

Determinants of exclusive breastfeeding cessation: identifying an “at risk population” for special support

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Abstract A study was conducted with 542 women, who gave birth in the hospital G.B. Grassi in Rome, to investigate risk factors for exclusive breastfeeding. Clinical data was collected from clinical records at delivery. Information on psychosocio-demographic characteristics was obtained by standardized questionnaires at delivery. Data on breastfeeding practice and the use of pacifier were collected at delivery and for 24 weeks' postpartum. The outcome of the study was exclusive breastfeeding for at least 4 months (yes/no). In the multivariate analysis, planned caesarean (OR 2.40, 95 % CI 1.06–5.43) and women with two or more psychological distress conditions (past episodes of depression, insomnia, perceive birth as a traumatic event) versus none were at a greater odds of stopping exclusive breastfeeding before 4 months (OR 3.42, 95 % CI 1.15–10.2). The use of pacifiers within the first 2 weeks postpartum (OR 2.38, 95 % CI 1.35–4.20) but not after 2 weeks (OR 0.86, 95 % CI 0.43–1.72) versus no use was

also associated with an increased odds. A protective effect was found for antenatal classes (OR 0.57, 95 % CI 0.35–0.95).

Conclusion: This study suggests that the type of delivery, antenatal classes, psychological distress conditions and the use of pacifiers in the first 2 weeks of a baby's life are independent factors associated with exclusive breastfeeding.

Keywords Exclusive breastfeeding cessation · Risk factors

Abbreviations

AAP	American Academy of Pediatrics
BMI	Body mass index
CI	Confidence intervals
G.B.	Giovan Battista
OR	Odds ratio
WHO	World Health Organization
UNICEF	United Nations Children's Fund

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Introduction

Breastfeeding results in improved infant and maternal health outcomes in both the industrialized and developing world. The WHO, the UNICEF, the American Academy of Pediatrics (AAP) and other organizations endorse exclusive breastfeeding as the preferred source of infant nutrition for infants younger than 6 months because of its proven benefits for infants and mothers [6, 11]. Breastfeeding provides many short- and long-term health benefits for mothers who breastfed [10, 27]. Infants who were breastfed according to the international recommendations (exclusive breastfeeding for about 6 months) seem to have lower risk of many diseases, mainly gastrointestinal and respiratory infections [3, 10]. Mothers who breastfed have decreased postpartum blood loss and more rapid involution of the uterus and return more rapidly to their pre-pregnant weight [10]. Long-term benefits for mothers who breastfed include a decreased risk of ovarian cancer [14] and type II diabetes [27]. Despite the many health benefits of breastfeeding for infants and mothers, the worldwide prevalence of infants who are breastfed exclusively for the first 6 months is less than 36 %. For example, 47.2 % of infants in the USA are still breastfed at 6 months, but only 16.3 % exclusively [2], while in Italy the prevalence of exclusive breastfeeding at discharge and at 3 months is 60.8 and 49.3 %, respectively [12]. While numerous factors have been shown to influence the initiation, duration and exclusiveness of breastfeeding such as maternal education [29], age [5], employment [8], smoking [7], marital status [21], antenatal classes [22], body mass index [18] and pacifier use [16], some researchers suggest that psychological factors may be also linked to the duration of breastfeeding [20]. In our study, we hypothesized that psychological factors affect exclusive breastfeeding practice.

Material and methods

This study was embedded in a longitudinal study conducted on 605 Italian women who gave birth between 2000 and 2001 in the hospital G.B. Grassi in Rome, Italy, and could be contacted by telephone. Women whose babies were hospitalized immediately following birth were not enrolled in the study because they could not participate in the follow-up study. The study was approved by the Ethics Committee of the Local Health Authority and written consent was obtained from all participants. Among the 605 mothers who initially participated in the study, 542 (89.6 %) completed the follow-up. The outcome of the study was exclusive breastfeeding for at least 4 months (no/yes). Questionnaires administered by telephone every 2 weeks for 6 months postpartum (12 interval questionnaires) were used to assess the use of pacifier, breastfeeding practice, duration and exclusiveness based on WHO definitions. At each of the postnatal surveys, the

mothers were asked whether they were still breastfeeding. “Exclusive breastfeeding” was defined as no other food or drink, not even water for 6 months of life.

