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Factors associated with a shorter duration of breastfeeding

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Abstract *This article seeks to identify the factors associated with a longer duration of breastfeeding. A nested case-control study was carried out with a cohort of mothers for about two years after they gave birth to their children in the two largest public maternity hospitals in João Pessoa - PB. Mothers who breastfed up to 15 months were considered as cases (n = 55) and those who breastfed for more than 15 months (n = 48) were considered controls. The exposure variables were maternal socioeconomic characteristics, gestational characteristics, birth characteristics and early introduction of food. The Chi-Square test was applied to select the independent variables (p-value <= 0.20) to be entered into a multiple logistic regression model, with only those with a p-value <= 0.05 being kept in the final model. The early introduction of infant formula (OR = 4.71, CI95%: 1.76 - 12.63), other milks (OR = 3.25, CI95%: 1.27 - 8.31) and having less than six prenatal consultations (OR = 2.73, CI95%: 1.04 - 7.07) were risk factors for a shorter breastfeeding duration. The early introduction of infant formulas or other milks may be an important indicator for the adoption of appropriate breastfeeding promotion and support actions to achieve the WHO target of breastfeeding for two years or longer.*

Key words *Breastfeeding, Epidemiology, Child health*

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Introduction

Breastfeeding is the most important and effective strategy for the health of the child, strengthening bonds, care and protection, and ensuring adequate nutrition. It is the most significant and economical intervention to reduce infant morbidity and mortality. It also has an incredible impact on promoting the integral health of mother and baby, having repercussions on the health indicators of society as a whole[1,2]. Breastfeeding is therefore vital, but the introduction of safe, accessible and culturally accepted foods into the child's diet at the right time and in the appropriate form is also indispensable to promote healthy development and prevent nutritional disorders in children with a great impact on Public Health[3,4].

The available Brazilian data show that the median Exclusive Breastfeeding (EB) time was 54.1 days in the year 2008. As for Total Breastfeeding (TB), the observed median duration was 341.6 days[5]. These values are still well below the recommendations, although a significant increase in this practice has been observed since the 1970s as a result of well-coordinated multisectoral actions involving civil society, the government, researchers and health professionals[6].

Even though it is a natural physiological process, breastfeeding is directly influenced by culture and by socioeconomic and demographic factors. Important studies have revealed factors associated with the early interruption of EB, including the maternal schooling level, primiparous mothers, type of delivery, low birth weight[7], pacifier use[8], companion participation, prenatal guidance, and being born in a child-friendly hospital (*amigo da criança program*)[9], among others, and it is possible to have a broad perspective of the complex network of relationships that affect this practice[10]. The evidence on the factors related to EB has been enriched by the ease with which follow-up studies can be performed from birth until six months of age, coupled with the initiative of diagnosing eating disorders in children under one year of age during national vaccination campaigns[11].

There are less studies considering the risk and protection factors for the duration of TB, especially considering longitudinal studies on the subject, with important gaps still remaining that hinder the development of programs and actions to promote this practice. This study followed a birth cohort in the city of João Pessoa, in northeastern Brazil, in order to identify the factors related to the success of breastfeeding up to the second year of life.

Methods

This is a nested case-control study in a cohort of mother-child pairings followed from birth until the second year of life of the infant between June 2013 and November 2015. The mothers were identified at the time of hospitalization for delivery in the two largest public maternity hospitals in João Pessoa-PB, the Instituto Cândida Vargas, a reference unit in the north-northeast, and the Maternidade Frei Damião, a reference in the State. All parturients were eligible to join the cohort with the exception of mothers with HIV, rare diseases, twin births, preterm births, newborns (NB) with congenital malformations or severe metabolic diseases. These exceptions entailed important aggravations that could directly influence the feeding practices of the neonates.

Maternal socioeconomic characteristics, characteristics of the mother, gestation and delivery factors, and the early introduction of complementary foods were tested to verify a possible association with the longer duration of breastfeeding. This information was collected through direct interviews in the maternity hospital right after delivery and during a home visit about four months after the baby's birth, performed by interviewers who were previously trained for each stage.

