey.

Presence/absence of association between EBF and each one of the independent variables was investigated, and significance was analyzed using the chi-square test. Multiple analysis was performed, by log-binomial regression, using the ProcGenmod procedure within the SAS 9.1.3 software for Windows, and the criterion for inclusion in the significance model was set at $p < 0.20$ in the previous univariate analysis. To express the magnitude of the risk of EBF interruption in under-6-month-old infants, associated as an independent variable with each factor, adjusted prevalence ratios and 95% confidence intervals (95%CI) were calculated.

This study used secondary data from the AMAMUNIC project and was approved by the Research Ethics Committee of Universidade de São Paulo (USP) School of Public Health (protocol no. 548). The surveys carried out in Bauru were previously authorized by the city of Bauru Health Department. After the mothers received explanations about the study and length of the interview, those who accepted to participate provided verbal informed consent.

Results

Characteristics of the study populations across the three surveys are compared in Table 1. Slight variations were observed in the mothers' socioeconomic and demographic characteristics across the three surveys: increased proportion of mothers > 35 years old and variation in the proportion of mothers who worked during pregnancy, but did not take a maternity leave. Regarding the children, we observed a significant decrease in the proportion of pacifier users (falling from 65.8 to 54.0%) and an increase in the proportion of mothers using public-assistance programs for child care.

A progressive increase in EBF prevalence was observed in all the three periods and age groups studied (Table 2). EBF rate for under-1-month-old children showed an almost twofold increase from 1999 to 2006; the same was observed for all age groups, except for infants aged 1 to 2 months. Among infants aged 0 to 6 months, EBF rate increased from 8.5 to 24.2%, a 15.7-percentage-point increase, representing a total increase of 184.7% across the 7 years under study.

An analysis of the data in Table 2 shows a fall in EBF rates proportional to the distinct increase in children's age in the three periods studied: in 1999, EBF levels remained practically constant for the first and second months of life, with a marked drop between the second and the third month. In 2004 and 2006, EBF frequency rates, although more elevated, showed a marked fall between the first and the second month of life followed by more uniform decreases.

Univariate analysis of EBF-associated factors revealed a significant inverse association between the child's situation in relation to EBF in 2006 and the use of pacifiers ($p = 0.0001$) (Table 3). EBF frequency was twice as high among pacifier nonusers as compared to users. Other variables did not show any association with the EBF situation, but mother's schooling, parity and mode of delivery were selected as potential confounding factors ($p < 0.20$) and included in multivariate analysis (log-binomial regression); results are shown in Table 4. We observed an association (regardless of mother's schooling, mode of delivery and parity) between the use of pacifiers and EBF interruption ($p < 0.0001$). The risk of EBF interruption (prevalence ratio) in the infant's first 6 months of life associated with the use of pacifiers was 2.03 (95%CI 1.44-2.84).

Discussion

Analysis of EBF trends for under-6-month-old infants in the city of Bauru, southeastern Brazil, revealed a significant increase in this practice over the last 7 years. EBF prevalence increased almost threefold, from 8.5% in 1999 to 24.2% in 2006. This result is in accordance with the growing trend observed in other Brazilian municipalities,[6,11-13] in Brazil as a whole[4,14] and in many other countries.[15] The percentage of exclusively breastfed under-6-month-old infants in Bauru (24.2%) in 2006 was somewhat below the national average for the same year (39.8%), according to data from the Brazilian National Demographic and Health Survey (Pesquisa Nacional de Demografia e Saúde, PNDS).[16] In a comparison with the city of Botucatu, located less than 100 km from Bauru and with EBF prevalence data available for years close to the study period, we observed a similar unfavorable situation both to EBF prevalence rates across the three periods studied and trend of increase. In Botucatu, EBF prevalence for under-6-month-old infants was 16.5% in 1999 and 29.6% in 2004.[17] Projecting EBF prevalence in Botucatu for the year 2006 (at a 2.6-percentage-point annual increase), we reach 34.8%, 10 percentage points above the EBF prevalence rate in Bauru in this same year. Bauru showed a 2.3-percentage-point per year increase between 1999 and 2003 and a 2.2-percentage-point per year increase between 2003 and 2006.

Note that, despite a positive increase, at this rate it will take about 30 years for 90% of the under-6-month-old infants in the city of Bauru to benefit from EBF advantages.

