



Defining Behavior Patterns Towards Exclusive Breastfeeding Using Latent Class Analysis

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Abstract

Background: The interruption of exclusive breastfeeding (EBF) is worrying. This study aimed to identify behavior patterns towards EBF among mothers and health professionals.

Methods: This is a cross-sectional analysis of a cohort consisting of 1309 women. We used latent class analysis (LCA), considering 15 indicators for defining 4 constructs: maternal emotional state, availability to breastfeed, maternal attitude, and health professional's attitude towards breastfeeding.

Results: Among mothers, 36.5% were classified as being in an unfavorable emotional state; they presented a higher probability of feeling tired, nervous, and sad; 14.7% had less availability to breastfeed and a higher probability of including primiparous and partners not helping to care for the child; 41.5% had negative attitude towards breastfeeding, including mothers more likely to give a pacifier and bottle. Among health professionals, 62.0% were categorized with unfavorable attitude towards breastfeeding, not providing guidance on breastfeeding in the hospital.

Conclusions: LCA enabled us to characterize behavior types with regards to EBF.

Keywords: Breastfeeding, Child Nutrition, Behavior, Quantitative Methods, Latent Class Analysis

1. Background

Proper feeding on early life stages is crucial for healthy growth and development of a human being. Breastfeeding (BF) is key to promote these events, especially when put into practice on an exclusive basis within the first 6 months of life and continued for 2 years of age or more (1).

The decision to initiate and continue BF, as well as early weaning, may be influenced by several factors acting independently or not. Among them, we highlight socioeconomic, demographic, behavioral, psychological, and cultural factors, among others (2, 3). Many of these factors cannot be measured directly, such as emotional, behavioral, and psychological traits.

Recently, 2 studies used theoretical models considering latent class analysis (LCA) to explain the relationship between latent classes and the BF practice (4, 5). The use of this method becomes relevant when taking into consideration the quantitative research scenario in the health field

carried out in Brazil, especially studies on BF.

LCA is a statistical technique for categorical data that seeks to explain the observed variables by means of latent influences, i.e. constructs referring to theoretical concepts that cannot be seen or directly measured by the researcher, however, they are manifested by various observable variables, in such a case named as indicator variables (6).

Thus, by using LCA, individuals may be grouped into latent classes with similar traits (7), which translate specific behavior patterns towards, for instance, BF (5). An advantage of using it is to reduce data dimensionality, which enables better understanding information as well as allows evaluating, simultaneously, the relationship between variables.

This study aimed to identify behavior patterns towards exclusive breastfeeding (EBF) among nursing mothers, as well as their information concerning the health professionals attitude during childbirth and postpartum care in Feira de Santana, Bahia, Brazil.

2. Methods

2.1. Study Type

The original study is a birth cohort. However, the data used to define patterns of behavior for exclusive breastfeeding considered the information available in the first month after delivery.

2.2. Data Source and Sample

We used data from a cohort of live births, which began in 2004, consisting of 1309 women interviewed at all of the 10 public and private maternity hospitals in Feira de Santana. The hospitals surveyed were: Uniao Medica (UNIMED), "Dom Pedro de Alcantara" hospital, "Stella Gomes" Maternity hospital, Empreendimentos Medicos e Cirurgicos (EMEC), "Inacia Pinto dos Santos" hospital, "Sao Matheus" hospital, "Santa Cecilia" Clinic, "Santana" Health Care Home, "Cleriston Andrade" General hospital, and "Mater Dei" hospital.

The study included the entire population of women who gave birth within the 2 month period at each maternity facility and met the inclusion criteria, i.e. those women admitted to hospitals who showed no complications during pregnancy or after childbirth, mothers of newborn babies who have not had perinatal complications, and newborn babies who were not admitted to the maternity ward for more than 24 hours. We excluded from the study: women who had some judicial situation keeping them separated from children (child given for adoption, imprisoned mother), children with health problems that might contraindicate BF, and living in locations posing a threat to the interviewer (drug trading and/or prostitution areas).

2.3. Data Collection Instruments

Forms have been prepared with clear and objective language, the answers were close-ended with 2 options: yes and no. No hypothetical questions were asked. Before, start of the data collection conducted a pilot test with the participation of 90 mothers to check the validity and quality of the questions. Forms were applied in maternity facilities by collecting information on pregnancy, postpartum care, delivery room, rooming-in care, BF by observing feed, biological traits of mothers and children, in addition to maternal socioeconomic and demographic variables. In a home visit 1 month after child birth there were questions regarding the intention to breastfeed, hospital care procedures at hospital discharge, BF management, introduction of supplementary food, family support to nursing mothers, sucking habits, lifestyle, and clinical events (diarrhea, respiratory infections).