In the maternity, the gestational antecedents (primiparous vs. multiparous), the delivery characteristics (normal vs. cesarean), the mother's age, the baby's sex and the number of prenatal consultations (up to six visits vs six or more visits) were gathered. The socioeconomic characteristics were recorded during the house visits: household type (masonry vs others), access to piped water (yes vs no), access to sanitary sewage (yes vs no), head of household, maternal occupation, family income per capita, maternal education, maternity leave (yes vs no) and the introduction of foods besides breast milk. The introduction of water, tea, juice, milk and infant formula was investigated and in positive cases the mother was asked for the age of the child at the time of introduction of each food. These variables were then dichotomized based on the estimated median time of exclusive breastfeeding of all the children in the study. At the end of the first year of the baby's life, the mothers received a phone call asking if they were still breastfeed-

ing their children and if not, until when they had breastfed. Those who were still breastfeeding at the end of the first year received another call at the end of the second year of the baby for the same investigation.

A complete set of information on 103 mother-child pairings classified according to the median duration of breastfeeding was available for the formation of the case and control groups. Mothers with a total breastfeeding duration less than or equal to the median - 15 months - were classified as cases (n = 55) and those with a duration longer than the median were classified as controls (n = 48).

The analyses were done using the *StataSE* statistical software, version 14. A descriptive analysis of all variables was performed and the observed inconsistencies were corrected by observing the original questionnaire or seeking out information from the interviewed mother. In cases where none of these actions were possible, the data was considered lost.

For the categorical variables, the frequency distribution was done for the continuous ones, calculating the mean values and the 95% confidence interval. The duration of breastfeeding was calculated by survival analysis, using the Kaplan-Meyer technique, calculating the median time of exclusive breastfeeding and the total time of breastfeeding.

The Chi-Square test was applied in order to verify the association of the different exposure factors with the cases and controls, selecting the variables with p-values less than 20% in said test to compose a multiple binary logistic regression model. The variables were progressively included in the model according to the Wald test and those with statistical significance (p-value < 0.05) were kept in the final model.

The project was approved by the Ethics Committee of the Health Sciences Center - UFPB. All procedures were adopted in accordance with CNS Resolution 466, which governs research involving human beings. All mothers received and signed an informed consent form at the time of recruitment in the maternity ward.

Results

The control group - mothers breastfeeding for more than 15 months - was composed of 48 women with a mean age of 26.3 years, and the cases group - mothers breastfeeding up to 15 months - was made up of 55 women with a mean age of 25.4 years, with no statistical difference between them. Almost all mother-child pairings resided in houses with piped water (98.1%), adequate sanitary sewage (93.1%), whether a public sewage system or a septic tank, and were built in masonry (95.1%). The average per capita family income was R$ 352.00 ($CI_{95\%}$: R$ 302.73 - R$ 401.24), which represented less than half of the minimum wage per capita at the time of the home interview (the minimum wage in 2015 was R$ 788.00). The maternal socioeconomic characteristics are shown in Table 1.

The 103 children in the study had a similar distribution with respect to sex, and the number of primiparous mothers was also close to the number of mothers with more than one child. As for the deliveries, 63.2% were performed surgically, or through cesarean deliveries. The recommended number of six or more prenatal consultations was performed by 69.9% of the women (Table 2).

The frequency of children who were still being breastfed at the time of the last telephone interview was 22.3%. The median time of exclusive breastfeeding was 60 days ($CI_{95\%}$: 46.7 - 73.3 days) and the total time of breastfeeding was 15 months ($CI_{95\%}$: 10.7 - 19.2 months), which was the time frame used to classify cases and controls.

Table 3 shows the main foods that are introduced in infant feeding and the frequency of introduction until the end of the second month of the baby's life, which corresponds to the median time of exclusive breastfeeding. The most frequently introduced food item until this time is water (45.6%), followed by cow's milk and infant formula (both around 30.0%). At the baby's fourth month of life, the period of the home interview, only 17.5% of them still received exclusive breastfeeding.

Three variables were included in the binary logistic regression model in three consecutive stages, entering first the early introduction of infant formula variable into the model, followed by the introduction of another milk and finally by the performance of less than six prenatal consultations. The gross and adjusted OR values are presented in Table 4, showing the independent effect of each of these risk factors on a shorter breastfeeding time, with the median of the total breastfeeding time serving as reference for these analyses. Performing less than six prenatal consultations compared to mothers who performed six or more visits increases the odds of breastfeeding for less time. The early introduction - before the baby's second month of life - of other

Table 1. Maternal and socioeconomic characteristics. João Pessoa, 2015.

