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Duration and Determinants of Breastfeeding: A Cohort Study

Angelina do Carmo Lessa

Federal University of Jequitinhonha and Mucuri Valleys
Department of Nutrition Science/Postgraduate Programme in Health Society and Environment

Ronilson Ferreira Freitas

Federal University of Jequitinhonha and Mucuri Valleys
Postgraduate Programme in Health, Society and Environment

Lorena Barbosa Fonseca

Federal University of Mato Grosso, Nutrition Sciences

Ana Marlúcia de Oliveira Assis

Federal University of Bahia
Nutrition Sciences/Postgraduate Programme in Collective Health

Abstract: *Objective: To evaluate the duration of exclusive breastfeeding (EBF) and full breastfeeding (FBF) as well as its determinants within a cohort. Methodology: Data were collected in household interviews. The analysis was performed through the estimative of survival curves, using the Kaplan-Meier method. Differences in the curves were evaluated employing the log-rank test. Cox proportional hazards model (or Cox regression) was applied in order to evaluate the joint effect of the predictor variables on the duration of breastfeeding. Results: The average duration of EBF was 15 days. Near the 30th day of life, 75% of children were not in EBF. At the end of the first year, approximately 50% of the children suckled at the breast, being the medium superior to 12 months. In the multivariate analysis, maternal age and type of delivery were associated with duration of EBF whereas education was associated with the duration of FBF. Conclusion: Efforts must be focused on increasing the duration of breastfeeding.*

Keywords: *Breastfeeding, survival analysis, incidence, risk factors.*

1. INTRODUCTION

In the first months of life, breast milk (BM) contains the ideal nutritional characteristics, with the correct balance of nutrients. Thus, it should be offered exclusively in the first six months of life. Following this period, the BM is still an important source of nutrients and its maintenance is encouraged to complement children's nourishment[1].

Breastfeeding is associated with lower incidence of morbidity for the defense factors that it contains and because it is considered one of the most important practices promoting children's health, with positive effects until adult age[2]. This is because breastfeeding benefits include lower diarrhea rates as well as lower respiratory tract infections and other related diseases. It also reduces mortality from these diseases in breastfed children[3] once the immunoglobulin, one of the breast milk constituents, enhances immunity of babies against allergic and infectious diseases[1].

There are many acknowledged and widely disseminated benefits of breastfeeding and the importance of creating incentive programs to this practice in several areas of the world. The prevalence of breastfeeding, especially the exclusive category, remains below recommended levels, which intensifies the need to develop its promotion, protection and support. The increase in breastfeeding will result in lower infant morbimortality rates[4].

Despite widespread scientific support to endorse breastfeeding (BF) and the increase of its duration observed in Brazil in recent years[5], the prevalence of exclusive breastfeeding for six months is still unsatisfactory. This situation can be found in a national study published in 2008 by the Ministry of

Health (MH). According to this study, although 91.8% of children younger than six months were being breastfed, in only 36.8% of cases the diet consisted of exclusive BM[5]. This scenario indicates that the interruption of EBF can be considered one of the most important child health issues in Brazil[6,7].

Although it is treated as a natural practice, breastfeeding is historically dependent on various factors worldwide. Some of them, previously mentioned, can be emphasized, being associated with breastfeeding, such as age and mother's education[8, 9], orientation on breastfeeding during prenatal care[9], child sex[10], type of delivery[11], mother return to work, maternal smoking[12] and breast problems[13].

In this regard, the advantages of breastfeeding in individual and collective levels are scientifically proven in the literature. However, as a consequence of changes in the epidemiological and nutritional transition in recent decades, a considerable diversity of situations that rapidly changes with time, space and people has been established[14]. Consequently, increasing exclusive breastfeeding and the average its duration has been a challenge worldwide, particularly in Brazil[4].

Therefore, this study aimed at identifying the duration and the factors associated with exclusive and full breastfeeding in children younger than one year of age in a cohort.

