

Association between Pacifier Use, Bottle-Feeding, and Pre-Postnatal Variables: A Cohort Study

Letícia Santos Alves de Melo¹, Lorena Fonseca Silva², Silvio Rocha Corrêa da Silva³, Fernanda Lopez Rosell³, Aylton Valsecki Júnior³, Angela Cristina Cilense Zuanon¹, Elaine Pereira da Silva Tagliaferro³

¹Department of Morphology and Children's Clinic, São Paulo State University, School of Dentistry, Araraquara, SP, Brazil.

²Pediatric Dentistry, São Paulo State University, School of Dentistry, Araraquara, SP, Brazil.

³Department of Community Dentistry, São Paulo State University, School of Dentistry, Araraquara, SP, Brazil.

Correspondence: Elaine Pereira da Silva Tagliaferro, Department of Community Dentistry, São Paulo State University (UNESP), Rua Humaitá, 1680, Centro, Araraquara, SP, Brazil. 14801-903. **E-mail:** elaine.tagliaferro@unesp.br

Academic Editor: Alessandro Leite Cavalcanti

Received: 03 November 2022 / **Accepted:** 17 March 2023

How to cite: Melo LSA, Silva LF, Silva SRC, Rosell FL, Valsecki Júnior A, Zuanon ACC, et al. Association between pacifier use, bottle-feeding, and pre- postnatal variables: a cohort study. *Pesqui Bras Odontopediatria Clín Integ*. 2023; 23:e220160. <https://doi.org/10.1590/pboci.2023.084>

ABSTRACT

Objective: To determine the prevalence and analyze the variables associated with the use of pacifiers and/or bottles by infants up to 6 months of age. **Material and Methods:** Data on sociodemographic characteristics, intention to offer pacifier and bottle-feeding, pregnancy and breastfeeding (BF) variables were collected at baseline by interviews and a self-administered questionnaire among pregnant women in the 3rd trimester. After delivery, mother-baby binomials were followed by phone calls at the 1st, 3rd, and 6th months of the baby's life (n=467) to gather information on the type of delivery, baby's gender, BF in the first hour of the newborn's life, baby's weight, mother's return to work, and oral habits. Association analyses were performed using logistic regression models with a 5% significance level with the pacifier/bottle-feeding use as the outcome. **Results:** Most mothers (52.5%) reported their babies used bottle-feeding, 48.2% used pacifiers and 33.4% used both of them throughout the 6 months. Intention to offer pacifier and bottle-feeding was reported by 45.0% and 54.8% of the mothers at the 3rd trimester of the pregnancy, respectively. Not living in one's own residence (OR=1.53; 95%CI: 1.05-2.24) and having the prenatal intention of offering a pacifier (OR=2.50; 95%CI: 1.63-3.83) to the baby were significantly associated with pacifier use. Variables significantly associated with bottle-feeding were mother's return to work (OR=2.48; 95%CI: 1.54-3.97), baby's lower birth weight (OR=1.58; IC95%: 1.07-2.33), and prenatal intention to offer bottle-feeding (OR=2.51; 95%CI 1.56-4.04). **Conclusion:** About half of the babies used pacifiers or were bottle-fed, which were associated with the mother's prenatal intention to offer them to their babies and socioeconomic factors.

Keywords: Pacifiers; Bottle Feeding; Intention; Pregnancy.

Introduction

Breast milk is the ideal food for infants because of its nutritional properties and because it helps babies to develop optimally [1]. Breastfeeding (BF) contributes to the adequate growth of the child's orofacial structures and brings several health benefits for mothers and babies [2].

Breast milk has immunological and anti-inflammatory properties that protect the infant from various infections and diseases [3]. It can prevent infant death [4-6], diarrhea, respiratory infections, especially in children of lower socioeconomic status [5], reduce the likelihood of developing chronic diseases and obesity throughout life, as well as promote better nutrition and adequate cognitive and oral cavity development [5,7].

On the contrary, deleterious oral habits modify the adequate development of the stomatognathic system [8] and compromise the duration of exclusive breastfeeding (EBF) [9]. Therefore, the World Health Organization (WHO) [10], the Brazilian Ministry of Health [11], and researchers advise parents/guardians not to offer pacifiers or bottle-feed infants for the first six months of the baby's life [12].

Bottle feeding is a very significant infant feeding modality to offer breast milk or formula, but for its optimal use, the baby, the parents/guardians, and the equipment used must contribute to the process [13]. Also, the mothers may consider it as a way to control the times and amounts of food offered to the child [14].

As a disadvantage, the high frequency of bottle-feeding has been considered a risk factor for the development of caries in early childhood [15], and may also contribute to overfeeding, leading to rapid weight gain in childhood and, subsequently, to obesity [16]. The use of bottle feeding may also cause alterations to the chewing, sucking, and swallowing functions, leading to dental malocclusion [8].

Pacifier use can negatively interfere with EBF duration [12,17] and is associated with otitis media and other infections [5,18]. The prevalence rates of pacifier use were found to be high in Brazil and Italy [12], and such non-nutritive habit is associated with malocclusion, even in BF children [19].

Some variables are usually associated with the use of pacifiers and bottles, such as primiparity, absence of the golden hour, consumption of other fluids on the first day at home, low birth weight [20], maternal work outside the home [20,21] and lower maternal level of schooling [21]. Despite this information, most studies are cross-sectional studies [14,20-23]. There is a scarcity of cohort studies assessing the establishment of such habits and the pre- and postnatal associated variables.

This study aimed to determine the prevalence and analyze the factors associated with the use of pacifiers and/or bottles in infants up to 6 months of age.