Clinical data were obtained from hospital clinical records at the time of delivery, and a standardized questionnaire was administered in the hospital by trained interviewers to all women enrolled in the study. The following information was collected and categorized as gestational age (early term ≤ 38 weeks, full term >38 weeks) [28], health status of the mother (e.g. thyroid diseases, chronic bronchitis, hypertension), intention to exclusive breastfeed (no/yes), parity, type of delivery (vaginal; planned caesarean, urgent caesarean), planned pregnancy (no/yes), employment during pregnancy (no/yes), antenatal classes (prepare mothers for baby’s birth and how to look after and feed their baby) (no/yes), past experience with breastfeeding (no; yes, less than 4 months; yes, for at least 4 months), past episodes of depression (no/yes), presence of insomnia before pregnancy (no/yes), self-perception of the birth experience as a traumatic event (no/yes), in-hospital breastfeeding initiation (no/yes), family support during labour (no/yes), ever smoking (no/yes), smoking habits during pregnancy (no/yes), neonatal problems such as respiratory problems, low blood glucose, infection, jaundice (no/yes) and infant’s sex, birth weight (<3 kg; ≥ 3 kg) and Apgar score (<8 ; ≥ 8). Intention to breastfeed was assessed by asking mothers their infant’s feeding choice (exclusive breastfeeding or bottle feeding or mixed feeding). Smoking included subjects who smoked at least five cigarettes a day. Educational level was classified into two categories: low level (primary or middle school education) and high level (university degree or graduated high school). Educational attainment was used as a proxy measure of social class. The presence of episodes of depression (pre-pregnancy) was assessed by asking the mothers whether they had episodes of depression diagnosed by a doctor before pregnancy and whether they followed a specific treatment (medication and/or psychological support). Insomnia (pre-pregnancy) was assessed by asking women if they suffered from insomnia defined as difficulty of initiating or maintaining sleep, or non-restorative sleep, for at least 1 month. A combined variable was created for the expressions of psychological distress. The variable was classified into three levels: none, the presence of at least one psychological distress condition (episodes of depression or insomnia or traumatic perception of birth) and the presence of two or more psychological distress conditions. Body mass index (BMI) was used to assess nutritional status. BMI was defined as weight in kilogrammes divided by height squared. BMI was categorized into four classes according to the WHO classification (<18.5 , 18.5 – 24.9 , 25.0 – 29.9 , ≥ 30.0).

Statistical analysis

Unconditional logistic regression analysis was used to identify factors associated with exclusive breastfeeding for at least

4 months. Crude and adjusted odds ratios (ORs) with 95 % confidence intervals (95 % CI) were calculated.

Age of the mother and all variables with a P value ≤ 0.05 (Wald test) in the bivariate analysis were included in the multivariable model. The following variables were included: age of the mother, educational level, ever smoking, antenatal classes, type of delivery, pacifier use and the psychological distress variable. We also controlled, one at a time in the model, for other potential confounders such as gestational age, parity, in-hospital breastfeeding initiation, health status of the mother, marital status, BMI, smoking during pregnancy, employment during early pregnancy, family support during delivery, past experience of breastfeeding, neonatal problems (respiratory problems, low blood glucose, infection, jaundice), birth weight, infant's sex and Apgar score. However, none of the variables contributed significantly to the model. The likelihood-ratio test was used to decide whether to keep each variable in the model (P value < 0.05). To test if different groups have different risk estimates, we evaluated effect modification by age, educational level, parity and exclusive breastfeeding for at least 4 months. All the analyses were performed using STATA software package PC-STATA (Stata 11.0, StataCorp LP, College Station, TX).

Results

A total of 542 women participated in the study, and the mean age was 29.3 years (SD=4.8) for primiparous women and 33.2 years (SD=4.2) for multiparous women. In our study, 537 (99.1 %) mothers intended to exclusively breastfeed their babies, 1 mother intended to bottle feed (0.18 %) and 4 mothers (0.74 %) intended to feed their babies with "mixed feeding" (breastfeeding and bottle feeding). Among 542 women, 402 women (74.2 %) exclusively breastfed their infants for at least 2 weeks, 343 women (63.3 %) for 1 month, 264 women (48.7 %) for 2 months, 166 women (30.6 %) for 3 months and 87 women (16.1 %) for 4 months or more. No statistically significant differences were found between the study base and subjects with complete follow-up and between patients with complete follow-up and patients lost to follow-up for the following variables: age, educational level, employment during pregnancy, BMI, smoking, smoking during pregnancy, health status of the mother, insomnia, past depression episodes, perception of infant's birth as a traumatic event, psychological distress condition, parity, previous breastfeeding experience, planned pregnancy, attendance at antenatal classes, family support during labour, type of delivery, infant's sex, gestational age, birth weight, Apgar score, neonatal problems and in-hospital breastfeeding initiation, except for marital status (see supplementary Table 1).

