Published in final edited form as:

Acta Paediatr. 2018 May ; 107(5): 806–810. doi:10.1111/apa.14253.

Exploratory study found that pacifier use did not affect feeding performance in full-term newborn infants but it was related to lower socioeconomic status

Roberta Pineda^{1,2}, Anhthi Luong¹, Justin Ryckman¹, and Joan Smith³

¹Program in Occupational Therapy, Washington University School of Medicine, St. Louis, MO

²Department of Pediatrics, Washington University School of Medicine, St. Louis, MO

³St. Louis Children's Hospital, St. Louis, MO

Abstract

Aim—Mothers are often advised not to use pacifiers until breastfeeding has been well-established. This study determined the infant and social factors that were related to pacifier use during the first few days of life and whether it led to alterations in feeding performance.

Methods—We enrolled 42 full-term infants and their mothers at Barnes-Jewish Hospital in urban St Louis, USA, in 2015. Before they were discharged the mothers completed a questionnaire, and infant feeding was assessed using a standardised assessment.

Results—There were 24 (57%) infants who used a pacifier during the first few days of life and seven (29%) of these were exclusively breastfed. Pacifier use was less common among mothers who exclusively breastfed ($p=0.04$). Pacifier use was more common among mothers whose income was less than 25,000 US dollars ($p=0.02$), who were single ($p=0.002$) and who did not have a college education ($p=0.03$). No associations between pacifier use and feeding performance were observed.

Conclusion—While lower socioeconomic status was related to pacifier use, feeding performance in the first few days of life was no different between those infants who did and did not use pacifiers after a full-term birth.

Keywords

breastfeeding; full-term birth; infant; pacifier; socioeconomic status

INTRODUCTION

There are almost four million infants born each year in the United States (1). Improving the health and development of newborn infants has become increasingly important, as more is

Address correspondence to: Roberta Pineda, PhD, OTR/L, Washington University School of Medicine, Program in Occupational Therapy, 1 Children's Place, St. Louis, MO, 63110, USA, pineda_r@kids.wustl.edu, Phone: 314-286-1304, Fax: 314-286-1261. DR. ROBERTA G PINEDA (Orcid ID: 0000-0001-9240-4798)

Conflict of interest

The authors have no conflicts of interest to declare.

learned about factors that can alter the safety, health and wellbeing of infants. Studies have shown that breastfeeding practices play a significant role in optimising the health of infants, which have led to recommendations for exclusive breastfeeding for at least the first six months of life (2). Due to the significant benefits of breastfeeding (2–4), education and support are common in and out of the hospital. However, there are many prenatal, medical, hospital, societal and sociocultural barriers that make it more difficult for mothers to actively meet the recommended goals for breastfeeding (5,6). One potential barrier to breastfeeding that has been identified is the use of artificial teats (7–13).

Avoiding pacifiers and artificial teats is one of the guidelines in the Baby Friendly Hospital Initiative's (BFHI) document *The Ten Steps to Successful Breastfeeding* (14,15). However, avoiding pacifiers has stirred up controversy within the medical community (16,17). Pacifiers are non-nutritive sucking devices that are used to calm infants and have become a cultural norm in the majority of countries (18–20). These devices are especially useful during painful procedures and for self-soothing in infants (21). More notably, research has demonstrated that pacifiers may be important in protecting infants from sudden infant death syndrome (22–24). However, some reports have indicated that pacifiers can affect early weaning, increase the likeliness of otitis media and cause dental problems (2,18,19,25). Pacifiers have also been criticised for delaying speech development and having an impact on sleeping habits (18). Finally, the use of pacifiers has been grouped together with evidence about the use of bottle nipples for oral feeding (13), resulting in perceptions that pacifiers can negatively impact the breastfeeding process. A Cochrane Review from 2016 identified three trials that demonstrated pacifier use and the impact on breastfeeding duration, but only two that included healthy breastfeeding infants were included in the meta-analysis. The authors concluded that the use of pacifiers had no significant effect on the proportion of infants who were fully and partially breastfeeding at three months of age and no effect on those who were breastfeeding at four months (26). It remained unclear what factors predicted pacifier use, during an era when pacifiers were discouraged in the newborn period. In addition, it remained unclear whether pacifier use was related to alterations in early feeding performance. The objectives of the current study were to determine factors that related to early pacifier use and to determine the relationships between pacifier use and early feeding skills.

