2020

Use of the theory of planned behavior framework to understand breastfeeding decision-making among mothers of preterm infants

Margaret G. Parker
Boston University

Sunah S. Hwang
University of Colorado

Emma S. Forbes
Boston University

Bryanne N. Colvin
Washington University School of Medicine in St. Louis

Kyria R. Brown
University of Colorado

See next page for additional authors

BREASTFEEDING MEDICINE
Volume 15, Number 10, 2020

DOI: 10.1089/bfm.2020.0127

Clinical Research

Use of the Theory of Planned Behavior Framework to Understand Breastfeeding Decision-Making Among Mothers of Preterm Infants

Margaret G. Parker,[1,2] Sunah S. Hwang,[3] Emma S. Forbes,[2] Bryanne N. Colvin,[4] Kyria R. Brown,[5] and Eve R. Colson[4]

Abstract

Background: Mothers of preterm infants face significant challenges to breastfeeding. The theory of planned behavior (TPB) is a well-known framework comprising three domains (attitudes, perceived control, and social norms), which has been used to conceptualize the array of factors that influence health-related behaviors and develop interventions to promote behaviors.
Aim: We used the TPB framework to determine the array of factors that contribute to breastfeeding among mothers of preterm infants.
Materials and Methods: Using qualitative research methods, we conducted in-depth, semistructured interviews with mothers regarding their experiences feeding their preterm infants according to TPB domains. We developed themes based on an iterative process of review of transcripts and conducted interviews until thematic saturation was reached.
Results: We interviewed 23 mothers in 3 states 2 to 6 months after hospital discharge; 22 mothers initiated milk production and 6 were breastfeeding at the time of the interview. Factors that were positive and negative toward breastfeeding were present for all three TPB domains. Regarding attitudes, mothers felt that breastfeeding was a way to bond, that breast milk was healthy and protective, and that breast milk alone was insufficient for a growing preterm infant. Regarding perceived control, mothers felt empowered to breastfeed due to encouragement from hospital staff, friends, and family, and had difficulty overcoming their infant's immature oral feeding skills, competing responsibilities, and perceived infant preference for bottle feeding. Regarding social norms, mothers reported support for and against breastfeeding among hospital and Special Supplemental Nutrition Program for Woman, Infants, and Children (WIC) providers, family, friends, and the media.
Conclusion: Interventional studies geared toward breastfeeding promotion among mothers of preterm infants may focus on addressing barriers to direct breastfeeding during the neonatal intensive care unit and early post-discharge time periods.

Keywords: breastfeeding, prematurity, theory of planned behavior

Introduction

Provision of mother's breast milk is recommended for preterm infants through the first corrected year of life or more because of an array of known health benefits,[1] including reduction of necrotizing enterocolitis and bloodstream infections[2,3] and improvements in later childhood neurodevelopment.[4] Benefits to infants are dose dependent,[4,5] emphasizing the importance of supporting mothers in maximizing their milk production over time. Mothers of preterm infants have similar breastfeeding intent and higher rates of initiation of mother's milk production when compared to mothers of term infants.[6] However, mothers of preterm infants experience tremendous barriers to ongoing milk production while their infants are hospitalized, including higher risks of complicated deliveries[7] and comorbid health conditions that can impact

[1]Department of Pediatrics, Boston Medical Center, Boston University School of Medicine, Boston, Massachusetts, USA.
[2]Slone Epidemiology Center, Boston University School of Medicine, Boston, Massachusetts, USA.
[3]Department of Neonatology, Colorado Children's Hospital, University of Colorado School of Medicine, Aurora, Colorado, USA.
[4]Department of Pediatrics, Washington University School of Medicine, Saint Louis, Missouri, USA.
[5]Graduate School of Social Work, Colorado School of Public Health at the University of Colorado-Anschutz, Aurora, Colorado, USA.

milk production, such as obesity,[8] need for prolonged pumping rather than oral feedings at the breast, and prolonged mother-infant separation. Due to these challenges, approximately half of mothers of very low birth weight infants (≤1,500 *g*) in the United States stop producing milk before hospital discharge.[9]

Among mothers who continue to produce mother's milk after infant discharge, challenges continue when transitioning to the home environment. Many preterm infants continue to have immature feeding skills and/or receive fortified mother's milk or formula in bottles, which reduce ongoing opportunities for breastfeeding. Furthermore, mother-infant separation continues after infant discharge home, as many mothers of preterm infants have returned to work or have competing demands of their time.