Variables	Cases - until median (15 months)		Controls - more than median (15 months)			
	n	%	n	%	Total	% of Total
Head of household						
Mother herself	5	*62.5*	3	*37.5*	8	7.8
Grandparents or others	20	*57.1*	15	*42.9*	35	34.3
Father	29	*49.2*	30	*50.8*	59	57.8
Mother's occupation						
Housemother, unemployed or student	34	*55.7*	27	*44.3*	61	59.2
Worker	21	*50.0*	21	*50.0*	42	40.8
Family income per capita						
Less than median	24	*50.0*	24	*50.0*	48	47.5
Equal or more than median	30	*56.6*	23	*43.4*	53	52.5
Maternal schooling level*						
Elementary	9	*37.5*	15	*62.5*	24	23.5
High School	36	*56.3*	28	*43.8*	64	62.7
College	10	*71.4*	4	*28.6*	14	13.7
Maternity leave						
No	40	*50.6*	39	*49.4*	79	0.8
Yes	15	*62.5*	9	*37.5*	24	0.2

* p-value < 0.20

Table 2. Characteristics of the mother and the birth. João Pessoa, 2015.

Variables	Cases - until median (15 months)		Controls - more than median (15 months)			
	n	%	n	%	Total	% of Total
Primiparidade						
Outro filho	30	*52.6*	27	*47.4*	57	55.3
Sim	25	*54.3*	21	*45.7*	46	44.7
Idade materna						
Menos que 25 anos	24	*52.2*	22	*47.8*	46	44.7
25 anos ou mais	31	*54.4*	26	*45.6*	57	55.3
Tipo de parto						
Cesarea	38	*56.7*	29	*43.3*	67	65.0
Normal	17	*47.2*	19	*52.8*	36	35.0
Sexo do bebe						
Feminino	32	*57.1*	24	*42.9*	56	54.4
Masculino	23	*48.9*	24	*51.1*	47	45.6
Pré-natal **						
Menos que 6 consultas	21	*67.7*	10	*32.3*	31	30.1
6 consultas ou mais	34	*47.2*	38	*52.8*	72	69.9

** p-valor < 0,05.

milks or infant formula not only implies the early interruption of exclusive breastfeeding, but also increases the chances of a shorter duration of breastfeeding by 3.25 and 4.71 times, respectively.

Table 3. Foods already introduced in the diet of the newborn until the first 60 days of life. João Pessoa, 2015.

Introduction of foods in the first 60 days	Cases - until median (15 months)		Controls - more than median (15 months)			
	n	%	n	%	Total	% of Total
Water*						
Yes	28	59.6	19	40.4	47	45.6
No	27	48.2	29	51.8	56	54.4
Tea**						
Yes	13	81.3	3	18.8	16	15.5
No	42	48.3	45	51.7	87	84.5
Milk**						
Yes	24	70.6	10	29.4	34	33.0
No	31	44.9	38	55.1	69	67.0
Formula**						
Yes	24	75.0	8	25.0	32	31.1
No	31	43.7	40	56.3	71	68.9
Juice**						
Yes	18	72.0	7	28.0	25	24.3
No	37	47.4	41	52.6	78	75.7

* p-value < 0.20; ** p-value < 0.05.

Table 4. Final model with the gross and adjusted Odds Ratio of the risk factors for the reduction of breastfeeding time. João Pessoa, 2015. (n=102)

Variables	OR_{gross}	$CI_{95\%}$	p-value[0]	$OR_{adjusted}$	$CI_{95\%}$	P-value
Infant Formula*	3.87	1.53 – 9.79	0.002	4.71	1.76 – 12.63	0.0002
Other milk*	2.94	1.22 – 7.07	0.012	3.25	1.27 – 8.31	0.014
Pre-natal **	2.35	0.97 – 5.68	0.044	2.76	1.04 – 7.07	0.041

* Early introduction of said food. ** Until six consultations. 0 The test power for the ORgross estimates was 59.2% for infant formula, 46.2% for other milk and 32.6% for prenatal.

Discussion

The duration of EB observed in this group of mothers was well below the recommendations of the World Health Organization, but it follows the national trend recorded in the last Capital Cities Survey of 2008 (*Pesquisa das Capitiais*)[5]. When compared with the state data, a survey conducted in 14 municipalities of Paraíba found a prevalence of breastfeeding close to 50% in infants between 6 and 12 months of age[12].