Worth mentioning the marked drop in EBF observed between the first and the second month of life; data that could guide the design of interventions specifically for this period of life. The identification of modifiable factors associated with EBF duration is also of great importance to the design of future interventions.

A longitudinal study conducted in southern Brazil, factors identified as independently associated with EBF duration in the infant's first 6 months of life included: mother aged 20 years or less; mother attended less than 6 prenatal sessions; use of pacifier in the first month of life; and negative parameters in the technical evaluation of breastfeeding 30 days after the infant's birth. The authors recommend that activities designed to promote and encourage EBF, as well as to discourage pacifier use, targeting adolescents and mothers who have not attended the desirable number of prenatal sessions be strengthened; the authors also argue that high priority for EBF support should go to the need for orientation regarding the appropriate breastfeeding technique to be used.[18]

Table 1 - Mother's characteristics relating to children and place of child care (1999, 2003 and 2006 – Bauru, state of São Paulo, Brazil)

	Year of the survey						
	1999 (n = 495)*		2003 (n = 674)*		2006 (n = 509)*		
Characteristics	**n**	**%**	**n**	**%**	**n**	**%**	**p**
Mother's schooling							-
Incomplete elementary school	-	-	-	-	117	26.3	-
Incomplete high school	-	-	-	-	107	24.0	-
High school and over	-	-	-	-	221	49.7	-
The mother is literate							0.15†
Yes	437	96.9	568	98.8	441	98.2	-
No	14	3.1	7	1.2	8	1.8	-
Mother's age							-
< 20 years old	87	19.3	112	19.5	80	17.9	0.07‡
20 to 35 years old	340	75.4	400	69.6	327	73.0	0.56‡
> 35 years old	24	5.3	63	10.9	41	9.1	0.04‡
Mother's occupation							0.26†
Housewife	256	65.0	-	-	229	52.9	-
Informal work	87	22.1	-	-	70	16.2	-
Formal work	51	12.9	-	-	134	30.9	-
Work during pregnancy							0.14†
Yes	200	44.4	204	45.4	279	48.9	-
No	251	55.6	245	54.6	292	51.1	-
Maternity leave							-
Yes	114	25.3	175	36.4	134	29.8	0.01‡
No	101	22.4	155	32.2	70	15.6	0.55‡
Does not apply	236	52.3	151	31.4	245	54.6	-
Currently employed							< 0.01†
Yes	75	16.7	107	18.9	100	22.3	-
No	375	83.3	460	81.1	349	77.7	-
Mode of delivery							0.79†
Vaginal	225	45.5	290	43.3	227	44.7	-
Cesarean	269	54.5	379	56.7	281	55.3	-
Parity							0.11†
One delivery	184	40.8	257	44.7	207	46.1	-
Two deliveries or more	267	59.2	318	55.3	242	53.9	-
Use of pacifiers							< 0.01†
Yes	325	65.8	388	57.7	275	54.0	-
No	169	34.2	285	42.3	234	46.0	-
Low weight							0.55†
Yes	42	8.5	47	7.0	38	7.5	-
No	453	91.5	627	93.0	471	92.5	-
Child care							< 0.01†
Private/health plan	269	55.9	178	26.6	153	30.3	-
Public health care	212	44.1	492	73.4	352	69.7	-
Informer is the child's mother							0.15†
Yes	451	91.1	576	86.9	449	88.2	-
No	44	8.9	87	13.1	60	11.8	-

Source: Breastfeeding and Municipalities (AMAMUNIC) project - tabulation by the authors.
* Variations in total number in each variable are due to incomplete answers.
† p value for tendency chi-square test.
‡ p value for Pearson's chi-square test.

Table 2 - Prevalences and differences as percentage-points of EBF prevalence according to age (months) (1999-2003/2003-2006 – Bauru, state of São Paulo, Brazil)

	EBF prevalence			Difference as percentage-points			
Age	**1999 (%)**	**2003 (%)**	**2006 (%)**	**1999-2003 (%)**	**p**	**2003-2006 (%)**	**p**
0-1	20.6	38.0	48.5	17.4	0.04	10.5	0.27
1-2	21.3	28.7	33.3	7.4	0.32	4.6	0.57
2-3	7.2	26.7	32.0	19.5	< 0.01	5.3	0.70
3-4	3.6	13.5	15.7	9.9	0.04	2.2	0.81
4-5	3.3	5.8	12.9	2.5	0.59	7.1	0.11
5-6	0.0	1.5	3.9	1.5	0.63	2.4	0.52
0-6	8.5	17.6	24.2	9.1	< 0.01	6.6	0.01

Source: Breastfeeding and Municipalities (AMAMUNIC) project – tabulation by the authors.
EBF = exclusive breastfeeding.