In short, the rate of breastfeeding continuation among mothers of preterm infants in the United States is considerably lower than the recommended standard, signifying the need to continue to elucidate novel, effective interventions to support mothers of preterm infants in reaching their lactation goals. The Theory of Planned Behavior (TPB) is a well-recognized theoretical framework to understand human behavior.[10] The premise of the TPB is that intention to perform a behavior is closely related to the actual performance of the behavior. There are three main determinants of intention, which include (1) attitudes about the behavior, (2) perceived control (a combination of self-efficacy, the belief in one's ability and control to actually perform a behavior), and (3) perceived social norms (what someone believes others think about the behavior). While this framework has been used extensively as a construct to understand parent behaviors regarding infant care practices, including breastfeeding in the full-term infant,[11–13] the factors that comprise the TPB domains among breastfeeding mothers of preterm infants are unclear. Previous studies examining TPB among mothers of healthy term infants cannot be generalized to mothers of preterm infants because of the unique experiences of this high-risk population. Therefore, the objective of this study was to determine the array of factors that comprise the domains of the TPB, attitudes, perceived control, and perceived subjective norms, related to breastfeeding among mothers of preterm infants. Our greater goal was to ascertain potential intervention targets that may inform development of a future trial to promote breastfeeding continuation among mothers of preterm infants.

Materials and Methods

Design

We conducted a qualitative study through in-depth interviews of mothers of preterm infants. We chose qualitative research to explore participants' views of barriers and facilitators to breastfeeding among mothers of preterm infants during the hospitalization and post-discharge. We used the TPB as a framework for our study design and analysis because of its utility in understanding health-promoting behaviors.

Purposeful sampling strategy

We sought to obtain a diverse range of perspectives and therefore recruited mothers of preterm infants from four hospitals with level 3 and 4 neonatal intensive care units (NICUs) in three U.S. states. We recruited mothers from Boston Medical Center in Boston, MA, where ~50% of patients identify as non-Hispanic black and 25% as Hispanic, from Saint Louis Children's Hospital in St. Louis, MO, where ~30% identify as non-Hispanic black and 3% as Hispanic, and from two hospitals in Denver, CO. The Denver hospitals were Children's Hospital Colorado, where ~5–10% of patients identify as non-Hispanic black and 30% identify as Hispanic, and University of Colorado Hospital, where less than 5% identify as non-Hispanic black and ~40% identify as Hispanic. Boston Medical Center and University of Colorado Hospital have Baby-Friendly designation and the other two hospitals do not.

We recruited mothers by phone after discharge of any age, who spoke English or Spanish, gave birth to their infants ≤37 weeks' gestation, and had infants hospitalized in the NICU for at least 7 days. Interviews were conducted when the infants had been home from the hospital for 2–6 months to gain perspectives of mothers who experienced prolonged mother-infant separation during the infant hospitalization and transitioned from hospital to home. At the time of recruitment, we explained that we were interested in the perspectives of mothers of preterm infants regarding infant feeding. We conducted 23 one-on-one interviews by phone and through videoconference, from January to June 2019. All interviewers were trained to conduct in-depth interviews by an experienced qualitative researcher (E.R.C.). Mothers received a $40 gift card incentive for participation. The Institutional Review Boards of the participating institutions approved the study.

Data collection

We constructed an interview guide with probe questions focused on the overall experience and decision-making process of making breast milk for a preterm infant. We asked about TPB domains, attitudes, perceived control, and social norms related to breastfeeding a preterm infant. Questions were asked in an open-ended format. After analyzing transcripts and discussing results through investigator triangulation, we revised the question guide and added probe questions about maternal stress with infant feeding. The in-depth semistructured interviews and focus groups were conducted in English or Spanish by three team members. Interviews and focus groups lasted 30 to 60 minutes and were audiotaped and transcribed verbatim. Interviews in Spanish were additionally translated into English. Basic demographic and health data were abstracted from the medical record for the purposes of describing the study population.