One of the limitations of studies evaluating the factors related to the total duration of breastfeeding is the difficulty of following mothers for two years or more, the recommended period for breastfeeding, which means case-control studies are a viable methodological alternative. Even without populational representativeness, the results of the analyses make important conclusions possible about the factors that may affect a given outcome, in the case of this work, a greater or shorter breastfeeding duration. The difference in the frequencies of the exposure factors of each group is strong evidence of causal events of the studied outcomes[13].

The analyzed information of the exposure factors was collected through face-to-face interviews in the maternity ward or during a home visit. For those mothers who were still breastfeeding during the home visit, the breastfeeding duration was calculated according to the mothers' response in a brief telephone interview. The telephone interview method has proven to be a cheap, efficient and reliable alternative, and has been used in several epidemiological surveys[14-16].

In the case of this study, the risk factors for shorter breastfeeding were: mothers who performed less than six prenatal consultations[17]

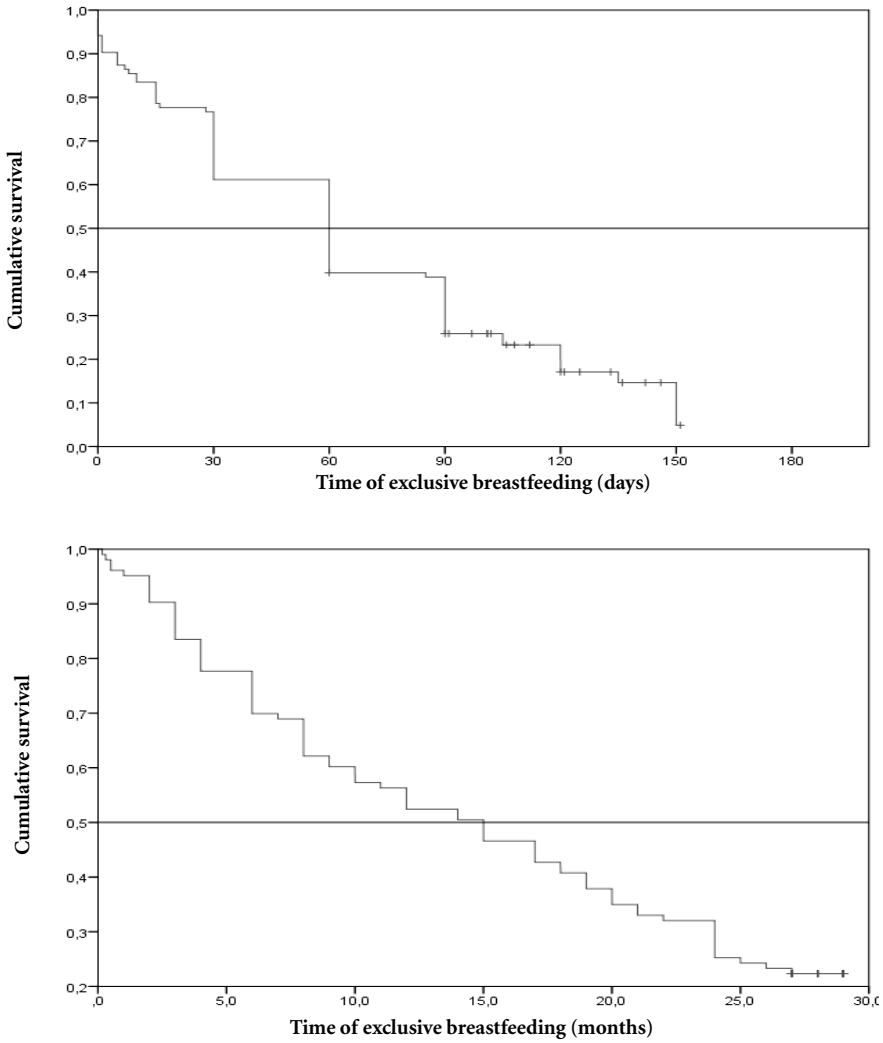

Figure 1. Function of the survival time of exclusive breastfeeding (85 events and 18 censures) and of the total breastfeeding time (80 events and 23 censures). João Pessoa, 2015.

and early interruption of exclusive breastfeeding, before the second month of the baby's life, with the introduction of another milk or infant formula. This result is especially important as it identifies an event that can be monitored during the puerperium, which is the early introduction of infant formula or another milk. This fact may be a predictor of shorter breastfeeding times and mothers who choose to start with breast milk substitutes in the first months of the baby's life need timely support and guidance to maintain breastfeeding until the second year of the child's life or more.