Table 1 shows the characteristics of women participating in the study by exclusive breastfeeding practice. High level of

education (OR 0.57, 95 % CI 0.34–0.94) and antenatal classes (OR 0.52, 95 % CI 0.32–0.82) were protective factors for exclusive breastfeeding for 4 months or more while planned caesarean, versus vaginal delivery, was associated with an increased odds (OR 2.17, 95 % CI 1.00–4.71, P value=0.051). An increased odds of stopping exclusive breastfeeding before 4 months was found for ever smoking (OR 1.70, 95 % CI 0.99–2.90, P value=0.053). Depression episodes in lifetime (OR 1.87, 95 % CI 0.83–4.23), insomnia (OR 1.77, 95 % CI 0.78–4.01) and perception of birth as a traumatic event (OR 1.54, 95 % CI 0.95–2.50) were all associated with an increased odds of stopping exclusive breastfeeding before 4 months, although it did not reach statistical significance. However, women with the presence of two or more psychological distress conditions (depression episodes in lifetime, insomnia, experienced birth as a traumatic event) versus none had a threefold increased odds of stopping exclusive breastfeeding before 4 months (OR 3.52, 95 % CI 1.22–10.1). No association was found for age of the mother, past experience on breastfeeding, marital status, being employed during pregnancy, BMI, smoking during pregnancy, mother's health problems, parity, planned pregnancy and family support during labour.

Table 2 shows the characteristics of the newborns participating in the study by exclusive breastfeeding practice. In our study, 93.0 % initiated breastfeeding in the hospital. An increased odds for stopping exclusive breastfeeding was found for the use of pacifier within the first 2 weeks postpartum (OR 2.39, 95 % CI 1.38–4.14) but not for the use of pacifier after the first 2 weeks postpartum (OR 0.91, 95 % CI 0.47–1.77) in comparison with no pacifier use. No association was found for infant's sex, infant's health, gestational age, birth weight, Apgar score, neonatal problems (respiratory problems, low blood glucose, infection, jaundice) and in-hospital breastfeeding initiation.

Table 3 reports the results of the multivariate analysis. The odds associated with the presence of two psychological distress conditions, planned caesarean section, antenatal classes and the use of pacifiers within the first 2 weeks postpartum remained statistically significant in the multivariate model. Women with the presence of two or more psychological distress conditions had a threefold increased odds of stopping exclusive breastfeeding before 4 months (OR 3.42, 95 % CI 1.15–10.2) in comparison to women with none of these conditions. Increased odds remained after adjustments for planned caesarean (OR 2.40, 95 % CI 1.06–5.43) versus vaginal delivery and the use of pacifier within the first 2 weeks postpartum versus no use (OR 2.38, 95 % CI 1.35–4.20). The protective effect of antenatal classes (OR 0.57, 95 % CI 0.35–0.95) also remained statistically significant in the model. The effect of mother's educational level and ever smoking were no longer significant in the multivariate model.

Table 1 Socio-demographic and individual characteristics of the women participating in the study by exclusive breastfeeding