Data analysis

We analyzed data through a systematic, iterative process of data collection and analysis, consistent with a Grounded Theory approach[14,15] informed by the TPB framework of human behavior. Each transcript was reviewed by investigators (M.G.P., S.S.H., E.S.F., K.R.B., E.R.C., and B.N.C.), with expertise in neonatology, general pediatrics, qualitative analysis, social work, and breastfeeding. To maximize trustworthiness of the analysis, each transcript was independently reviewed by three members of the group to identify tentative codes. The group met at regular intervals to review and revise the coding structure before independently coding the transcripts and meeting again to assure uniform coding of each transcript. Any disagreement was resolved through group discussion. An iterative approach to data analysis allowed

the team to continuously refine interview questions, develop themes, and monitor for thematic saturation. Data collection ended when thematic saturation was reached (no new themes identified.)

Results

Characteristics of the mothers we interviewed are shown in Table 1. Regarding intention to breastfeed and actual breastfeeding, many mothers reported that they developed decisions to breastfeed during the prenatal period or even earlier. However, mothers noted that the process of breastfeeding was often much different than what they had envisioned when they delivered preterm. For example, one mother stated, ''A lot of women have [a] plan for how they want things to go and then, all of a sudden, your baby comes early and the baby can't eat for whatever reason … and then they can't breastfeed, so, I think that's just a really hard concept to come to terms with.'' Mothers imagined directly breastfeeding their infants after birth, and, instead, needed to exclusively pump, add fortifiers to their milk, and/or use bottles. Nearly all the mothers we interviewed initiated milk production, but mothers varied widely how long they made breast milk and whether they were able to directly breastfeed.

Regarding TPB domains, we found positive and negative factors within each domain (Table 2). With respect to maternal attitudes, we found that most mothers reported that breastfeeding was comforting and a source of bonding; however, one mother reported that she did not want to directly breastfeed because breastfed infants become too ''clingy,'' and she preferred pumping and giving bottled breast milk. Several mothers commented on the health benefits and protective effects of breast milk for preterm infants, particularly due to the vulnerability. Others reported that breast milk was better than formula because it was easier to digest and reduced reflux, two common issues among preterm infants. Some mothers feared that breastfeeding could negatively impact the infant's growth and development, because infants might not get enough milk. Other mothers worried about the inadequate nutritional content of mother's breast milk for a preterm infant. Mothers stated that the breast milk was too ''thin,'' or lacked nutritional content. Some mothers preferred formula because they felt it had better nutrition for a growing preterm infant.

Regarding perceived control, mothers reported that family members improved their sense of perceived control over their capacity to make milk by cleaning bottles, helping with milk storage, and bottle feeding, as well as nonfeeding tasks, such as childcare, cleaning, and meal preparation. Not only did mothers report that relief from these activities gave them more time to spend on actual breastfeeding and pumping but also this help gave mothers more time to rest and reduce their stress. Mothers also reported that medical providers played an important role in increasing their perceived control with breastfeeding. Mothers mentioned that medical providers helped them obtain pumping supplies and scales for weighing, and taught technical aspects of using breast pumps and storing milk.

Table 1. Participant Characteristics

Number of individual interviews	23
	Median (range)
Maternal age (years)	34 (21–38)
Infant gestational age at birth (weeks)	33 (25–36)
Infant birth weight (g)	1,770 (790–2,980)
	n *(%)*
Non-Hispanic Black, English-speaking	8 (34.8)
Hispanic (any race), English-speaking	1 (4.3)
Hispanic (any race), Spanish-speaking	7 (30.4)
Multiples	3 (13)
Mothers that initiated milk production	22 (95.7)
Mothers with any breastfeeding at the time of the post-discharge interview	6 (26.1)