Table 3 - Association between the presence of EBF and maternal variables relating to children and delivery (Bauru, state of São Paulo, Brazil, 2006)

	EBF				
	Yes		No		
Variables	**n**	**%**	**n**	**%**	**p***
Mother's schooling					0.19
Incomplete elementary school	37	31.6	80	68.4	
Incomplete high school	24	22.4	83	77.6	
High school and over	52	23.5	169	76.5	
Mother's age					0.23
< 20 years old	16	20.0	64	80.0	
20 to 35 years old	85	26.0	242	74.0	
> 35 years old	14	34.1	27	65.9	
Mother's occupation					0.26
Housewife	65	28.4	164	71.6	
Informal work	13	18.6	57	81.4	
Formal work	36	26.9	98	73.1	
First delivery					0.05
Yes	44	21.3	163	78.7	
No	71	29.3	171	70.7	
Use of pacifiers					< 0.01
Yes	46	16.7	229	83.3	
No	77	32.9	157	67.1	
Low birth weight					0.39
Yes	7	18.4	31	81.6	
No	116	24.6	355	75.4	
Mode of delivery					0.14
Vaginal	62	27.3	165	72.7	
Cesarean	61	21.7	220	78.3	
Place of delivery					0.99
SUS maternity	97	24.0	307	76.0	
Private hospital/health plan	18	24.0	57	76.0	
Private hospital	2	22.2	7	77.8	
Child care					0.34
Private/health plan	33	21.6	120	78.4	
Public health care	90	25.6	262	74.4	

EBF = exclusive breastfeeding; SUS = Brazilian National Health System.
* Pearson's chi-square.

Table 4 - Association between EBF interruption in the infant's first 6 months of life and mother's schooling, parity, mode of delivery, and use of pacifiers (Bauru, state of São Paulo, Brazil, 2006)

Variables	Prevalence ratio*	95%CI	p†
Mother's schooling			
Incomplete elementary school	0.81	0.56-1.18	0.28
Incomplete high school	1.10	0.72-1.68	0.64
High school and over	-	-	-
Parity			
One delivery	1.16	0.83-1.62	0.39
Two deliveries or more	-	-	-
Mode of delivery			
Vaginal	-	-	-
Cesarean	1.10	0.79-1.53	0.56
Pacifiers			
Yes	2.03	1.44-2.84	< 0.01
No	-	-	-

95%CI = 95% confidence interval; EBF = exclusive breastfeeding.
* Estimated by log-binomial regression.
† Wald test.

In the present study, the use of pacifier was also identified as a factor significantly associated with EBF interruption in the infant's first 6 months of life: pacifier users were twice as likely not to be on EBF. This result is similar to that observed in another Brazilian municipality close to the city of Bauru (odds ratio for EBF interruption associated with pacifier use = 2.7)[17] and is in accordance with several other Brazilian studies, which also demonstrated a strong association between the use of pacifier and early EBF cessation or interruption.[12,13,19-21]

A longitudinal study, carried out in the city of Porto Alegre, southern Brazil, revealed that almost two thirds of the children who used pacifiers were no longer on EBF after the second month of life; among the nonusers, the rate was 45%.[21] In another longitudinal study, the authors verified that 73% of pacifier users had discontinued EBF before three months of age; for nonusers, the rate was 58%.[21]

The association between the use of pacifier and increased risk of EBF interruption seems to be valid across the country, which would justify a nationwide intervention to discourage pacifier use. However, besides making information on the risks of using pacifiers available to the general population, we need to qualify health professionals to provide routine support to mothers during the infant's first 6 months of life so that mothers successfully avoid the use of pacifiers.