2. METHODOLOGY

2.1. Ethical Aspects

This study complies with the guidelines and regulations on research involving human beings and it has been approved by the Ethics Committee in Research of the Federal University of the Jequitinhonha and Mucuri Valleys (UFVJM), meeting the ethical requirements of the Resolution 466/2012 of the National Health Council. The permanent registration number in UFVJM Ethics Committee is 011/05 (029/04).

2.2. Design, Location of Study and Period

This is a cohort study on infants born alive, in the city of Diamantina, Minas Gerais, from September of2004 to April of 2005.

2.3. Population

The population was set to include all children born alive in this city. Exclusion criteria were multiple pregnancy births, birth defects and weight lower than 2.5 kg.

The recruitment was conducted based on the Declaration of the Born Alive. Information was collected through household interview conducted monthly with the person responsible for the child, until the sixth month of their life. Following that time, visits were carried out at the ninth and twelfth months of life. On the first visit, information on socioeconomic and demographic conditions was collected as well as obstetric and anthropometric characteristics at birth, using a semi-structured questionnaire. On the following visits, data regarding the infant feeding were gathered, including the month in which other food was added in the child's diet and the implementation of the Food Consumption survey, adopting the 24 hours recall method. All data collection was performed by researchers and nutrition science students trained on the application of the study tools.

2.4. Study Protocol

The dependent variables – duration of Exclusive Breastfeeding (EBT) and duration of Full Breastfeeding (FBF) – were based on the definition proposed by the World Health Organization (WHO) [15], and implemented in Brazil, for monitoring BF:

- Exclusive breastfeeding: diet that consists of BM, excluding any other liquid or solid.
- Predominant breastfeeding: characterized by the consumption of BM, water, tea and/or juice, excepting other types of milk or solids.
- Breastfeeding: diet consisting of BM, regardless the addition of any liquid or solid.

The independent variables were classified adopting cut-off points based on the distribution of these variables in the population studied and on conditions that confer risk for interrupting breastfeeding, according to well-established literature. We used the encoding zero (0) to express protection and one (1) for exposure. Maternal age was classified as <19 years old (1) and ≥19 years old (0). Maternal

education was categorized based on years of study [<8 years (1) and ≥8 years (0)]. Family agglomeration in the house was defined by counting the inhabitants per room, being classified as: inhabitants/room ≤1 (0) and >1 (1). Family income was converted into *per capita* (obtained by dividing the total income by the number of family members) and categorized by the median. Maternal marital status was categorized as single (1) and stable relationship/married or widowed (0). Prenatal care was characterized according to the number of medical appointments [number of appointments <7 (1), and ≥7 (0)]. Regarding parity, the mother was placed as multiparous (0) and primiparous (1). The number of children younger than five years of age, living in the house, was classified in: none or one child (0) and more than one child (1). The type of delivery was classified as surgical (cesarean section) (1) and vaginal (0). Birth weight was categorized as underweight [<3.0Kg (1)] and appropriate birth weight, [≥3.0Kg (0)]. The occurrence of hospitalization during the first month was categorized as: no (0) and yes (1).

2.5. Results Analysis and Statistics

Median duration of BF was calculated using survival analysis and the BF curves were obtained with the Kaplan-Meier estimator, eliminating the need to specify the failure time for each response variable.

Bivariate analysis was performed with the log-rank test in order to identify maternal and infant variables associated with the durations of breastfeeding and exclusive breastfeeding, applied in the Cox regression. In this analysis, variables were selected based upon values p≤0,20 for the associations.

The survival time was considered as the time between the beginning of the observation (birth) and the occurrence of the event of interest (end of EBF and end of BF). In cases of loss of the sequence prior the occurrence of the event or when the event did not occur by the completion of the observation time, the condition was considered as censoring. The duration of events was measured in days.

The relation between EBF and BF durations and the maternal and child variables was evaluated applying Cox regression. All the variables identified by the log-rank test with p≤0.20 were included in the model and selected by backward elimination. The significance level (p value) adopted for the variable permanence in the model was <0.05. The measurement obtained from the Cox regression was the hazard ratio (HR) with 95% confidence interval.