Data collection was carried out as a direct interview, where the forms were filled in by interviewers themselves (they were students at the Bahia State University of Feira de Santana (UEFS) or health professionals), who had been previously trained. Additional information on the methodology of the cohort are published in other studies (8, 9).

2.4. Latent Class Analysis

LCA is a statistical technique that seeks to explain categorical observed variables through latent influences. This technique uses the response patterns as its analysis unit, which is constituted by a set of answers provided by an individual on certain items (indicators), i.e. it classifies individuals into their most probable class according to their response patterns (7, 10).

LCA has 2 key quantities: conditional and non-conditional probabilities. Non-conditional probabilities may be interpreted as the prevalence of each latent class, indicating which is the population proportion of each class. Conditional probabilities are the probability of response to indicators on each specific class (11). The name of latent classes is provided according to the interpretation of conditional probabilities (12).

The definition of latent variables starts by formulating the theoretical and conceptual models that allow us to determine the multiple dependency relationships between variables, based on consistent theoretical assumptions or biological plausibility. The selection of variables contained in the database was defined according to the study purpose and the researcher's empirical knowledge. After selecting the items, the models proposed were adjusted to observe the relationship between items. When needed, changes were made to the original model until achieving a final model (13), i.e. a systematic set of relationships that provide consistent and comprehensive explanations of phenomena under study (14).

The theoretical model may be represented by equations or path diagrams, which summarize a set of hypotheses. A path diagram consists of geometrical figures and arrows that allow viewing the types of variables and relationships between them (6). By convention, the indicator variables are dependent on the constructs. Figure 1 displays the representation of the relationships based on our conceptual model.

In this study, LCA was used to define categorical constructs through the answers provided by 1309 women. The criteria used to determine the most parsimonious model, providing an adjustment that fits the data includes the bayesian information criterion (BIC) and Akaike information criterion (AIC), the Vuong-Lo-Mendell-Rubin likelihood ratio and Bootstrap tests, and entropy. For the BIC and AIC criteria, the choice was based on lower values; for