A study conducted in Porto Alegre, following a cohort of 151 children during their first five years of life, identified the following factors favoring the duration of EB for two years or more: mother staying with her children during the first six months of life, not giving a pacifier to the baby, not living with the father or partner, and delaying the introduction of water and tea, as well as other milks[18]. These latter results corroborate the findings of this study regarding the early introduction of milk, although the effect for water and tea was not observed in the present study. The other factors described in the Porto Alegre study were not investigated in this study.

The differences of each food introduced into the infant's diet need to be studied in more detail, since the results observed in this study show that

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infant formulas or other milks impact the total duration of breastfeeding directly, while this behavior was not observed for the other food items, such as water, perhaps because it has the sole function of quenching thirst and not feeding, or tea, which is almost always used for therapeutic purposes. The impact and consequences of the early introduction of food on the total duration of breastfeeding would therefore depend on the type of food. This discussion does not apply to exclusive breastfeeding, of course, which is interrupted early whenever any other food is introduced into the child's diet before the child reaches six months of age.

Another study conducted in Belo Horizonte compared factors related to weaning in five historical cohorts from 1980 to 2004, a period during which the median duration of breastfeeding increased from 5 to 11 months. In all the times under investigation, the mother's understanding that the time of exclusive breastfeeding should be less than six months was a risk factor for weaning. Other factors were especially related to problems at the beginning of breastfeeding, and only in the 2004 study did the unfavorable opinion of the father negatively influence the maintenance of breastfeeding[19], as was observed in Martins and Giugliani's study[18], perhaps because the total breastfeeding duration was lasting longer. However, the results of these cohorts confirm that the early interruption of exclusive breastfeeding, whether because of the mother's judgment or her practices, and regardless of the type of food introduced, is a risk factor for shorter breastfeeding times.

The evidence from the present study combined with these two follow-up studies indicates that failure to follow the recommendation of exclusive breastfeeding for six months, or the early introduction of complementary food items, is related to a trend toward shorter breastfeeding times. It would therefore be possible to use the exclusive breastfeeding time as an important indicator for maternal and child care in order to stimulate timely promotion and follow-up actions to maintain breastfeeding for up to two years or more.

More effective, however, and also more specific than the simple observation of exclusive breastfeeding to predict the total duration of breastfeeding, is the monitoring of the introduction of infant formula or other milks, which according to the findings of this study increase the risk of decreasing breastfeeding times by 4.7 times and 3.2 times respectively. As such, the message that "breast milk is the only milk that should be offered to the child until the second year of life or more" may yield better results when the goal is reaching the breastfeeding duration recommended by the WHO.

This same recommendation was already proposed in a follow-up study conducted in Germany between 2008 to 2012, where the early introduction of food was a predictor of early weaning and health professionals were therefore recommended to promote the continuity of breastfeeding in these cases[20]. Another study, analyzing data from two randomized clinical trials conducted in Iceland, concluded that mothers who exclusively breastfed for six months, compared with those who introduced other foods at four months of age, had the highest total breastfeeding times, independent of the health services and breastfeeding support offered, and they were the only ones who reached the WHO breastfeeding recommendation[21].

The positive effects of exclusive breastfeeding in protecting newborns from the risks of different morbidities as well as death are well known, but less is known about the benefits of prolonged breastfeeding beyond the first or second year of life when compared to shorter breastfeeding[22]. Longer breastfeeding is known to increase the cognitive development of children around six years of age[23] and decrease the risk of overweight and obesity[24], but more studies need to be performed, both in the search for well-designed interventions and to understand its consequences for child and adult health.

Brazil has an exemplary history in conducting public policies to promote, protect and support breastfeeding[25,26] and continues to innovate with the incorporation of primary health care units that support the mother-child pairing[27]. The results of this study can help in the development of recommendations and effective care for the prolongation of breastfeeding by observing the risk factors identified in this study.

Collaborations

SC Mendes performed the fieldwork, entered the data into the database, performed the analyses and drafted the first version of the work. IKV Lobo participated in the design of the work, collected data in the field, prepared the initial database and participated in the review of the manuscript. SQ Sousa performed fieldwork, typed data, performed initial analyses and participated in the review of the manuscript. RPT Vianna carried out the design of the work, coordinated all data collection steps, performed the statistical analyses and reviewed and drafted the final version of the article.

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