The assumption of proportionality of the risks between the categories of the variables was verified by employing the comprehensive proportionality test, adopting ≤0,05 of significance level to reject the hypothesis that the risks are proportional. In addition, Log-Minus-Log plots of each variable as a function of time, derived from the survival curves, were observed[16].

Epiinfo Software version 6.04 and Stata® 9.0 were usedfor building the database and the statistical analysis, respectively.

3. RESULTS

Among the 310 births identified in the recruitment period, 24 did not meet the inclusion criteria, as 14 were premature, 8 were born from double delivery and 2 with congenital malformation. Therefore, 286 children met the inclusion criteria, given that 18 were considered losses. From those, the following was registered: refusal to participate in the study (n=3), city chance (n=3), addresses registered in the Declaration of the Born Alive not found (n=11) and child death (n=1). Thus, the cohort initiated with 268 children.

Three censoringswere recorded during EBF follow-up for the inability to locate the mother or due changes of the family address. On breastfeeding, there were 158 censorings: 114 children were still being breastfed at the conclusion of the study, 11 mothers withdrew the study, 21 censorings for the inability to find the mother at home, 8 because of city change and 01 child death.

Comparative analysis between maternal characteristics such as age, education, marital status, parity, and the child's (birth weight and sex) did not differ from those who were withdrew and those who remained in the cohort until the end of the study (data not shown).

Demographic, biological, social and economic characteristics of mothers and children are shown in Table 1. As it is observed, there is a higher percentage of males (60.07%) among members of the cohort. Moreover, 19.03% of mothers were adolescents, 37% did not live with the partner and 46%

were primiparas. The median maternal education was eight years and the median *per capita* income was R$100.00. This variable was not included in the bivariate analysis and in the multivariate model due to the large number of observed losses (24%).

Table1. *Demographic, biological, social and economic characteristics of children and mothers, Diamantina (MG), 2004-2005*

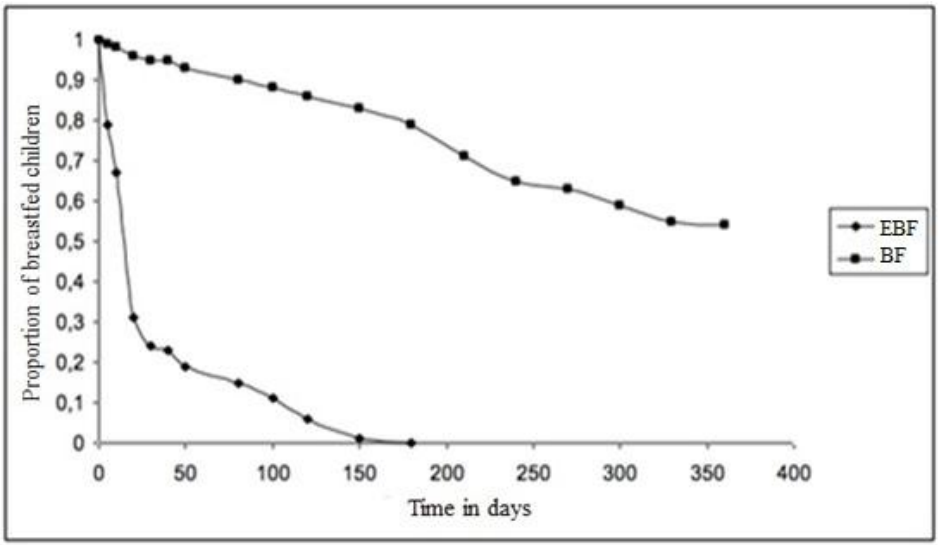
Characteristics	Variables	n (%)
Sex	Masculine Feminine	161 (60.1) 107 (39.9)
Maternal age (years)	≥19 <19	217 (80.9) 51(19.1)
Prenatal appointments	≥4 <4	250 (93.2) 18 (6.8)
Birth weight (Kg)	≥3 <3	181 (67.5) 87 (32.5)
Maternal education (years)	> 8 ≤ 8	131 (48.8) 137 (51.2)
Per capita income* (emreais) **	>100,00 ≤100,00	96 (47.5) 106 (52.5)
Inhabitants per room	≤1 >1	157 (58.5) 111 (41.5)
Children younger than 5 years	≤1 >1	157 (58.5) 111 (41.5)
Marital status	Married Divorced	168 (62.6) 100 (37.4)
Type of delivery	Vaginal Cesáreo	169 (63.1) 99 (39.9)
Parity	Multipara Primipara	143 (53.4) 125 (46.6)
Hospitalization on 1st month	Não Sim	252 (94.1) 16 (5.9)