A substantial part of every interview was devoted to mothers' narratives of various factors that limited mothers' sense of control in achieving mothers' breastfeeding goals. Mothers' felt limited by the infant's immaturity and clinical feeding processes in the NICU. Mothers reported that difficulty latching and/or coordination of sucking and swallowing, which are typical of preterm infants, made establishment of breastfeeding more difficult. Preterm infants had difficulty sucking at the breast because of their immature feeding skills, which was frustrating to mothers. Several mothers commented that feeding immaturity led to more bottle feeding by staff and consequent infant preference for bottle feeding over direct breastfeeding; this influenced several mothers' decisions to stop pumping and switch exclusively to formula. Mothers also reported that using bottles to establish oral feeding skills or to give extra fortification was a faster way to get out of the NICU and therefore a necessary practice, although this differed from mothers' initial goal to breastfeed directly.

Mothers also remarked that their lack of perceived control stemmed from lack of experience breastfeeding a premature infant and low milk supply. Low milk supply was reported by nearly all of the mothers we interviewed and was a tremendous source of stress. Some mothers felt that they could not produce enough milk for their infants, even with frequent pumping, and others were frustrated because they could not pump as often as desired to maintain a milk supply. A multitude of competing priorities impacted mothers' ability to pump or visit the NICU to feed their infants, including child care, work, household tasks, and managing visits back and forth to the NICU. One mother noted, ''I ended up eventually just letting go of the breastfeeding.'' Mothers of multiples acknowledged that issues with milk supply and managing the feeding schedules of two infants were even more challenging, and made mothers feel even less in control.

Regarding social norms, mothers mentioned several sources of information or advice regarding breastfeeding, including medical providers, family, friends, Special Supplemental Nutrition Program for Woman, Infants, and Children (WIC), and the media. These sources of information were mixed regarding their support for breastfeeding. Many mothers reported that medical providers in the NICU were very supportive of breast milk for preterm infants. However, some mothers mentioned that many providers were less supportive of the process to establish actual direct breastfeeding during the NICU period. Mothers stated that direct breastfeeding required more time and practice and this need was at odds with medical providers' pressure to discharge infants' home sooner on bottles. Mothers felt that hospital providers perceived that opportunities to practice breastfeeding could be better achieved at home. Mothers also stated that some medical providers favored formula over breast

Table 2. Factors That Comprised the Theory of Planned Behavior Domains Related to Breastfeeding a Preterm Infant

TPB domain		*Factors*	*Quote*
Attitudes	Positive	Breastfeeding is comforting and way to bond with a baby	''I like to feel her close to me when I breastfeed her myself, it was a very nice experience. But I'm also satisfied and I feel good knowing she is drinking my milk, even if it's through the bottle.''
		Breast milk is healthy and protective	''I just thought it was important that all the antibodies that I would produce all the nutrients that I would produce… I believe in breast milk that they just can't create in formula.''
		Breast milk is easier to digest and for reflux	''It [breast milk] was easier on her stomach than formula would be. Formula's a lot rougher on baby's stomach, so I just knew that for her it would be easier.''
			''I did it especially when she has acid reflux…I didn't want anything heavier than her having breast milk.''
	Negative	Directly breastfeeding makes babies ''clingy''	I just don't like breast feeding because they become too clingy, so as long as he wasn't having to latch on then I could pump it and give it to him, I mean, that was no problem.
		Fear that the infant is not feeding enough because he/she is small	''I mean, you want them to thrive, you don't wanna go, to the checkup and have the doctors say they're not gaining cuz it makes you feel like you're failing and not feeding your kid enough and so, there's just a fear that you're gonna mess them up.''
		Breast milk is not sufficient	''And my milk is very thin; my other two boys also drank it for two months, because they didn't like my milk. It's very thin, it didn't make them full.''
			''At our last appointment, they asked me like, ''Oh, have you started doing the breastmilk again?'' ''And I still haven't just because, you know, I'm kind of happy with their weight gain [with formula]''
Perceived control	Positive	Family members contribute to infant care and other household tasks that allow mothers to rest	''My husband. He was a great coach to me. He would take the baby, give me lots of breaks. He was home for the first month with me, with her, so he wasn't away working. That was really great that we were just together. We worked really close as a team, so he would try and give me breaks.''
			''My husband has been probably the biggest help throughout the process, that is, nursing my babies mostly because he—when I'm pumping at work it just generates so much dishes really that him helping with the dishes and being committed to giving the babies the bottles and managing all the supply that I have at home has been really helpful''
		Medical providers provide supplies and guidance that mothers need	''While I was admitted for pre-eclampsia I know about that one-hour critical nature to really start pumping to make enough milk. So [the hospital staff] helped and came set me up with a pump and all the supplies that I needed even beforehand. That was very helpful because in the chaos right after the delivery that was all set up but there was nothing to think about or have to worry about, I just started pumping while they were stabilizing the babies''
			''When I first brought Mauve home to make sure she was gaining weight, they brought a Medela scale for me to weigh her. That eased my concerns about breastfeeding.''
			''[The lactation consultants] walked with me step by step. They showed me how to go about my process, how can we be able to pump properly and breastfeed and all of that. So, they really helped me a lot, a lot.''