Material and Methods

Study Design and Ethical Aspects

This was a prospective cohort study with a non-random sample obtained at a referral center for pregnant women in the third trimester of pregnancy who were followed after delivery until the baby was six months of age.

Participation in the study was considered after the pregnant woman signed the free and informed consent form. The Research Ethics Committee of the Araraquara School of Dentistry, UNESP, Brazil, approved the study protocol under register (CAAE 96978518.6.0000.5416).

Study Sample

The baseline sample consisted of all pregnant women in the third trimester of pregnancy who attended a public maternity hospital under private administration located in a medium-sized city in the state of São Paulo,

Brazil, during the data collection period (December 2018 to November 2019). The inclusion criteria comprised literate Brazilian women with no contraindications for BF practice.

Among all invited pregnant women ($n=678$), 655 agreed to participate in the study. Two of them were excluded due to incomplete data, totaling 653 pregnant women at baseline. After delivery, 467 mother-baby binomials were followed until the baby was six months of age or BF was stopped. Four participants were excluded due by death of mother or baby, 1 twin pregnancy, and 181 due to contact failure, despite repeated attempts.

The sample size of 467 mother-infant binomials provided a test power of 0.80 ($\beta=0.20$) with a significance level of 5% ($\alpha=0.05$) for a minimum detectable odds ratio of 2.0. This sample size also follows the minimum number of events per variable required in the logistic regression analyses [24]. Calculations were performed using the Epi Info software for the main dependent variables "intention to offer pacifier" and "intention to offer bottle", considering the prevalence of pacifier and bottle use found in a previous study [20].

Data Collection

At baseline, data collection was performed through interviews and a self-administered questionnaire. The following variables were collected: sociodemographic characteristics, parity, type of delivery, baby's characteristics, maternal intention to exclusively BF, BF (previous BF experience, prior help on BF practice, golden hour) and intention to offer pacifier and use bottle-feeding. The questionnaire included the Infant Feeding Intentions Scale [25] translated and adapted into Brazilian Portuguese [26], to assess the intention to initiate and continue EBF during the baby's first six months of life, as well as questions of interest, according to a previous study [27].

After delivery, mother-infant binomials were followed through telephone calls in the first, third and sixth months of the baby's life, to gather information on the type of delivery, baby's sex, BF in the golden hour, baby's birth weight, mother's return to work, and oral habits (pacifier and bottle-feeding use).

Statistical Analysis

Descriptive data analysis was carried out. Association analyses were carried out for each independent variable individually and the outcomes (pacifier use, bottle feeding, pacifier+bottle feeding) using simple logistic regression models, estimating crude odds ratios and the 95% confidence intervals. All variables with $p<0.20$ in the individual analyses were included in the multiple logistic regression analyses. The variable entry sequence in the multiple models followed the conceptual model of Bucinni et al. [20]. The blocks of variables were entered into the model from the most distal to the most proximal ones, and the variables with significant association with the outcomes were maintained in each step, until the final adjustment of the model. Based on the final model, adjusted odds ratios were estimated, with their respective 95% confidence intervals. Model fits were evaluated using Akaike's Information Criterion (AIC). All analyses were performed using the R software, with a significance level set at 5%.

Results

Table 1 shows the descriptive analysis of the sociodemographic variables. At baseline, the mothers' mean age was 27.2 years, the mean income was R\$2,159.00, 36.8% were primiparous, 66.8% reported no help to BF before baseline data collection, 45.0% intended to offer a pacifier, and 54.8% intended to offer a bottle. After delivery, 55.0% reported they had a caesarean delivery, 48.2% offered a pacifier, 52.5% offered a bottle, and 33.4% offered a pacifier and bottle-feeding at some point during the baby's first six months.

Table 1. Descriptive analysis of the sample

Variables	Categories	N (%)
Type of residence ¹	Own, paid off	88 (18.8)
	Own, financed	126 (27.0)
	Rented	179 (38.3)
	Given by parents	64 (13.7)
	Ceded by employer	4 (0.9)
	Given up for having nowhere to live	1 (0.2)
	Others	4 (0.9)
	Not informed	1 (0.2)
	Color/Race ¹	Black
	White	209 (44.8)
	Yellow	6 (1.3)
	Brown	193 (41.3)
	Indigenous	2 (0.4)
Maternal education ¹	Incomplete Elementary School	46 (9.8)
	Complete Elementary School	42 (9.0)
	Incomplete High School	77 (16.5)
	Complete High School	225 (48.2)
	Incomplete Higher Education	25 (5.4)
	Complete Higher Education	51 (10.9)
Maternal marital status ¹	Single	148 (31.7)
	Married	195 (41.8)
	Common-law marriage	115 (24.6)
	Separated/Divorced	9 (1.9)
Parity ¹	Primiparous	172 (36.8)
	Multiparous	295 (63.2)
Previous breastfeeding experience ¹	Yes	262 (56.1)
	No	205 (43.9)
Type of delivery ²	Vaginal	210 (45.0)
	Caesarean section	257 (55.0)
Health Care Services ¹	Health insurance	2 (0.4)
	Private	1 (0.2)
	SUS	423 (90.6)
	Health Insurance + SUS	25 (5.4)
	Private + SUS	16 (3.4)
Golden hour breastfeeding practice ²	Yes	172 (36.8)
	No	290 (62.1)
	Not informed	5 (1.1)
Baby's sex ²	Female	232 (49.7)
	Male	235 (50.3)
Mother received help to breastfeed ¹	Yes	154 (33.0)
	No	312 (66.8)
	Not informed	1 (0.2)
Intention to offer pacifier ¹	Yes	210 (45.0)
	No	164 (35.1)
	Doesn't know	93 (19.9)
Intention to offer bottle-feeding ¹	Yes	256 (54.8)
	No	114 (24.4)
	Doesn't know	97 (20.8)
A pacifier was offered during the first 6 months ²	Yes	225 (48.2)
	No	235 (50.3)
	Not informed	7 (1.5)
Bottle feeding was offered for the first 6 months ²	Yes	245 (52.5)
	No	212 (45.4)
	Not informed	10 (2.1)
Pacifiers and bottles were offered during the first 6 months ²	Yes	156 (33.4)
	No	299 (64.0%)
	Not informed	12 (2.6%)
Returned to work before 6 months of the baby's life ²	Yes	110 (23.6%)