METHODS

This was an observational study that investigated factors related to pacifier use as well as identified relationships between pacifier use and feeding performance in full-term, healthy newborn infants. In 2015 we enrolled 51 consecutively admitted full-term infants, who were born at 37 weeks of gestation or later within the first days of life. The infants were part of an overarching study that measured early auditory exposure, neurobehavioral performance and feeding outcome in full-term infants in the first few days. Infants with an identified congenital anomaly, brain injury, intensive care stay or who had parents who were non-English speakers were excluded. Infants were enrolled at Barnes-Jewish Hospital, which has a 35-bed mother and baby unit, and is located in urban St Louis in the United States. After the mother signed informed consent, she completed a questionnaire that identified sociodemographic factors and pacifier use practices. The infants underwent a feeding

assessment within the first few days of life. All study procedures were conducted by the fourth day of life, while the infants and their mothers were hospitalised on the newborn floor of the hospital. There were 42 infants who had data on whether or not pacifiers were used, as some parents did not answer questions about pacifier use.

Questionnaire

The parents completed a written questionnaire prior to discharge. The questionnaire defined gender, whether the mode of feeding was breastfed, bottle fed or both, whether the dyad was African American or non-African American and the socioeconomic status of the family, categorised as annual income of less than 25,000 US dollars or greater than 25,000 US dollars. It also identified maternal age, whether the mothers were married or single, whether the mode of delivery was vaginal or Caesarian, the number of previous children and highest level of education achieved by the mother, defined as college education or less than a college education. In addition, information about pacifier use was collected from the questionnaire, and this was defined as whether a pacifier was, or was not, used by the infant while he or she was in the hospital.

Feeding assessment

Feeding assessments were conducted at the infant's bedside by the fourth day of life. Parents were requested to feed their infant and the feeding was video recorded. The feeding was conducted by the mother in the way that she normally fed her baby, by bottle or at the breast. The length of time the infant was actively engaged in feeding, defined as regular, rhythmic sucking on the nipple, was documented. The feeding videos were evaluated using the Neonatal Eating Outcome assessment (27), which is a new feeding assessment that consists of seven pre-feeding behaviours, nine feeding behaviours and three observations made at the end of the feeding. It can be used for breastfed or bottle fed infants. The total score for the assessment ranges from 18–90, with higher scores indicating optimal performance. The assessment has content validity and good to excellent reliability (28), and the assessment scores and the length of time the infant actively engaged in oral feeding were used as the feeding outcome measures.

Statistics

The relationships between pacifier use and gender, mode of feeding, race, the family's socioeconomic status, maternal age, marital status, mode of delivery, number of previous children and highest level of education were investigated using chi-square analyses and linear regression. The relationship between pacifier use and feeding outcome was explored using independent samples t-tests, using length of time spent orally feeding during the assessment as well as the total score on the Neonatal Eating Outcome assessment. The relationships between pacifier use and feeding outcomes were also explored only in those infants who were exclusively breastfed.

RESULTS

There were 51 infants enrolled in the study, and 42 had data on pacifier use available for the analysis. See Table 1 for the sample characteristics. There were 24 (57%) infants who used a

pacifier while in the hospital during the first few days of life, and seven (29%) of these were exclusively breastfed.

Predictors of pacifier use

Table 1 details the predictors of pacifier use. Pacifier use was more common in mothers with an income level of less than 25,000 US dollars ($p=0.02$), in mothers who were single ($p=0.002$), in mothers who did not have a college education ($p=0.03$) and in infants who were bottle fed or partially breastfed ($p=0.04$). There were no other relationships observed between pacifier use and maternal, infant or social factors.

Relationships between pacifier use and feeding performance

The feeding scores from the Neonatal Eating Outcome assessment and the duration of oral feeding did not differ between the infants who did and did not use a pacifier. In addition, there was no difference between the scores and duration of feeding for the infants who were exclusively breastfed and who did and did not use a pacifier. Table 2 provides the Neonatal Eating Outcome assessment scores and duration of oral feeding, along with the associated p values.

DISCUSSION

The key findings of this study were that infants were more likely to receive pacifiers in the first few days of life if they were not exclusively breastfed and if their mothers had a low income level, were single or did not pursue higher education. No relationships between early pacifier use and feeding performance, including breastfeeding performance, was observed.