As observed by researchers from the WHO multicenter study of growth curves in Brazil, who analyzed the role of the EBF support given by health professionals (videotapes, leaflets and home visits for regular orientation), interventions should include several routine contacts to produce an effect. In that study, the more mothers were exposed to these actions, the higher the positive results obtained.[22]

Specific strategies to reduce the use of pacifiers need to be tested, since there are no studies with this objective in the literature. For Victora et al.,[23] the pacifier is, mainly, a marker of difficulties in breastfeeding. A possible explanation is that the use of pacifiers may hide maternal problems, such as anxiety and insecurity, which negatively affect breastfeeding.[12] A self-effect has also been attributed to the pacifiers, i.e., a causal relation between pacifier use and difficulties in breastfeeding: by reducing the number of breast feedings, there is a reduction in breast stimulation and milk secretion, increasing the chances of EBF interruption.[24] Another hypothesis to explain the effect of pacifier use as a risk factor for weaning is the mechanism called nipple confusion, which is already accepted as an explanation for the negative relationship between bottlefeeding and early weaning.[25]

Despite the high frequency of children using pacifiers in 2006, in Bauru, a positive aspect observed in the present study was the decreased proportion in pacifier use across the three surveys: from 65.5% in 1999 to 54.0% in 2006.

Would this progress explain the positive trend of EBF in Bauru? Given the great difference between the possible cause (decrease of 17.9% in pacifier use) and the effect (increase of 184.7% in EBF), only a partial responsibility could be attributed to this factor, leading us to consider other possible explanations.

The introduction of organized community-based actions to enhance promotion and support of breastfeeding among

mothers could also be, at least in part, responsible for this positive trend. This hypothesis finds strong evidence in the literature.

Labbok et al.[15] analyzed EBF trends in developing countries in the 1980s and 1990s and observed an increase from 46 to 53% in under-4-month-old infants, and from 34 to 39% in under-6-month-old infants, suggesting that the introduction of pro-breastfeeding programs and policies were responsible for the positive trend.

Grummer-Strawn[26] attempted, based on the World Fertility Survey and the Demographic and Health Survey (DHS), to separate the effect of changes in the population characteristics from that resulting from changes in the mother's behavior in relation to breastfeeding. Urbanization and increased schooling, contraceptive use and mother's laborforce participation would reduce rather than increase EBF rates, unless deep behavioral changes regarding breastfeeding occurred in the general population. This change, empirically established, would result from intensive and well-organized pro-breastfeeding interventions and qualification of health professionals. Thus, the authors view policies and programs to encourage breastfeeding as successful global interventions.

Pérez-Escamilla[27] has recently analyzed breastfeeding trends in Latin America and the Caribbean also using data from 23 DHS conducted in the 1980s and 1990s. The growing trend toward breastfeeding was confirmed, and the comprehensive pro-breastfeeding intervention to encourage and support this practice in developing countries played a crucial role in this increase. The enhanced EBF situation in municipalities that introduced a greater number of pro-breastfeeding actions was demonstrated by Venâncio & Monteiro[28] using data from the 1999 AMAMUNIC project survey; children born in municipalities with four or more pro-breastfeeding actions were twice as likely to be on EBF in the first 6 months of life.

Would the actions to promote and support breastfeeding, developed in Bauru during the study period, explain the increased EBF prevalence? At first, it is important to point out that none of the three city maternity hospitals holds the title Baby-Friendly Hospital and none of the primary health care units was organized around strategies to promote and support breastfeeding, facts that could unauthorize a positive response to the question proposed. However, since the year 2000 there has been a pro-breasting movement in the city. Investments are highly concentrated on qualifying health professionals working in public primary health care and maternity hospitals and on breastfeeding promotion in the local media by organizing events, such as the Breastfeeding Week, setting up pro-breastfeeding booths in street fairs and shopping streets, among other actions. This intervention can be, at least in part, responsible for the favorable EBF trend.

We concluded that, despite the rising EBF trend observed in Bauru from 1999 to 2006, this trend grows at an unsatisfactory rate. The prevalence in 2006 is still low (24.2%) and unfavorable in relation to that observed in other municipalities in the state of São Paulo and in Brazil as a whole, and far below the recommended levels. Only the use of pacifiers was identified as a possible determinant of EBF interruption in the infant's first 6 months of life in the 2006 analysis. This finding indicates a need for community-based actions and reinforces the need for nationwide actions to reduce pacifier use. However, specific strategies to reduce the use of pacifiers should be designed to further evaluate their effect.

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