	No	350 (74.9%)
	Not informed	7 (1.5%)
Variables	Mean (SD)	Median (Min. and Max.)
Maternal Age (years) ¹	27.2 (6.4)	27.0 (15.0-44.0)
Family income (Brazilian Reais) ¹	2159.0 (1138.1)	2000.0 (190.0-7000.0)
Baby weight at birth (Kg) ²	3.29 (0.51)	3.28 (1.67-6.30)
Infant Feeding Intention (IFI) Scale score ¹	14.4 (2.6)	16.0 (1.0-16.0)

¹Information collected at baseline; ²Information collected after delivery; SD: Standard Deviation; Min.: Minimum; Max.: Maximum.

Babies whose mothers did not own their own residence or those whose mothers intended to offer a pacifier were 1.53 (95%CI: 1.05-2.24) and 2.50-fold (95%CI: 1.63-3.83) more likely to use a pacifier during the baby's first six months of life, respectively ($p < 0.05$), as shown in Table 2.

Table 3 shows that babies whose mothers returned to work within 6 months after delivery were 2.48-fold (95%CI: 1.54-3.97) more likely to use bottle-feeding during the first six months, with $p < 0.05$. Lower birth weight infants were 1.58-fold (95% CI: 1.07-2.33) more likely to receive bottle-feeding during the six months, with $p < 0.05$. Moreover, babies whose mothers previously intended to offer bottle-feeding at the end of the pregnancy were 2.51-fold (95% CI: 1.56-4.04) more likely to use bottle-feeding during the first six months, with $p < 0.05$.

Table 4 shows the results for pacifier and bottle-feeding use at some point during the first six months of the baby's life. Babies whose mothers intended to offer a pacifier were 2.13-fold (95%CI: 1.36-3.33) more likely to use pacifier and bottle-feeding during the six months ($p < 0.05$).

Discussion

This cohort study assessed the influence of pre- and postnatal factors on the prevalence of pacifier and bottle use over the first six months of a baby's life. Prevalence rates of 48.2%, 52.5%, and 33.4% were found for pacifier, bottle, and pacifier+bottle use, respectively. These rates are much higher than those found in the II Brazilian National Breastfeeding Prevalence Survey of 2008 [20], which found that 24.8% of babies aged up to one year were exclusively bottle-fed and 9.1% used a pacifier.

The prevalence rates of pacifier and bottle-feeding use over the first six months of a baby's life was very close to those found among pregnant women who reported intending to offer bottle-feeding (54.8%) and pacifier (45.0%). Therefore, we recommend effective strategies for improving the knowledge and empowering future lactating women about the consequences of deleterious oral habits to BF and the baby's health.

The pregnant women's intention to bottle-feed was associated with the baby's being offered bottle-feeding during the first six months. Similarly, the mother's return to work was associated with bottle-feeding use, corroborating data from cross-sectional studies [20,21]. It has been pointed out that puerperal women who were unable to be close to their babies chose to bottle-feed [28]. One can suggest measures for encouraging BF after the mothers return to work, such as manual milking and storage of breast milk that would be offered using alternative containers that do not promote nipple confusion (such as American, 360° cup and spoon-feeding).

The newborn's weight was also associated with bottle-feeding use. Those with lower birth weight (≤ 3.28 kg) were more likely to be bottle-fed. Considering that some practices associated with bottle-feeding can contribute to fast weight gain, it is possible that many parents choose to use infant formula [29].

Concerning pacifier use, babies whose mothers who lived in residences that were not owned by them were more likely to use a pacifier. Although we cannot assume that people living in their own homes are more socioeconomically favored than their counterparts, babies living in lower socioeconomic households tend to use pacifiers [30].

Table 2. Analyses (crude and adjusted) of associations with pacifier use at some point during the first 6 months of the baby's life (n=460).