** Minimal wage at the time: R$250,00*

*** 66 mothers did not answer, corresponding to 24.6%.*

Figure 1 shows the survival curves for the EBF and BF. The median duration of EBF was 15 days ($CI_{95\%}$=14-17), indicating that 50% of the children in this study were exclusively breastfed for 15 days. The curve for BF did not reach the 50th percentile. Therefore, it was decided to present the 25th and 40th percentiles. Taking the 25th percentile as reference, the results indicated that 75% of children were breastfed for at least 210 days ($CI_{95\%}$=180-240) and taking the 40th percentile as a reference, 60% were breastfed for at least 300 days ($CI_{95\%}$=240-369).

Figure 1 - Survival function estimated by the Kaplan-Meier method for the durations of exclusive and full breastfeeding. Diamantina (MG), 2004-2005.



The median EBF duration was 14 days among mothers <19 years old. Among those ≥19 years, the median was 15 days (p = 0.013). Children born to mothers who had vaginal delivery showed median EBF duration of 14 days, whereas those born to mothers who had cesarean section had a median of 18 days (p = 0.004). Children born weighing <3kg exhibited median EBF duration of 14 days, while those born weighing ≥3kg, 16 days (p = 0.008).

Considering the 25th percentile for the variable BF, children of mothers with education ≤8 years had BF duration of 210, whereas children of mothers with education above 8 years, had duration of 201 days (p = 0.04).

Table 2 presents the results of the Cox regression for both breastfeeding categories studied. Regarding the EBF, it was found that children of mothers who experienced cesarean section had 29% lower risk of finishing EBF before six months (HR=0.71, $CI_{95\%}$=0.55-0.91) compared with children whose mothers had vaginal delivery. Children of adolescent mothers showed 42% higher risk of interrupting EBF (HR=1.42, $CI_{95\%}$=1.04-1.93), compared to children of adult mothers.

Considering BF, maternal education was the only variable that remained associated to the event (HR=0.67, $CI_{95\%}$=0.46-0.98), indicating that mothers with less education had 33% lower risk of weaning at the end of children's first year of life.

Table2. *Gross hazard ratio (HRG), adjusted hazard ratio (HRA) and their respective confidence intervals, according to variables associated to the durations of exclusive and full breastfeeding by applying the multivariate analysis. Diamantina (MG) 2004-2006.*

	Duration of Exclusive Breastfeeding			**Duration of Full Breastfeeding**		
Variáveis	HRG	HRA	CI95%	HRG	HRA	CI95%
Type of delivery						
Vaginal	1	1				
Cesarean	0,70	0,71	0,55-0,91	NS	NS	NS
Maternal age (years)						
≥ 19	1	1				
< 19	1,45	1,42	1,04-1,93	NS	NS	NS
Education (years)						
≥ 8	1					
< 8	1,24	NS	NS	0,67	0,67	0,46-0,98
NS: not significant;						

4. DISCUSSION

Because of the numerous scientific evidences of its benefits, in the last decades important advances in public policies aimed at increasing duration of breastfeeding have taken place. Although exclusive breastfeeding rates and the total duration of breastfeeding have increased worldwide in the last decade, they still remain inferior the recommended level[17].