Our findings of pacifier use being more common in those with lower socioeconomic status were consistent with other research that identified that pacifier use was less common in women with a college education (20). This suggests that educated mothers may have been more likely to be influenced and exposed to current recommendations to avoid pacifier use. However, despite the recommendations to avoid pacifier use, 41% of the infants used pacifiers while they were in the hospital and one-third of these were exclusively breastfed. Pacifier use was less common among mothers who exclusively breastfed, indicating that the messaging about avoiding pacifiers prior to establishing breastfeeding was likely to be reaching the target audience.

It has been suggested that pacifier use can have a detrimental effect on breastfeeding (8–11,18,25), and the World Health Organization and the United Nations Children's Fund recommend avoiding pacifiers (19,25). However, while additional research is needed, the findings from the current study do not support the need to avoid pacifiers early in life. Feeding performance was the same among babies who did or did not use pacifiers and the length of time that was spent actively engaged in feeding was similar across the two groups. These findings are consistent with other reports that no differences in feeding outcome were observed in infants who did and did not use pacifiers in early infancy (25,29–31).

Although few studies have investigated feeding performance in relation to pacifier use, we attempted to clarify whether or not there were alterations in feeding behaviours among

infants who used a pacifier within the first few days of life. There was no evidence to support avoiding pacifiers, even among those who were exclusively breastfed. However, the number of mothers who used a pacifier and exclusively breastfed was small.

There were several factors that limited the scope of this study. First, there was a small sample size. Due to its exploratory nature, this study was not appropriately powered, but it does set the stage for future research. This study was observational and the use of pacifiers was not randomised. It remains unclear how messaging about pacifiers could have influenced their use. Therefore, there could have been inherent qualities in the mother-infant dyads that led to the use of pacifiers that could not be accurately untangled. Overall, this cohort had low rates of breastfeeding, which limits the generalisability of the findings to other populations of mother-infant dyads. Finally, this study investigated the use of pacifiers in the first few days of life. This cohort will be followed and early weaning and later performance can provide additional insights into the potential impact of early pacifier use.

CONCLUSION

In this observational study, the relationship between pacifier use and feeding performance in full-term, healthy infants was observed. Mothers with a lower socioeconomic status and those who chose to bottle feed were more likely to use pacifiers. However, pacifier use was not related to early feeding performance, including among those who were exclusively breastfed. More research is needed to define the effect, if any, that pacifier use has on early feeding and weaning. Such information is important as it can provide information about whether messaging about pacifiers given to parents is appropriate or needs to be changed. In addition, it can provide the information parents need to make informed decisions about using pacifiers to soothe their infants. Finally, pacifier use, in light of its potential impact on reducing sudden infant death syndrome (22,23,31), can be appropriately recommended based on the current evidence.

Acknowledgments

We would like to thank Jessica Roussin, Anna Annecca, Lara Liszka, Bailey Hall, Rachel Harris, Lisa Shabosky, Sarah Wolf and Lori Stillwell for their guidance and support during this project. We also thank the infants and families who participated and the nursing staff on the mother and baby floor supporting this project.

Funding

This project was supported by NIH R24 (5R24HD065688-05), awarded to the Boston Rehabilitation Outcomes Center, and the Eunice Kennedy Shriver National Institute of Child Health & Human Development of the National Institutes of Health under Award Number U54 HD087011 to the Intellectual and Developmental Disabilities Research Center at Washington University.