Variables	Categories	N (%)	Pacifier Use During the First 6 Months		Crude OR (95%CI)	p-value	OR Final Model (95%CI)	p-value
			*Yes N (%)	No N (%)				
Distal Level								
Family income (Reais) ¹	≤ 2000	244 (53.0)	132 (54.1)	112 (45.9)	1.60 (1.07-2.40)	0.0224		
	> 2000	158 (34.4)	67 (42.4)	91 (57.6)	Ref			
	Not informed	58 (12.6)	26 (44.8)	32 (55.2)				
Type of residence ¹	Own	211 (45.9)	89 (42.2)	122 (57.8)	Ref		Ref	
	Not own	248 (53.9)	135 (54.4)	113 (45.6)	1.64 (1.13-2.27)	0.0090	1.53 (1.05-2.24)	0.0276
	Not informed	1 (0.2)	1 (100.0)	0 (0.0)	-		-	
Skin Color / Ethnicity ¹	White	205 (44.6)	98 (47.8)	107 (52.2)	Ref			
	Not White	255 (55.4)	127 (49.8)	128 (50.2)	1.08 (0.75-1.56)	0.6700		
Maternal Age (years) ¹	≤ 27	248 (53.9)	129 (52.0)	119 (48.0)	1.31 (0.91-1.89)	0.1502		
	> 27	212 (46.1)	96 (45.3)	116 (54.7)	Ref			
Maternal level of schooling ¹	Elementary school (complete and incomplete)	86 (18.7)	45 (52.3)	41 (47.7)	1.18 (0.74-1.88)	0.4966		
	Other	373 (81.1)	180 (48.3)	193 (51.7)	Ref			
	Not informed	1 (0.2)	0 (0.0)	1 (100.0)	-			
Return to work within 6 months ²	Yes	109 (23.7)	50 (45.9)	59 (54.1)	0.86 (0.56-1.32)	0.4849		
	No	348 (75.6)	173 (49.7)	175 (50.3)	Ref			
	Not informed	3 (0.6)	2 (66.7)	1 (33.3)	-			
Parity ¹	Primiparous	171 (37.2)	85 (49.7)	86 (50.3)	1.05 (0.72-1.54)	0.7931		
	Multiparous	289 (62.8)	140 (48.4)	149 (51.6)	Ref			
Maternal marital status ¹	Single or Separated	156 (33.9)	76 (48.7)	80 (51.3)	0.99 (0.67-1.45)	0.9522		
	Married or common-law marriage	304 (66.1)	149 (49.0)	155 (51.0)	Ref			
Distal Intermediate Level								
Baby's sex ²	Female	227 (49.4)	120 (52.9)	107 (47.1)	1.40 (0.95-1.97)	0.0947		
	Male	233 (50.6)	105 (45.1)	128 (54.9)	Ref			
Baby's birth weight (Kg) ²	≤ 3.28	228 (49.6)	116 (50.9)	112 (49.1)	1.17 (0.81-1.70)	0.3973		
	> 3.28	226 (49.1)	106 (46.9)	120 (53.1)	Ref			
	Not informed	6 (1.3)	3 (50.0)	3 (50.0)	-			
Type of delivery ²	Vaginal	205 (44.6)	93 (45.4)	112 (54.6)	Ref			
	Caesarean section	255 (55.4)	132 (51.8)	123 (48.2)	1.29 (0.89-1.87)	0.1727		
Proximal Intermediate Level								
Prenatal care ¹	SUS, exclusively	417 (90.6)	205 (49.2)	212 (50.8)	1.11 (0.59-2.09)	0.7412		
	Others	43 (9.4)	20 (46.5)	23 (53.5)	Ref			
Mother received help to breastfeed ¹	Yes	152 (33.0)	80 (52.6)	72 (47.4)	Ref			

	No	307 (66.7)	144 (46.9)	163 (53.1)	0,80 (0.54-1.17)	0.2487		
	Not informed	1 (0.2)	1 (100.0)	0 (0.0)	-			
EBF intention (IFI Scale score) ¹	< 16	224 (48.7)	119 (53.1)	105 (46.9)	1.39 (0.96-2.01)	0.0786		
	16	236 (51.3)	106 (44.9)	130 (55.1)	Ref			
Had previously breastfed ¹	Yes	256 (55.6)	122 (47.7)	134 (52.3)	Ref			
	No	204 (44.4)	103 (50.5)	101 (49.5)	1.12 (0.78-1.62)	0.5459		
Golden hour breastfeeding ¹	Yes	169 (36.7)	75 (44.4)	94 (55.6)	Ref			
	No	288 (62.6)	148 (51.4)	140 (48.6)	1.32 (0.90-1.94)	0.1482		
	Not informed	3 (0.6)	2 (66.7)	1 (33.3)	-			
Proximal Level								
Intention to offer pacifier ¹	Yes	209 (45.4)	127 (60.8)	82 (39.2)	2.61 (1.71-3.98)	<0.0001	2.50 (1.63-3.83)	<0.0001
	No	161 (35.0)	60 (37.3)	101 (62.7)	Ref		Ref	
	Doesn't know	90 (19.6)	38 (42.2)	52 (57.8)	1.23 (0.73-2.08)	0.4406	1.23 (0.72-2.08)	0.4470

*Outcome event. Ref: Reference category for independent variables. OR: Odds Ratio. CI: Confidence Interval. AIC (empty model) = 638.04. AIC (final model) = 617.31. IFI: Infant Feeding Intention ¹ Information collected at baseline. ² Information collected after delivery.

Table 3. Analyses (crude and adjusted) of associations with bottle feeding at some point during the first 6 months of life.

Variables	Categories	N (%)	Bottle-feeding up to 6 months		Crude OR (95%CI)	p-value	OR Final Model (95%CI)	p-value
			*Yes N (%)	No N (%)				
Distal Level								
Family income (Reais) ¹	≤ 2000	244 (53.4)	143 (58.6)	101 (41.4)	1.33 (0.88-1.99)	0.1707	-	-
	> 2000	155 (33.9)	80 (51.6)	75 (48.4)	Ref			
	Not informed	58 (12.7)	22 (37.9)	36 (62.1)	-			
Type of residence ¹	Own	211 (46.2)	113 (53.6)	98 (46.4)	Ref		-	-
	Not own	245 (53.6)	131 (53.5)	114 (46.5)	1.00 (0.69-1.44)	0.9855		
	Not informed	1 (0.2)	1 (100.0)	0 (0.0)	-			
Skin Color / Ethnicity ¹	White	202 (44.2)	111 (55.0)	91 (45.0)	Ref		-	-
	Not White	255 (55.8)	134 (52.6)	121 (47.4)	0.91 (0.63-1.32)	0.6094		
Maternal Age (years) ¹	≤ 27	246 (53.8)	128 (52.0)	118 (48.0)	0.87 (0.60-1.26)	0.4652	-	-
	> 27	211 (46.2)	117 (55.4)	94 (44.6)	Ref			
Maternal level of schooling ¹	Elementary school (complete and incomplete)	86 (18.7)	53 (61.6)	33 (38.4)	1.49 (0.92-2.41)	0.1041	-	-
	Other	373 (81.1)	192 (51.9)	178 (48.1)	Ref			
	Not informed	1 (0.2)	0 (0.0)	1 (100.0)	-			