	Total (N=542)	Exclusive breastfeeding for at least 4 months		ORs (95 % CI) ^b	P value
	N (%) ^a	Yes (N=87) ^a	No (N=455) ^a		
Age group (years)					
<30	199 (36.7)	29 (37.4)	170 (33.3)	1	
30–34	196 (36.2)	30 (36.5)	166 (34.5)	0.94 (0.54–1.64)	0.84
≥35	147 (27.1)	28 (26.1)	119 (32.2)	0.73 (0.41–1.28)	0.27
Educational level (years)					
Low (≤8)	207 (38.2)	24 (27.6)	183 (40.2)	1	
High (>8)	335 (61.8)	63 (72.4)	272 (59.8)	0.57 (0.34–0.94)	0.03
Marital Status					
Married	440 (81.2)	72 (82.8)	368 (80.9)	1	
Not married	102 (18.8)	15 (17.2)	87 (19.1)	1.13 (0.62–2.07)	0.68
Employment during early pregnancy					
No	231 (42.6)	31 (35.6)	200 (44.0)	1	
Yes	311 (57.4)	56 (64.4)	255 (56.0)	0.71 (0.44–1.14)	0.15
Body mass index (kg/m ²)					
<18.5	51 (9.7)	6 (7.0)	45 (10.2)	1	
18.5–24.9	380 (72.2)	61 (70.9)	319 (72.5)	0.70 (0.28–1.71)	0.43
25.0–29.9	68 (12.9)	17 (19.8)	51 (11.6)	0.40 (0.15–1.10)	0.08
≥30.0	27 (5.1)	2 (2.3)	25 (5.7)	1.67 (0.31–8.88)	0.55
Ever smoking					
No	369 (68.1)	67 (77.0)	302 (66.4)	1	
Yes	173 (31.9)	20 (23.0)	153 (33.6)	1.70 (0.99–2.90)	0.05
Smoking during pregnancy					
No	442 (81.6)	71 (81.6)	371 (81.5)	1	
Yes	100 (18.4)	16 (18.4)	84 (18.5)	1.00 (0.56–1.82)	0.99
Health problems ^c					
No	503 (92.8)	80 (92.0)	423 (93.0)	1	
Yes	39 (7.2)	7 (8.0)	32 (7.0)	0.86 (0.37–2.03)	0.74
Insomnia					
No	474 (87.5)	80 (92.0)	394 (86.6)	1	
Yes	68 (12.5)	7 (8.0)	61 (13.4)	1.77 (0.78–4.01)	0.17
Depression episodes in life					
No	471 (86.9)	80 (92.0)	391 (85.9)	1	
Yes	71 (13.1)	7 (8.0)	64 (14.1)	1.87 (0.83–4.23)	0.13
Perception of birth experience					
Peaceful event	315 (58.1)	58 (66.7)	257 (56.5)	1	
Traumatic event	227 (41.9)	29 (33.3)	198 (43.5)	1.54 (0.95–2.50)	0.08
Psychological distress condition					
None	263 (48.5)	50 (57.5)	213 (46.8)	1	
Presence of 1 condition ^d	215 (39.7)	33 (37.9)	182 (40.0)	1.29 (0.80–2.10)	
Presence of 2 conditions ^e	64 (11.8)	4 (4.6)	60 (13.2)	3.52 (1.22–10.1)	0.02
Parity					
Multiparous	243 (44.8)	34 (39.1)	209 (45.9)	1	
Primiparous	299 (55.2)	53 (60.9)	246 (54.1)	0.76 (0.47–1.21)	0.24
Previous breastfeeding experience					
No	335 (63.2)	55 (64.0)	280 (63.1)	1	
Yes, less than 4 months	72 (13.6)	8 (9.3)	64 (14.4)	1.57 (0.71–3.46)	0.26
Yes, for at least 4 months	123 (23.2)	23 (26.7)	100 (22.5)	0.85 (0.50–1.46)	0.57

Table 1 (continued)

	Total (N=542)	Exclusive breastfeeding for at least 4 months		ORs (95 % CI) ^b	P value
	N (%) ^a	Yes (N=87) ^a	No (N=455) ^a		
Planned pregnancy					
No	186 (34.3)	28 (32.2)	158 (34.7)	1	
Yes	356 (65.7)	59 (67.8)	297 (65.3)	0.89 (0.55–1.46)	0.65
Attendance at antenatal classes					
No	363 (67.0)	47 (54.0)	316 (69.5)	1	
Yes	179 (33.0)	40 (46.0)	139 (30.5)	0.52 (0.32–0.82)	0.006
Family support during labour					
No	180 (33.2)	28 (32.2)	152 (33.4)	1	
Yes	362 (66.8)	59 (67.8)	303 (66.6)	0.95 (0.58–1.54)	0.82
Type of delivery					
Vaginal	352 (64.9)	64 (73.6)	288 (63.3)	1	
Caesarean (planned)	86 (15.9)	8 (9.2)	78 (17.1)	2.17 (1.00–4.71)	0.05
Caesarean (urgent)	104 (19.2)	15 (17.2)	89 (19.6)	1.32 (0.72–2.43)	0.38

ORs odds ratios, CI confidence intervals

^a Totals may vary because of missing values

^b ORs indicate the probability of stopping exclusive breastfeeding

^c Thyroid disease, chronic bronchitis, hypertension, hepatitis, epilepsy

^d Insomnia and/or depression episodes in life or experienced birth as a traumatic event

^e Insomnia and/or depression episodes in life and experienced birth as a traumatic event

Discussion

Although there is growing evidence that supports the importance of exclusive breastfeeding, not many mothers follow this practice. Our study suggests that planned caesarean, no attendance at antenatal classes, the presence of two or more psychological distress conditions and the use of pacifiers in the first 2 weeks are independent factors for non-exclusive breastfeeding.