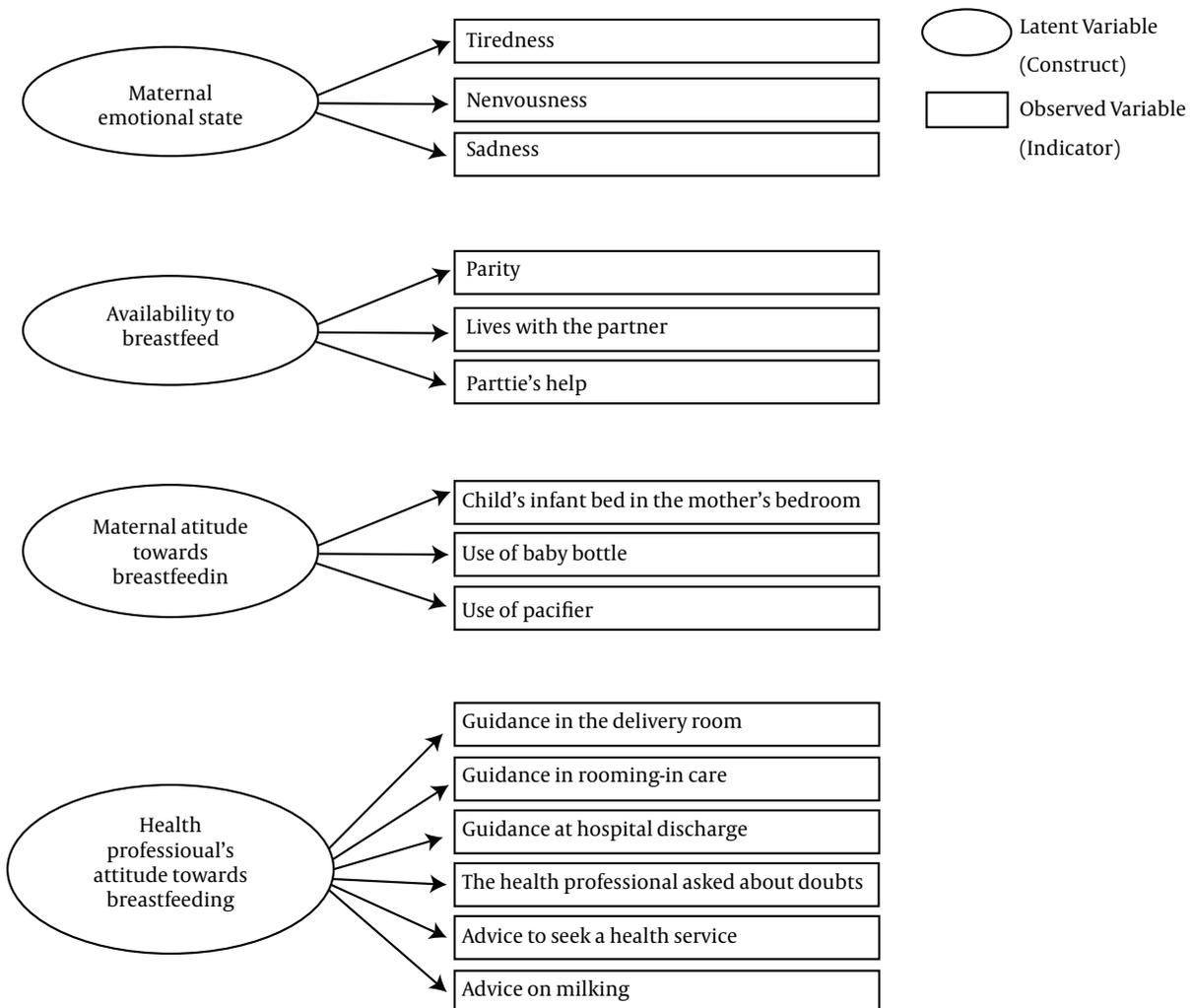


Figure 1. Theoretical Model of Latent Class Analysis on Nursing Mothers' Traits and Their Views About the Health Professionals Who Provided Them with Care Regarding Exclusive Breastfeeding

the Vuong-Lo-Mendell-Rubin and Bootstrap tests, $P > 0.05$ (in order to not reject the null hypothesis that the model with fewer classes is better); and for entropy, values closer to 1. The individuals were assigned to the class where they were most likely to join through the maximum likelihood classification rule. Besides evaluating the models through the statistical criteria for choosing the best model, the final model was examined according to the interpretation of its conditional and non-conditional probabilities of each latent class.

Statistical softwares used for data analysis were Stata version 12, for descriptive analysis, and Mplus version 5.21, for adjusting LCA.

2.5. Defining the Constructs

Variables obtained during home interviews of 1309 women within the first month postpartum were used for defining 4 constructs, each of them with 2 latent classes. A total of 15 indicators were considered (Figure 1):

- "Maternal emotional state": It was defined by 3 indicators: tiredness, nervousness, and sadness. The questions were: "have you felt physically tired within the last 15 days?" (yes/no); "have you felt nervous (stressed) within the last 15 days?" (yes/no); "have you felt sad within the last 15 days?" (yes/no).

- "Availability for breastfeeding": It was defined by 3 indicators: living with the partner, partner's help, and parity. The questions were: "currently, are you and your part-

ner living in the same household?” (yes/no); “does your partner help you to care for the baby?” (yes/no); “how many children were born alive?” (dichotomized into primiparous/multiparous).

- “Maternal attitude towards breastfeeding”: It was defined by 3 indicators: infant bed in the bedroom, use of pacifier, and use of baby bottle. The questions were: “is your child’s infant bed in your bedroom?” (yes/no); “does your child use a pacifier?” (yes/no); “does your child use a baby bottle?” (yes/no).

- “Health professionals’ attitude towards breastfeeding”: It was defined by 6 indicators that nursing mothers reported in relation to the health professionals who provided them with care: guidance in the delivery room, in rooming-in care, and at hospital discharge, the professional asked if there was any doubt, advice to seek a health service, and guidance on milking. The questions were: “have you received guidance on breastfeeding in the delivery room?” (yes/no); “have you received guidance on breastfeeding in rooming-in care?” (yes/no); “have you received guidance on breastfeeding at hospital discharge?” (yes/no); “have any health professional asked, in the maternity facility, if you had some question with regard to breastfeeding?” (yes/no); “in the maternity facility, have you received any advice to seek some health service in case of any doubt with regard to breastfeeding?” (yes/no); and “after this pregnancy, have you received any advice, in the hospital, to empty your breast if it becomes too full of milk?” (yes/no).

2.6. Ethical Aspects

The cohort was approved by the research ethics committee of UEFS (CEP/UEFS), under the protocol 12/2003 and by the board of education research and University Outreach of UEFS (CONSEPE/UEFS), under the protocol 57/2003. The current study was approved by the research ethics committee of Faculdade Anísio Teixeira under the certificate of application for ethical review (CAAE) 38308414.1.0000.5631.