This study found a low prevalence of exclusive breastfeeding, confirming the results obtained by other Brazilian researchers that indicated lower breastfeeding levels according to the numbers recommended by the World Health Organization. A study carried out in Rio Grande do Sul revealed that the prevalence of EBF was 33.7%[18]. Additionally, a research in Paraná also showed a low prevalence of EBF, equivalent to 36.8%[19].

The duration of EBF in this study was estimated to be 15 days ($CI_{95\%}$=14-17), considering children residents ofDiamantina-MG, located in the Jequitinhonha Valley, one of the poorest regions in Brazil. Other cohort studies similarly indicated low predominance of breastfeeding, establishing a scenario in which the duration of EBF is rare in various regions of the country. Consequently, the minimum duration advised by the MH is not accomplished. One example of this scenario is Itaúna-MG, in which the occurrences of EBF on the 1th and 4th months were 62.6% and 19.5%, respectively[20]. Situation more optimistic when compared with Diamantina (present study), which had EBF prevalence of 24% and 6% on the 1th and 4th months, respectively. In Pelotas (RS), a cohort study conducted with 560 mothers and their children, revealed that 247 (44.1%) of the children were exclusively breastfed until the third month of life and 45 (8%) for less than one month[21]. At six months of age, only 88 children (15.7%) were receiving exclusively breast milk. Another example is a case in Pernambuco, were a medium EBF duration of zero days was registered[22], number never seen in the history of the EBF in Brazil.

Cross-sectional studies have also detected low EBF frequency. The region of High Jequitinhonha[23] and the city of Salvador[24] are examples of this pattern, with a median duration of 45.3 and 30.6 days, respectively. The lower median, 30 days, was recorded in Rio de Janeiro[25].

The median EBF duration identified in this study (15 days) is inferior to that estimated for Brazil (66 days) by the Demographic and Health Survey of 2006[5]. In both cases, there is a great difference when compared to the median recommended (180 day) by the agencies that promote incentive policies towards the practice of breastfeeding.

In this study, 75% of children were breastfed for 210 days ($CI_{95\%}$=180-240), 60% of those did so for 300 days ($CI_{95\%}$=240-369), indicating that the median duration of BF possibly exceeded 12 months. These values are greater than the found in Pernambuco, in the same year, which median was 183 days[10].

Several aspects are associated with the duration and exclusivity of BF, including socioeconomic, demographic and cultural[17] aspects. Among the variables evaluated in this study, after the multivariate adjustment, early motherhood and vaginal delivery were negatively associated with the duration of EBF, association observed exclusively by Martins *et al*[26], although it did not demonstrate significance after adjustment for confounding variables.

It is recognized that cesarean delivery may interfere in the start of lactation, since it reduces the release of oxytocin, a hormone directly involved in the milk flow. In addition, it can constrain the breastfeeding process, as in the early hours of lactation the mother is sedated. Furthermore, the child generally does not stay with the mother immediately after the delivery[27]. Thus, the protective association between cesarean delivery and EBF in this study is paradoxical, as in relation to epidemiological findings as on the biological plausibility.

It is also recognized that this relation might reflect other aspects except the type of delivery. For example, in Brazil, elective surgical deliveries usually occur to women who are provided with a more consistent family support and higher socioeconomic status, conditions that can contribute to the longer EBF duration[5]. Therefore, this result should be analyzed cautiously and should not serve as an incentive to perform surgical deliveries, especially considering the benefits of natural childbirth for mother and child.

Another variable that has been a risk factor for short duration of EBF is the early motherhood. In this study, mothers younger than 19 years old had a risk of EBF interruption before six months of the child's life 42% higher when compared to adult mothers. According to a study carried out in a Unit of Family Health (UFH) in Pelotas-RS[28], children born to older mothers, with greater incomes, consequently with more experience and knowledge on breastfeeding, were more likely to be exclusively breastfed for six months. Similarly, the fact that younger women breastfeed their children for a shorter time can be attributed to their inexperience or unpreparedness, and consequently more susceptibility to tendencies and pressures towards the interruption of BF[28]. In conclusion, the results of the studies produced until now were not sufficiently consistent to evidence the association between maternal age and breastfeeding.