Although breastfeeding is a natural behaviour, it may pose difficulties for some mothers. In our study, we found that women with two or more psychological distress conditions (history of depression episodes, insomnia, perception of birth delivery as a traumatic event) were three times more likely to interrupt exclusive breastfeeding before 4 months, independent of other risk factors. A possible explanation is the biological effect of psychological distress on milk production. Oxytocin is modulated by the central nervous system and psychological well-being seems necessary for an adequate let-down response [29, 4]. Experimental studies in breastfeeding women show that both acute physical and mental stress can impair the milk ejection reflex by reducing the release of oxytocin and thus reduce milk production [20]. Depression, anxiety and stress are all associated with decrease oxytocin levels [25, 26]. It has been suggested that for some women, close contact and intimate relationship with the infant

may be experienced as distressing, intolerable and unpleasant [26]. Therefore, we could also speculate a relapse among women suffering from two or more psychological distress conditions due to the emotional impact of infant birth which then interfere with breastfeeding. The findings of our study reinforce the link between psychological factors and breastfeeding [30, 1]. A study conducted in Turkey showed an association between maternal depressive symptoms during the postpartum period and cessation of exclusive breastfeeding at 4 months. However, the study of Akman and colleagues was very small ($n=60$) and they did not control for potential confounding factors [1]. A study conducted in Norway showed that maternal “negative affectivity” (anxiety, depression, irritability and negative view of oneself) was associated with breastfeeding cessation. However, information was available only for predominant and mixed feedings, and not for exclusive breastfeeding, and the authors did not adjust for all possible factors that could influence breastfeeding as we did in our study [30].

Antenatal classes have been suggested to increase breastfeeding duration [22, 15]. Our study confirms that antenatal classes are an independent risk factor for breastfeeding exclusivity and suggests that women attending an antenatal educational course have half the odds of stopping exclusive breastfeeding before 4 months in comparison to women not attending it. Pannu and colleagues showed that individual

Table 2 Newborn characteristics by exclusive breastfeeding

	Total (N=542) N (%) ^a	Exclusive breastfeeding for at least 4 months		ORs (95 % CI) ^b	P value
		Yes (N=87) ^a	No (N=455) ^a		
Infant's sex					
Males	274 (50.6)	47 (54.0)	227 (49.9)	1	
Females	268 (49.4)	40 (46.0)	228 (50.1)	1.18 (0.75–1.87)	0.48
Gestational age					
(≤38 weeks)	95 (17.5)	12 (13.8)	83 (18.2)	1	
(>38 weeks)	447 (82.5)	75 (86.2)	372 (81.8)	0.72 (0.37–1.38)	0.32
Birth weight (kg)					
High (≥3)	450 (83.0)	77 (88.5)	373 (82.0)	1	
Low (<3)	92 (17.0)	10 (11.5)	82 (18.0)	1.69 (0.84–3.41)	0.14
Apgar score					
High (≥8)	473 (87.3)	394 (86.6)	79 (90.8)	1	
Low (<8)	69 (12.7)	61 (13.4)	8 (9.2)	1.53 (0.70–3.32)	0.28
Neonatal problems ^c					
No	490 (90.4)	82 (94.3)	408 (89.7)	1	
Yes	52 (9.6)	5 (5.7)	47 (10.3)	1.89 (0.73–4.89)	0.19
In-hospital breastfeeding initiation					
Yes	504 (93.0)	82 (94.3)	422 (92.8)	1	
No	38 (7.0)	5 (5.7)	33 (7.2)	1.28 (0.49–3.38)	0.62
Pacifier use					
No	110 (20.3)	26 (29.9)	84 (18.5)	1	
Yes, within the first 2 weeks ^d	349 (64.4)	40 (46.0)	309 (67.9)	2.39 (1.38–4.14)	0.002
Yes, after the first 2 weeks ^e	83 (15.3)	21 (24.1)	62 (13.6)	0.91 (0.47–1.77)	0.79

ORs odds ratios, CI confidence intervals

^a Totals may vary because of missing values

^b ORs indicate the probability of stopping exclusive breastfeeding

^c e.g. respiratory problems, low blood glucose, infection, jaundice

^d Introduction of pacifier use within the first 2 weeks of life

^e Introduction of pacifier use after the first 2 weeks of life

consultation or discussion on breastfeeding with hospital staff in the antenatal period was significantly associated with fully breastfeeding at 6 months postpartum [22].