3. Results

In regards to the characteristics of the mothers, 19.3% were over the age of 20 years old, 37.7% had schooling up to elementary school, 50.2% were primiparous and 59.1% breastfed exclusively your son in the first month of life. The other characteristics of the samples are described in previous publications (8).

The distribution of indicator variables and latent classes for 1309 nursing mothers are shown in Table 1. The estimated parameters for LCA, regarding the 4 constructs, are also displayed in Table 1.

Two latent classes were identified for each construct: mothers with favorable or unfavorable emotional states, with higher or lower availability to breastfeed, with positive or negative attitudes towards breastfeeding; and health professionals with favorable or unfavorable attitude towards breastfeeding.

It was found that 36.5% of nursing mothers showed an unfavorable emotional state; 14.7% had lower availability to breastfeed; 41.5% had negative attitude towards breastfeeding; and 62.0% reported the health professionals who provided them with care had an unfavorable attitude towards breastfeeding.

Nursing mothers showing an unfavorable emotional state reported higher probability to feel tired, nervous, and sad, where “nervousness” was the indicator most frequently mentioned (90.3%). In the class of mothers with lower availability to breastfeed, there was a higher probability of primiparous women who reported that their partners do not help them to care for the baby and that they did not live with partners. Women classified as showing a negative attitude towards breastfeeding were more likely to use a pacifier, baby bottle, and have no infant bed in the bedroom. For the class where mothers reported that the health professionals had an unfavorable attitude towards breastfeeding, there was a high probability of lack of guidance considering all 6 indicators used in the analysis (Table 1). The models with 2 classes properly adjusted data, and entropy ranged between 0.521 and 1.000 (Table 2).

4. Discussion

The practice of AME arises from the interaction of multiple factors that are better defined and understood through multivariate analysis, however the analysis using isolated variables aren’t as informative and useful to describe behaviors of mothers breastfeeding.

The current study used the ACL through the joint evaluation of multiple variables based on the likelihood of responses of mothers, which identified 2 classes of similar patterns to observed behaviors for 4 constructs: maternal emotional state (unfavorable, favorable), maternal attitude towards breastfeeding (negative, positive), and availability to breastfeed (lower, higher), besides mothers “views about health professionals’ attitude towards the practice of BF (unfavorable, favorable). The prevalence of unfavorable attitudes of health professionals with regards to breastfeeding was 62%, followed by negative maternal attitude (41.5%), maternal emotional state unfavorable and lower maternal availability to breastfeed (14.7%).

Although no study using latent classes specifically addressed to the maternal emotional state has been identified, the indicator variables of the maternal emotional

Table 1. Estimated Parameters for Analysis of Latent classes for Four Constructs Related to Behaviors of Mothers and Health Professionals Regarding Exclusive Breastfeeding^a

Constructs/Indicators	%	Latent Classes	
Maternal emotional state		Unfavorable (36.5)	Favorable (63.5)
Tired	46.4	76.2	28.9
Nervous	34.6	90.3	2.1
Sad	16.8	37.0	5.0
Maternal availability to breastfeed		Lower (14.7)	Higher (85.3)
Primiparous	50.2	66.3	47.4
Does not live with the partner	14.7	100	0.0
The partner does not help	16.8	47.7	11.5
Maternal attitude towards breastfeeding		Negative (41.5)	Positive (58.5)
Uses pacifier	41.5	80.1	0.0
Has no infant bed in the bedroom	26.7	30.2	23.0
Uses baby bottle	19.8	30.0	8.8
Health professional's attitude towards breastfeeding		Unfavorable (62.0)	Favorable (38.0)
Lack of guidance in the delivery room	80.1	95.6	55.1
Lack of guidance in rooming-in care	46.1	69.5	8.3
Lack of guidance at hospital discharge	48.1	59.1	30.3
Professional did not ask about doubts	68.0	96.7	21.4
Lack of guidance to seek a health service in case of doubts	64.5	96.1	13.1
Lack of guidance on milking	60.7	86.7	18.3

^aValues are expressed as (%).**Table 2.** Adjustment Criteria for Each Construct Model

Constructs	Criteria				
	AIC	BIC	Vuong-Lo-Mendell-Rubin	Bootstrapped	Entropy
Maternal emotional state					
2 classes	4296180	4332420	0.0000	0.0000	0.776
3 classes	4304180	4361128	0.5000	1.0000	0.706
Maternal availability to breastfeed					
2 classes	3961880	3998119	0.0000	0.0000	1.000
3 classes	3958697	4015644	0.0038	0.0000	0.624
Health professional's attitude towards breastfeeding					
2 classes	9819450	9897105	0.0000	0.0000	0.896
3 classes	7971738	8075278	0.0000	0.0001	0.751
Maternal attitude towards breastfeeding					
2 classes	5987421	6034014	0.0002	0.0000	0.521
3 classes	4553354	4610301	0.2857	0.6000	0.407

state have already been examined by other studies with various methodologies, such as qualitative and quantitative approaches (15-21).