Return to work within 6 months ²	Yes	110 (24.1)	76 (69.1)	34 (30.9)	2.35 (1.49-3.72)	0.0002	2.48 (1.54-3.97)	0.0002
	No	345 (75.5)	168 (48.7)	177 (51.3)	Ref		Ref	
Parity ¹	Not informed	2 (0.4)	1 (50.0)	1 (50.0)	-		-	
	Primiparous	169 (37.0)	92 (54.4)	77 (45.6)	1.05 (0.72-1.54)	0.7860	-	-
	Multiparous	288 (63.0)	153 (53.1)	135 (46.9)	Ref			
Maternal marital status ¹	Single or Separated	156 (34.1)	84 (53.8)	72 (46.2)	1.01 (0.69-1.50)	0.9420	-	-
	Married or common-law marriage	301 (65.9)	161 (53.5)	140 (46.5)	Ref			
Distal Intermediate Level								
Baby's sex ²	Female	226 (49.4)	117 (51.8)	109 (48.2)	Ref		-	-
	Male	231 (50.6)	128 (55.4)	103 (44.6)	1.16 (0.80-1.67)	0.4352		
Baby's birth weight(Kg) ²	≤ 3.28	227 (49.7)	135 (59.5)	92 (40.5%)	1.60 (1.10-2.33)	0.0129	1.58 (1.07-2.33)	0.0207
	> 3.28	224 (49.0)	107 (47.8)	117 (52.2)	Ref		Ref	
	Not informed	6 (1.3)	3 (50.0)	3 (50.0)	-		-	
Type of delivery ²	Vaginal	201 (44.0)	100 (49.8)	101 (50.2)	Ref		-	-
	Caesarean section	256 (56.0)	145 (56.6)	111 (43.4)	1.32 (0.91-1.91)	0.1430		
Proximal Intermediate Level								
Prenatal care ¹	SUS, exclusively	414 (90.6)	222 (53.6)	192 (46.4)	1.00 (0.54-1.89)	0.9865	-	-
	Others	43 (9.4)	23 (53.5)	20 (46.5)	Ref			
Mother received help to breastfeed ¹	Yes	151 (33.0)	82 (54.3)	69 (45.7)	Ref		-	-
	No	305 (66.7)	162 (53.1)	143 (46.9)	0.95 (0.64-1.41)	0.8106		
	Not informed	1 (0.2)	1 (100.0)	0 (0.0)	-			
EBF intention (IFI Scale score) ¹	< 16	221 (48.4)	132 (59.7)	89 (40.3)	1.61 (1.11-2.34)	0.0114	-	-
	16	236 (51.6)	113 (47.9)	123 (52.1)	Ref			
Had previously breastfed ¹	Yes	255 (55.8)	129 (50.6)	126 (49.4)	Ref		-	-
	No	202 (44.2)	116 (57.4)	86 (42.6)	1.32 (0.91-1.91)	0.1458		
Golden hour breastfeeding ¹	Yes	165 (36.1)	81 (49.4)	84 (50.9)	Ref		-	-
	No	289 (63.2)	163 (56.4)	126 (43.6)	1.34 (0.91-1.97)	0.1334		
	Not informed	3 (0.7)	1 (33.3)	2 (66.7)				
Proximal Level								
Intention to offer bottle-feeding ¹	Yes	250 (54.7)	155 (62.0)	95 (38.0)	2,58 (1.63-4.08)	<0.0001	2.51 (1.56-4.04)	0.0002
	No	111 (24.3)	43 (38.7)	68 (61.3)	Ref		Ref	
	Not informed	96 (21.0)	47 (49.0)	49 (51.0)	1.52 (0.87-2.64)	0.1399	1.40 (0.79-2.48)	0.2541

*Outcome event. Ref: Reference category for independent variables. OR: Odds Ratio. CI: Confidence Interval. AIC (empty model) = 622,02. AIC (final model) = 593.55. IFI: Infant Feeding Intention ¹ Information collected at baseline. ² Information collected after delivery (2nd phase of the study).

Table 4. Analyses (crude and adjusted) of associations with pacifier and bottle-feeding use at some point during the baby's first 6 months of life (n=455).