Abbreviations

BFHI	Baby Friendly Hospital Initiative
NEO	Neonatal Eating Outcome Assessment

References

1. Martin JA, Hamilton BE, Ventura SJ, Osterman MJ, Wilson EC, Mathews TJ. Births: final data for 2010. *Natl Vital Stat Rep.* 2012; 61:1–72.
2. Eidelman AI. Breastfeeding and the use of human milk: an analysis of the American Academy of Pediatrics 2012 Breastfeeding Policy Statement. *Breastfeed Med.* 2012; 7:323–4. [PubMed: 22946888]
3. Grace T, Oddy W, Bulsara M, Hands B. Breastfeeding and motor development: A longitudinal cohort study. *Hum Mov Sci.* 2017; 51:9–16. [PubMed: 27821311]
4. Lechner BE, Vohr BR. Neurodevelopmental outcomes of preterm infants fed human milk: A systematic review. *Clin Perinatol.* 2017; 44:69–83. [PubMed: 28159210]
5. Dunn RL, Kalich KA, Henning MJ, Fedrizzi R. Engaging field-based professionals in a qualitative assessment of barriers and positive contributors to breastfeeding using the social ecological model. *Matern Child Health J.* 2015; 19:6–16. [PubMed: 24740721]
6. Sriraman NK, Kellams A. Breastfeeding: What are the barriers? Why women struggle to achieve their goals. *J Womens Health (Larchmt).* 2016; 25:714–22. [PubMed: 27111125]
7. Boccolini CS, Carvalho ML, Oliveira MI. Factors associated with exclusive breastfeeding in the first six months of life in Brazil: a systematic review. *Rev Saude Publica.* 2015;49. [PubMed: 26270011]
8. Buccini, GoS, Benício, MH., Venancio, SI. Determinants of using pacifier and bottle feeding. *Rev Saude Publica.* 2014; 48:571–82. [PubMed: 25210816]
9. Goldman RD. Pacifier use in the first month of life. *Can Fam Physician.* 2013; 59:499–500. [PubMed: 23673585]
10. Kair LR, Colaizy TT. Association between in-hospital pacifier use and breastfeeding continuation and exclusivity: Neonatal intensive care unit admission as a possible effect modifier. *Breastfeed Med.* 2017; 12:12–9. [PubMed: 27813671]
11. Rigotti RR, de Oliveira MI, Boccolini CS. Association between the use of a baby's bottle and pacifier and the absence of breastfeeding in the second six months of life. *Cien Saude Colet.* 2015; 20:1235–44. [PubMed: 25923634]
12. Saadeh R, Akré J. Ten steps to successful breastfeeding: a summary of the rationale and scientific evidence. *Birth.* 1996; 23:154–60. [PubMed: 8924101]
13. Zimmerman E, Thompson K. Clarifying nipple confusion. *J Perinatol.* 2015; 35:895–9. [PubMed: 26181720]
14. Munn AC, Newman SD, Mueller M, Phillips SM, Taylor SN. The impact in the united states of the baby-friendly hospital initiative on early infant health and breastfeeding outcomes. *Breastfeed Med.* 2016; 11:222–30. [PubMed: 27082284]
15. Hadjiona V, Middleton N, Kouta C, Hadjigeorgiou E, Lambrinou E, Kolokotroni O. Cyprus mothers' breast feeding self-efficacy and their perceptions about the implementation of the '10 steps' in the first 48 hours after birth. *Midwifery.* 2016; 36:43–52. [PubMed: 27106943]
16. Lozano de la Torre M, Pallás Alonso C, Hernández Aguilar M, Aguayo Maldonado J, Arena Ansótegui J, Ares Segura S, et al. Use of pacifiers and breastfeeding. *Anales de pediatria.* 2011; 74:271–e1. [PubMed: 21256098]
17. Sexton S, Natale R. Risks and benefits of pacifiers. *Am Fam Physician.* 2009; 79:681–5. [PubMed: 19405412]
18. Recommendations for the use of pacifiers. *Paediatr Child Health.* 2003; 8:515–28. [PubMed: 20019941]
19. Kramer MS, Barr RG, Dagenais S, Yang H, Jones P, Ciofani L, et al. Pacifier use, early weaning, and cry/fuss behavior: a randomized controlled trial. *JAMA.* 2001; 286:322–6. [PubMed: 11466098]
20. Mauch CE, Scott JA, Magarey AM, Daniels LA. Predictors of and reasons for pacifier use in first-time mothers: an observational study. *BMC Pediatr.* 2012; 12:7. [PubMed: 22257532]
21. Pinelli J, Symington A, Ciliska D. Nonnutritive sucking in high-risk infants: benign intervention or legitimate therapy? *J Obstet Gynecol Neonatal Nurs.* 2002; 31:582–91.