Our data is in agreement with studies published elsewhere which showed that the adverse association between caesarean delivery and breastfeeding is limited to scheduled caesarean [13, 23, 24]. A possible explanation of our findings is that the magnitude of oxytocin and prolactin responses, which play mediating roles in milk ejection and in establishing mother-infant interaction, differs in mothers delivering by caesarean and vaginally [19, 23]. However, it does not explain the lack of association between urgent caesarean section and exclusive breastfeeding in our study.

The role of pacifiers on breastfeeding duration or exclusivity is not yet clear [9, 16]. A study conducted by Jaafar and colleagues showed that pacifier use (use versus no use) in healthy breastfeeding infants have no significant effect on the proportion of infants exclusively breastfed at 4 months of age

(RR 0.99, 95 % CI 0.92–1.06) [9]. However, a study published elsewhere showed that pacifiers given to infants before 4 weeks and used most days were significantly associated with shorter duration of breastfeeding [16]. In our study, we found that the use of pacifier within the first 2 weeks postpartum, but not after the first 2 weeks, was associated with an increased odds for exclusive breastfeeding cessation before 4 months. A possible explanation for the deleterious effect of the use of pacifiers in the first 2 weeks postpartum may be linked to not breastfeeding “on demand” that is essential to ensure continued production of milk.

The present study has some strengths and some limitations. The strength of our study is the large sample size and the control of many potential confounding variables. As far as we are aware, this is the first study showing the association between psychological factors and exclusive breastfeeding, independently of a wide range of different maternal and infant factors. A limitation of your study is that we did not collect

Table 3 Determinants of exclusive breastfeeding: multivariate analysis

	ORs (95 % CI) ^{a,b}	P value
Age group (years)		
<30	1	
30–34	0.96 (0.54–1.73)	0.90
≥35	0.66 (0.36–1.22)	0.19
Educational level (years)		
Low (≤8)	1	
High (>8)	0.70 (0.41–1.20)	0.20
Ever smoking		
No	1	
Yes	1.28 (0.73–2.24)	0.40
Psychological distress condition		
None	1	
Presence of 1 condition ^c	1.34 (0.81–2.22)	0.26
Presence of 2 conditions ^d	3.42 (1.15–10.2)	0.03
Attendance at antenatal classes		
No	1	
Yes	0.57 (0.35–0.95)	0.03
Type of delivery		
Vaginal	1	
Caesarean (planned)	2.40 (1.06–5.43)	0.04
Caesarean (urgent)	1.20 (0.63–2.29)	0.58
Pacifier use		
No	1	
Yes, within the first 2 weeks ^e	2.38 (1.35–4.20)	0.003
Yes, after the first 2 weeks ^f	0.86 (0.43–1.72)	0.66

ORs odds ratios, CI confidence intervals

^a ORs indicate the probability of stopping exclusive breastfeeding

^b Adjusted for age, education, smoking habits, antenatal classes, type of delivery and pacifier use

^c Insomnia and/or depression episodes in life or experienced birth as a traumatic event

^d Insomnia and/or depression episodes in life and experienced birth as a traumatic event

^e Introduction of pacifier use within the first 2 weeks of life

^f Introduction of pacifier use after the first 2 weeks of life

data regarding the frequency of pacifier use. However, we collected data regarding the use of pacifiers versus no use, every 2 weeks from birth. Limitations of our study include the possibility of information bias. However, misclassification may occur if subjects, aware of the study hypothesis, influence responses. In our study, neither the subjects nor the study collaborators responsible for collecting the data were aware of the study hypothesis. Another potential limitation of our study was the lack of a question at baseline regarding mothers' plan for the duration of exclusive breastfeeding in order to measure compliance of breastfeeding duration. However, we measured at baseline both mothers' intention to breastfeed and choice of infants' feeding (exclusive breastfeeding, bottle

feeding, mixed feeding). One important aspect in a follow-up study is the dropouts. If the baseline characteristics of the dropouts differ from the population that completed the follow-up, a bias could be introduced. However, in our study, no difference in the baseline characteristics was observed between dropouts and the population who completed the follow-up.

In this study, we identified factors and a profile of women that may need additional support in the postpartum period. Finally, early identification of an “at risk” population may be one of the steps to increase exclusive breastfeeding compliance and thus ensures that infants receive the full benefits of exclusive breastfeeding.

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Conflict of interest The authors have no conflicts of interest to disclose.

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