Variables	Categories	N (%)	Pacifier and bottle-feeding up to 6 months of life		Crude OR (95%CI)	p-value	OR Final Model (95%CI)	p-value
			*Yes	No				
			N (%)	N (%)				
Distal Level								
Family income (Reais) ¹	≤ 2000	242 (53.2)	97 (40.1)	145 (59.9)	1.69 (1.09-2.60)	0.0180	-	-
	> 2000	155 (34.1)	44 (28.4)	111 (71.6)	Ref			
Type of residence ¹	Not informed	58 (12.8)	15 (25.9)	43 (74.1)	-			
	Own	211 (46.4)	63 (29.9)	148 (70.1)	Ref		-	-
	Not own	243 (53.4)	92 (37.9)	151 (62.1)	1.43 (0.97-2.12)	0.0734		
Skin Color / Ethnicity ¹	Not informed	1 (0.2)	1 (100.0)	0 (0.0)	-			
	White	201 (44.2)	73 (36.3)	128 (63.7)	Ref		-	-
Maternal Age (years) ¹	Not White	254 (55.8)	83 (32.7)	171 (67.3)	0.85 (0.56-1.26)	0.4166		
	≤ 27	246 (54.1)	86 (35.0)	160 (65.0)	1.07 (0.72-1.57)	0.7428	-	-
Maternal level of schooling ¹	> 27	209 (45.9)	70 (33.5)	139 (66.5)	Ref			
	Elementary school (complete and incomplete)	86 (18.9)	40 (46.5)	46 (53.5)	1.89 (1.17-3.04)	0.0090	-	-
	Other	368 (80.9)	116 (31.5)	252 (68.5)	Ref			
Return to work within 6 months ²	Not informed	1 (0.2)	0 (0.0)	1 (100.0)	-			
	Yes	109 (24.0)	42 (38.5)	67 (61.5)	1.28 (0.82-2.00)	0.2764	-	-
	No	344 (75.6)	113 (32.8)	231 (67.2)	Ref			
Parity ¹	Not informed	2 (0.4)	1 (50.0)	1 (50.0)	-			
	Primiparous	169 (37.1)	57 (33.7)	112 (66.3)	0.96 (0.64-1.44)	0.8474	-	-
	Multiparous	286 (62.9)	99 (34.6)	187 (65.4)	Ref			
Maternal marital status ¹	Single or Separated	156 (34.3)	51 (32.7)	105 (67.3)	0.90 (0.60-1.35)	0.6051	-	-
	Married or common-law marriage	299 (65.7)	105 (35.1)	194 (64.9)	Ref			
Distal Intermediate Level								
Baby's sex ²	Female	224 (49.2)	79 (35.3)	145 (64.7)	Ref		-	-
	Male	231 (50.8)	77 (33.3)	154 (66.7)	0.92 (0.62-1.35)	0.6639		
Baby's birth weight (Kg) ²	≤ 3.28	226 (49.7)	89 (39.4)	137 (60.6)	1.58 (1.07-2.34)	0.0228	-	-
	> 3.28	223 (49.0)	65 (29.2)	158 (70.8)	Ref			
	Not informed	6 (1.3)	2 (33.3)	4 (66.7)	-			
Type of delivery ²	Vaginal	200 (44.0)	61 (30.5)	139 (69.5)	Ref		-	-
	Caesarean section	255 (56.0)	95 (37.2)	160 (62.8)	1.35 (0.91-2.01)	0.1324		
Proximal Intermediate Level								
Prenatal place ¹	SUS, exclusively	412 (90.6)	143 (34.7)	269 (65.3)	1.23 (0.62-2.43)	0.5568	-	-
	Others	43 (9.4)	13 (30.2)	30 (69.8)	Ref			
Mother received help to breastfeed ¹	Yes	150 (33.0)	51 (34.0)	99 (66.0)	Ref		-	-
	No	304 (66.8)	104 (34.2)	200 (65.8)	1.00 (0.67-1.52)	0.9645		

	Not informed	1 (0.2)	1 (100.0)	0 (0.0)	-			
EBF intention (IFI Scale score) ¹	< 16	221 (48.6)	87 (39.4)	134 (60.6)	1.55 (1.05-2.29)	0.0269	-	-
	16	234 (51.4)	69 (29.5)	165 (70.5)	Ref			
Have previously breastfed ¹	Yes	253 (55.6)	82 (32.4)	171 (65.6)	Ref		-	-
	No	202 (44.4)	74 (36.6)	128 (63.4)	1.21 (0.82-1.78)	0.3460		
Golden hour breastfeeding practice ¹	Yes	164 (36.0)	49 (29.9)	115 (70.1)	Ref		-	-
	No	288 (63.3)	106 (36.8)	182 (63.2)	1.37 (0.91-2.06)	0.1364		
	Not informed	3 (0.7)	1 (33.3)	2 (66.7)				
Proximal Level								
Intention to offer pacifier ¹	Yes	208 (45.7)	91 (43.8)	117 (56.2)	2.13 (1.36-3.33)	0.0009	2.13 (1.36-3.33)	0.0009
	No	157 (34.5)	42 (26.8)	115 (73.2)	Ref		Ref	
	Don't know	90 (19.8)	23 (25.6)	67 (74.4)	0.94 (0.52-1.70)	0.8375	0.94 (0.52-1.70)	0.8375
Intention to offer bottle-feeding ¹	Yes	250 (55.0)	101 (40.4)	149 (59.6)	2.33 (1.40-3.89)	0.0012	-	-
	No	111 (24.4)	25 (22.5)	86 (77.5)	Ref			
	Not informed	94 (20.7)	30 (31.9)	64 (68.1)	1.61 (0.87-3.00)	0.1399		

*Outcome event. Ref: Reference category for independent variables. OR: Odds Ratio. CI: Confidence Interval. AIC (empty model) = 587,05. AIC (final model) = 575,76. IFI: Infant Feeding Intention ¹ Information collected in the baseline. ² Information collected after delivery.

Babies whose mothers reported intending to offer a pacifier at the end of the pregnancy were more prone to offer it to their babies. It is important to consider that mothers who do not plan to BF, are undecided, or plan to BF for a short period, may choose to use a pacifier instead of the breast to comfort the baby and assist with weaning [18]. Additionally, there is a cultural issue in Brazil related to the offering of pacifiers to babies as early as in the first month of life, aiming to soothe them [31].

The pregnant women's intention to offer a pacifier was also associated with the use of pacifier+ bottle, even though the participants showed a strong intention to EBF, as demonstrated in a study conducted in a Brazilian urban center that showed an association between the use of bottle in the first month of the baby's life and the use of pacifier [23]. However, according to Jaafar et al. [32], mothers who are well motivated to breastfeed should be encouraged to make a decision about pacifier use based on their personal preferences. Thus, we recommend providing advice about the consequences of using artificial nipples on BF and the baby's health during pregnancy and after childbirth.