22. Moon RY, Hauck FR, Colson ER. Safe infant sleep interventions: what is the evidence for successful behavior change? *Current pediatric reviews*. 2016; 12:67–75. [PubMed: 26496723]
23. Moon RY. Task Force On Sudden Infant Death Syndrome. SIDS and other sleep-related infant deaths: Evidence base for 2016 updated recommendations for a safe infant sleeping environment. *Pediatrics*. 2016;138. [PubMed: 27544347]
24. Alm B, Wennergren G, Mollborg P, Lagercrantz H. Breastfeeding and dummy use have a protective effect on sudden infant death syndrome. *Acta Paediatr*. 2016; 105:31–8. [PubMed: 26175065]
25. Howard CR, Howard FM, Lanphear B, Eberly S, deBlieck EA, Oakes D, et al. Randomized clinical trial of pacifier use and bottle-feeding or cupfeeding and their effect on breastfeeding. *Pediatrics*. 2003; 111:511–8. [PubMed: 12612229]
26. 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; 7:CD007202.
27. Neonatal Eating Outcome (NEO) Assessment. 2014.
28. Pineda R, Harris R, Foci F, Roussin J, Wallendorf M. Neonatal Eating Outcome Assessment: Tool Development and Inter-rater Reliability. *Acta Paediatrica*. 2017 Oct.doi: 10.1111/apa.14128
29. Collins CT, Ryan P, Crowther CA, McPhee AJ, Paterson S, Hiller JE. Effect of bottles, cups, and dummies on breast feeding in preterm infants: a randomised controlled trial. *BMJ*. 2004; 329:193–8. [PubMed: 15208209]
30. Collins CT, Gillis J, McPhee AJ, Suganuma H, Makrides M. Avoidance of bottles during the establishment of breast feeds in preterm infants. *Cochrane Database Syst Rev*. 2016; 10:CD005252. [PubMed: 27756113]
31. Alm B, Wennergren G, Möllborg P, Lagercrantz H. Breastfeeding and dummy use have a protective effect on sudden infant death syndrome. *Acta Paediatr*. 2016; 105:31–8. [PubMed: 26175065]

Key Notes

- Mothers are often advised not to use pacifiers until breastfeeding is well-established and this study compared pacifier use in 42 full-term mother-infant dyads.
- We found that pacifier use was not associated with early feeding performance, but that mothers who breastfed were less likely to use pacifiers.
- Women with a lower socioeconomic status were more likely to use pacifiers in the first few days after birth.

Table 1

Sample Characteristics and Predictors of Pacifier Use

Predictors	Total Sample Mean (SD) or N (%)	Pacifier Use Mean (SD) or N (%)	No Pacifier Use Mean (SD) or N (%)	<i>p</i> -value [†]
Maternal Age	28 (±6.0)	26 (±6.4)	29 (±5.2)	0.13
Income Level (<\$25,000)	24 (53%)	15 (33%)	9 (20%)	0.02
Other Children (Had other children)	36 (80%)	17 (36%)	19 (40%)	0.67
Marital Status (Single)	35 (69%)	21 (45%)	14 (30%)	0.002
Education (Junior High/High School/Some College)	36 (71%)	16 (32%)	20 (39%)	0.03
Mode of Delivery (Vaginal)	34 (67%)	13 (26%)	21 (41%)	0.07
Race (African American)	37 (73%)	20 (39%)	17 (33%)	0.10
Gender (Female)	29 (57%)	13 (26%)	16 (31%)	0.71
Bottlefed, Both/Breastfed (Bottlefed, Both)	28 (55%)	17 (33%)	11 (22%)	0.04

* *p* value investigated the relationship between social factors and pacifier use

Bold values are significant *p* values at 0.05

Table 2

Feeding Performance in infants who did and did not use a pacifier

Outcome Variable	Whole Cohort Mean (SD) [Range] (n=42)	Whole Cohort Mean (SD) by pacifier use		p-value
		Among Those Using a Pacifier (n=24)	Among Those Not Using a Pacifier (n=18)	
Neonatal Eating Outcome assessment scores	81.1 (11.0) [30–90] *	80.0 (9.6)	81.2 (14.3)	0.76
Duration of Oral Feeding, minutes	8.7 (4.9) [1–20]	8.5 (4.8)	8.8 (5.2)	0.85
		Exclusively Breastfed Mean (SD) by pacifier use		
Exclusively Breastfed Outcome Variable	Exclusively Breastfed Mean (SD) [Range] (n=18)	Mean (SD) Among Those Using a Pacifier (n=7)	Mean (SD) Among Those Not Using a Pacifier (n=11)	p-value
Neonatal Eating Outcome assessment scores	81.7 (15.0) [30–90]	80.6 (9.1)	82.4 (18.6)	0.81
Duration of Oral Feeding, minutes	9.4 (5.9) [1–20]	9.1 (6.2)	9.5 (6.0)	0.91

* One infant scored a 14, but feeding readiness precluded participation in oral feeding, so this score was eliminated from analysis.