Maternal education was the only variable that remained associated with BF duration: inferior to eight years it represented 33% lower risk for weaning before the end of the first year (RR=0.67; $CI_{95\%}$= 0.46 to 0.98).

Maternal education has often been linked to the practice of BF[25, 26]. It is assumed that mothers with superior social and economic status tend to value the benefits of breastfeeding. The tendency currently observed is that mothers with higher education breastfeed longer, possibly because of the access to information about the benefits of breastfeeding and the planning to address occasional difficulties related to breastfeeding. However, the evidences indicate that this association is limited to the first six months of the child's life. Henceforth, a lower maternal education interferes positively on the duration of breastfeeding. This relation can be understood in the light of the theory that mothers with low educational level, proxy variable of the family's financial condition, would have difficulty to fully replace BM for other foods, possibly for difficulties in acquiring complementary food in quantity they consider to be enough to suspend breastfeeding[12].

This study results, corroborating the majority of other related researches in Brazil, indicate that the breastfeeding median, especially of the exclusive category, is below the duration recommended by the Ministry of Health (MH) and the World Health Organization (WHO) [17]. This scenario requires

reassessment of policies to promote BF, actions in health services as well as intensify research on the factors that interfere negatively on breastfeeding. It is worth highlighting the strategy of the *Rede Amamenta Brasil* (Brazil's Breastfeeding Network) [29], implemented by HM in 2008. It focuses on primary health care and presupposes the need to consider the numerous interfaces of breastfeeding that constitute the sociobiological breastfeeding network. Such strategy is promising since it is based on the review and supervision of interdisciplinary work process in basic health units, based on the principles of permanent health education, respecting the worldview of professionals and considering local and regional specificities. Reflecting on these results is important, once they relate to lactation issues that may directly influence the EBF. In the light of these findings, health professionals should be alert to the importance of guidance and monitoring of mothers during lactation.

5. CONCLUSION

The current knowledge regarding breastfeeding elucidates a complex network of factors associated with this practice. Nevertheless, it is acknowledged that there are gaps in understanding this phenomenon, requiring new investigative approaches. In addition, given the pattern previously discussed, it can be said that the promotion and support of breastfeeding are major challenges for public policies, requiring innovative ways of improving the indicators and, consequently, children's health.

In this scenario, it highlights the importance of contemplating the emotional aspects of breastfeeding, not limiting to approach the ability to breastfeed only to biological. Considering each woman's singularities, meeting their doubts and difficulties can help them to take over more confidently the role of food provider, and possibly to extend the duration of breastfeeding.

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AUTHORS' BIOGRAPHY

Angelina do Carmo Lessa, PhD in Public Health from the Federal University of Bahia (2010), Master in Health Sciences from the Federal University of São Paulo (2002), graduated in Nutrition from the Federal University of Viçosa (1999). He is currently a professor in the Department of Nutrition and the Graduate Program in Health, Society and Environment of the Federal University of the Jequitinhonha and Mucuri Valleys.

Ronilson Ferreira Freitas, Master's student in Health, Society and Environment of the Federal University of the Valleys of Jequitinhonha and Mucuri. Specialist in Pharmacology and Clinical Toxicology by Integrated College Pythagorean Montes Claros - FIPMoc (2014) in Pharmaceutical Care Management from the Universidade Cândido Mendes (2015). He graduated in Pharmacy by FIPMoc (2014).

Lorena Barbosa Fonseca, Master of Science in Nutrition from the Federal University of Viçosa (2009). He graduated in Nutrition from the Federal University of the Valleys of Jequitinhonha and Mucuri (2007) Professor of Nutrition Faculty Assistant at the Federal University of Mato Grosso.

Ana Marlucia de Oliveira, He graduated in Nutrition from the Federal University of Bahia (1974), Master of Public Health - Escuela de Salud Publica de Mexico (1977) and Doctorate in Public Health at the Federal University of Bahia (1996). He is currently a professor at the Federal University of Bahia.