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1/3 of the women showed an unfavorable behavior. The indicator variable that best characterized this class was the maternal information regarding nervousness, followed by fatigue and sadness. It is expected that mothers who feel sad, stressed, and tired have a higher probability to cease BF because the act of BF requires emotional balance, dedication, and time expenditure. In addition, energy expenditure during childbirth itself, physiological postpartum adjustments, and increased frequency of BF within the early months, added to pain, stress, anxiety, fear, and insecurity, may adversely affect the milk release process by inhibiting the hormone oxytocin (22).

For a successful BF, in addition to a good emotional state, nursing mothers need availability to breastfeed. In this study, women with lower availability to breastfeed were more likely to be primiparous. Scientific evidence documents the inverse relationship between primiparity and BF due to previous experience enhances BF performance (23, 24).

Regarding primiparity and LCA, a study conducted with primiparous women in Colorado identified a non-linear relationship between maternal age and duration of BF. Primiparous women aged between 29 - 31 years were more likely to continue BF and return to work; however, women over 35 years of age assigned more importance to work, returning to their full-time jobs in detriment of BF (5).

Furthermore, concerning availability, women who did not live with their partners or those whose partners did not help care for their children showed a lower availability to breastfeed. The practice of BF requires time and a favorable environment. Father's help to care for the child and fulfill household chores allows women to devote more time to BF (21, 22, 25).

Mothers with a negative attitude towards breastfeeding were more likely to give a pacifier and a baby bottle to their children. The use of a pacifier has been reported as an indicator of maternal difficulty in BF management and it signals their willingness to wean (26). The association between pacifier use and duration of AME presents conflicting results, although recent systematic reviews concluded that the use of pacifier associated with the shortest time of AME (27, 28).

Also, concerning maternal attitude towards breastfeeding, the absence of the infant bed in the bedroom signals a negative attitude. Similarly, one of the few studies published on latent classes and BF concern the temporal interdependent relationship between bed-sharing and prevalence of BF, which was significantly higher among the groups that shared beds on a continued basis, mainly within the first 15 months after birth. Similarly, having the infants bed in the mother's bedroom may be a facili-

tating factor for BF and it does not involve the risk of sudden death reported in bed-sharing (29). Further studies are needed to define these associations more clearly.

As for health professionals' attitude towards breastfeeding, women reported more frequently a health care by professionals showing unfavorable behaviors (lacking guidance in the delivery room, in rooming-in care, at hospital discharge, and lack of advice on milking). Moreover, they were not asked if there was any question regarding BF and no information was provided regarding the health services available to be sought in case of difficulties with BF management. Good BF practices should be informed during prenatal care, in the delivery room, in rooming-in care, and at hospital discharge. It is important that at hospital discharge mothers are confident and motivated to breastfeed. Furthermore, if by chance they have any difficulty, they know where to seek help and support.

It is worth mentioning the limitations of this study. Data were self-reported and individuals were designated to a particular class based on having the higher probability of belonging to it, characteristics that can lead to misclassification. Besides that, the results are not easily interpretable, requiring good theoretical background and prior knowledge on the part of researchers. On the other hand, grouping individuals' answers allows better interpretation of results, a unique trait that brings the analysis of qualitative studies closer to quantitative studies.

The use of LCA in this paper to define and characterize behavior patterns may contribute to better understanding the phenomena involved in the practice of BF and provide means to programs that encourage and promote EBF.

4.1. Conclusion

Determining classes through modeling with latent variables, without imposing predefined categories, enabled us to characterize behavior types with regards to EBF. Further studies are needed to find out how these traits behave in defining EBF patterns, as well as to improve knowledge on the use of LCA in studies addressing BF.

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Footnotes

Authors' Contribution: Priscila de Argolo Cerqueira and Graciete O Vieira conceived paper design and preparation,

conducted data analysis, as well as wrote the manuscript. Leila D A F Amorim conducted data analysis and interpretation. Tatiana de O Vieira contributed to preparation of database, data analysis, and interpretation. Janaina S Dias contributed to the data interpretation. Heli V Brandao contributed to the data interpretation, wrote, and reviewed the manuscript. All authors revised and approved the final version of the paper for publication.

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