Considering the harmful effects of pacifiers and bottles for EBF practice and the health institutions recommendations, the health professional must also recognize the influence of culture and media exposure on the use of artificial nipples to guide future mothers since the gestational period. In case the family chooses to use them, the decision must be welcomed and respected since offering pacifiers and bottle-feeding provides emotional security for mother and baby, especially when the mother is not available. The findings of this study highlight the relevance of prenatal public policy measures aimed at improving the knowledge and empowering pregnant women about the deleterious effects of pacifier use and bottle-feeding on the baby's health and BF.

The limitations of this study include the failure to contact some of the participants at baseline due to telephone number changes. The strengths of this study are the design, quality of data, and statistical analysis.

Conclusion

About 50% of the babies used pacifier or were offered bottle-feeding, which were associated with the mothers' prenatal intention to offer them to their babies and socioeconomic factors. It is necessary to advise pregnant women about the consequences of pacifier and bottle-feeding use for the baby's health and breastfeeding.

Authors' Contributions

LSAM		https://orcid.org/0000-0001-7106-9783	Conceptualization, Methodology, Formal Analysis, Data Curation, Writing - Original Draft, Writing - Review and Editing and Funding Acquisition.
LFS		https://orcid.org/0000-0002-6932-6290	Conceptualization, Methodology, Data Curation and Writing - Review and Editing.
SRCS		https://orcid.org/0000-0002-0227-8896	Conceptualization, Methodology and Writing - Review and Editing.
FLR		https://orcid.org/0000-0002-6270-9168	Conceptualization, Methodology and Writing - Review and Editing.
AVJ		https://orcid.org/0000-0002-1776-0925	Conceptualization, Methodology and Writing - Review and Editing.
ACCZ		https://orcid.org/0000-0002-4518-331X	Conceptualization, Formal Analysis and Writing - Review and Editing.
EPST		https://orcid.org/0000-0001-6225-6915	Conceptualization, Methodology, Formal Analysis, Writing - Original Draft, Writing - Review and Editing, Supervision and Project Administration.

All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

Financial Support

This study was supported by the Coordination for the Improvement of Higher Education Personnel - Brazil (CAPES) - Funding Code 001.

Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

Acknowledgments

The authors would like to thank the maternity hospital and its employees for welcoming us, and the pregnant women for their participation in the study, to Dr. Cintia Regina Tornisiello Katz for contribution to the article writing, Dr. Laurie Nommsen-Rivers, for authorizing the use and Dr. Fernanda Góes for translating the Infant Feeding Intentions scale.

References

- [1] American Pediatric Association. Breastfeeding and the use of human milk. *Pediatrics* 2012; 129(3):e827-41. <https://doi.org/10.1542/peds.2011-3552>
- [2] Victora C, Bahl R, Barros AJD, França GVA, Horton S, Krasevec J, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifefong effect. *Lancet* 2016; 387(10017):475-90. [https://doi.org/10.1016/S0140-6736\(15\)01024-7](https://doi.org/10.1016/S0140-6736(15)01024-7)
- [3] Islam A, Manun A, Hossain M, Bharati P, Saw A, Lestrei PE, et al. Prevalence and factors associated with early initiation of breastfeeding among Bangladeshi mothers: a nationwide cross-sectional study. *PLoS One* 2019; 14(4):e0215733. <https://doi.org/10.1371/journal.pone.0215733>
- [4] Caminha MdFC, Serva VB, Anjos MMRd, Brito RBdS, Lins MM, Batista Filho M. Aleitamento materno exclusivo entre profissionais de um Programa Saúde da Família. *Cien Saúde Colet* 2011; 16(4):2245-50. <https://doi.org/10.1590/S1413-81232011000400023> [In Portuguese].
- [5] Brasil. Saúde da criança: Aleitamento Materno e Alimentação Complementar. 2 ed. Brasília: Ministério da Saúde; 2015:186. [In Portuguese].
- [6] Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS. How many child deaths can we prevent this year? *Lancet* 2003; 362(9377):65-71. [https://doi.org/10.1016/S0140-6736\(03\)13811-1](https://doi.org/10.1016/S0140-6736(03)13811-1)
- [7] Levy L, Bértolo H. Manual de Aleitamento Materno. Lisboa: UNICEF; 2012. [In Portuguese].
- [8] Gisfredi TF, Kimura JS, Reyes A, Bassi J, Drugowick R, Matos R, et al. Hábitos bucais deletérios e suas consequências em Odontopediatria. *Rev Bras Odontol* 2016; 73(2):144-9. [In Portuguese].
- [9] Batista CLC, Ribeiro VS, Nascimento M, Rodrigues VP. Association between pacifier use and bottle-feeding and unfavorable behaviors during breastfeeding. *J Pediatr* 2018; 94(6):596-601. <https://doi.org/10.1016/j.jpmed.2017.10.005>

- [10] World Health Organization, United Nations Children's Fund. Ten steps to successful breastfeeding. 2018. Available from: <https://www.who.int/activities/promoting-baby-friendly-hospitals/ten-steps-to-successful-breastfeeding> [Accessed on April 22, 2020].
- [11] Brasil. Bases para a discussão da política nacional de promoção, proteção e apoio ao aleitamento materno. Brasília: Ministério da Saúde Brasília; 2017. [In Portuguese].
- [12] Buccini GDS, Pérez-Escamilla R, Paulino LM, Araújo CL, Venancio SI. Pacifier use and interruption of exclusive breastfeeding: Systematic review and meta-analysis. *Matern Child Nutr* 2017; 13(3):e12384. <https://doi.org/10.1111/mcn.12384>
- [13] Kotowski J, Fowler C, Hourigan C, Orr F. Bottle-feeding an infant feeding modality: An integrative literature review. *Matern Child Nutr* 2020; 16(2):e12939. <https://doi.org/10.1111/mcn.12939>
- [14] Costa AD, Tagliaferro EPdS, Costa ED, Ambrosano GMB, Possobon RdF. Expectation of parental control and the maintenance of bottle-feeding in childhood. *J Pediatr* 2021; 97(2):225-32. <https://doi.org/10.1016/j.jpmed.2020.03.002>
- [15] Feldens CA, Rodrigues PH, de Anastácio G, Vítole MR, Chaffee BW. Feeding frequency in infancy and dental caries in childhood: a prospective cohort study. *Int Dent J* 2018; 68(2):113-21. <https://doi.org/10.1111/idj.12333>
- [16] Lakshman R, Ogilvie D, Ong KK. Mothers' experiences of bottle-feeding: a systematic review of qualitative and quantitative studies. *Arch Dis Child* 2009; 94(8):596-601. <https://doi.org/10.1136/adc.2008.151910>
- [17] Buccini GdS, Pérez-Escamilla R, Venancio SI. Pacifier use and exclusive breastfeeding in Brazil. *J Hum Lact* 2016; 32(3):Np52-60. <https://doi.org/10.1177/0890334415609611>
- [18] Adair SM. Pacifier use in children: a review of recent literature. *Pediatr Dent* 2003; 25(5):449-58.
- [19] Costa CTd, Shqair AQ, Azevedo MS, Goettens ML, Bonow MLM, Romano AR. Pacifier use modifies the association between breastfeeding and malocclusion: a cross-sectional study. *Braz Oral Res* 2018; 32:e101. <https://doi.org/10.1590/1807-3107bor-2018.vol32.0101>
- [20] Buccini GdS, Benício MHDA, Venancio SI. Determinants of using pacifier and bottle feeding. *Rev Saúde Pública* 2014; 48(4):571-82. <https://doi.org/10.1590/s0034-8910.2014048005128>
- [21] Bezerra VM, Magalhães EldS, Pereira IN, Gomes AT, Pereira M, Rocha DdS. Prevalence and determinants of the use of pacifiers and feedingbottle: a study in Southwest Bahia. *Rev Bras Saude Mater Infant* 2019; 19(2):311-21. <https://doi.org/10.1590/1806-93042019000200004>
- [22] Miranda C, de Sousa TM, do Carmo AS, Pereira SCL, Notaro KAM, Dos Santos LC. Use of artificial nipples among Brazilian infants and associated factors. *J Trop Pediatr* 2020; 66(5):511-6. <https://doi.org/10.1093/tropej/fmaa007>
- [23] França MCT, Giugliani ERJ, Oliveira LdD, Weigert EML, Santo LCdE, Köhler CV, et al. Uso de mamadeira no primeiro mês de vida: determinantes e influência na técnica de amamentação. *Rev Saúde Pública* 2008; 42(4):607-14. <https://doi.org/10.1590/S0034-89102008005000028> [In Portuguese].
- [24] Peduzzi P, Concato J, Kemper E, Holford TR, Feinstein AR. A simulation study of the number of events per variable in logistic regression analysis. *J Clin Epidemiol* 1996; 49(12):1373-9. [https://doi.org/10.1016/s0895-4356\(96\)00236-3](https://doi.org/10.1016/s0895-4356(96)00236-3)
- [25] Nommsen-Rivers LA, Dewey KG. Development and validation of the infant feeding intentions scale. *Matern Child Health J* 2009; 13(3):334-42. <https://doi.org/10.1007/s10995-008-0356-y>
- [26] Góes FGB, Ledo BC, Santos AST, Pereira-Ávila FMV, Silva ACSS, Christoffel MM. Cultural adaptation of Infant Feeding Intentions Scale (IFI) for pregnant women in Brazil. *Rev Bras Enferm* 2020; 73(Suppl 4):e20190103. <https://doi.org/10.1590/0034-7167-2019-0103>
- [27] Silva LF, Cortellazzi KL, Melo LSA, Silva SRC, Rosell FL, Valsecky Júnior A, et al. Exclusive breastfeeding intention among pregnant women and associated variables: a cross-sectional study in a Brazilian community. *Rev Paul Pediatr* 2024; 42:e2022192. <https://doi.org/10.1590/1984-0462/2024/42/2022192>
- [28] Santos ASTd, Góes FGB, Ledo BC, Silva Lfd, Bastos MPdC, Silva MdA. Family learning demands about post-natal newborn care. *Texto Contexto-Enferm* 2021; 30:e20190352. <https://doi.org/10.1590/1980-265X-TCE-2019-0352>
- [29] Appleton J, Russell CG, Laws R, Fowler C, Campbell K, Denney-Wilson E. Infant formula feeding practices associated with rapid weight gain: A systematic review. *Matern Child Nutr* 2018; 14(3):e12602. <https://doi.org/10.1111/mcn.12602>
- [30] Pineda R, Luong A, Ryckman J, Smith J. Pacifier use in newborns: related to socioeconomic status but not to early feeding performance. *Acta Paediatr* 2018; 107(5):806-10. <https://doi.org/10.1111/apa.14253>
- [31] da Silva JMD, Fernandes DC, Lima ECP, Farias MRS. Uso prolongado da chupeta e suas repercussões clínicas na saúde bucal da criança: uma revisão integrativa. *Cad. Grad Ciênc Biol Saúde Unit* 2018; 5(1):55-66. [In Portuguese].
- [32] Jaafar SH, Ho JJ, Jahanfar S, Angolkar M. Effect of restricted pacifier use in breastfeeding term infants for increasing duration of breastfeeding. *Cochrane Database Syst Rev* 2016; 2016(8):Cd007202. <https://doi.org/10.1002/14651858.CD007202.pub4>