(*continued*)

TABLE 2. (CONTINUED)

TPB domain		*Factors*	*Quote*
	Negative	Mothers lack control over the feeding process because of the physical immaturity of infant (poor latch and uncoordinated suck) and need for bottles in the NICU environment	''I have to realize that she was a preemie because she will have days where she'll forget how to suck a bottle or something that she wouldn't immediately latch on to her bottle when it came time to feed. It was also an issue with me trying to breastfeed her. She wouldn't immediately latch on me breastfeeding her which is one of the biggest reasons I just went straight to pumping. She was giving me a hard time with the latching on.''
			''For the most part at that point we did the side line position just because he wasn't completely coordinated with his suck, swallow, breathe. Then we use the premie nipple on the Dr. Brown's bottle and he only ate probably two to three ounces at that point.''
		Mothers lack control over infants' preference for formula or bottles	''He actually preferred his formula milk that made him fuller than my milk''
			''I give him the formula because since he was there for a long time in the NICU, he didn't want to hold my breast anymore, but I spent a lot of time pumping my breast milk and giving it to for a long time, but later he didn't want it so I gave him the formula, but he was more used to the formula. I gave it to him and now he drinks more formula.''
			''And then I was getting her my breastmilk with a pump, but when we left there and came back here she didn't want to breastfeed anything, she'd gotten used to having just the bottle, so that's why we used formula, but the decision I first made was to breastfeed her.''
		Lack of previous breastfeeding experience by mothers or greater family with a preterm baby	''But at home like my family we don't really have premature babies so they don't really know how to take care of…that was the first experience, in the family.''
		Mothers have low milk supply, which is the source of tremendous stress	''The problem was I never could produce enough, I was lucky if I was able to get about two, three ounces a day at the max''
			''I was really upset because I did not know that I wasn't producing enough milk and that hung on me forever. I felt like I couldn't keep up. I did the power pumping, I did everything I could. I felt like a failure…It was very stressful.''
		Managing competing priorities and work make it difficult for mothers to breastfeed	''Then my schedule became kind of hectic at the time. My mom was in the hospital she had just had open heart surgery so I did a lot of running back and forth trying to help her and stuff. So I wasn't like stable enough to sit down and breastfeed her. Then there would be times I would forget to pump. So I ended up eventually just letting go of the breastfeeding. At that time my schedule was so busy I didn't even have time to do it and then when I did I was just too tired from running and all that''
		Multiples add to the complexity of breastfeeding	''It was hard trying to breastfeeding two babies at the same time, they were on the same eating schedule. I was like feeding two babies at one time''

NICU, neonatal intensive care unit; TPB, theory of planned behavior.

milk for faster growth. Finally, mothers reported varied support for breastfeeding among family and friends. For example, some mothers acknowledged that breastfeeding was part of their culture, and for others, they were the first ones in their family to breastfeed.

Discussion

The premise of our study was to explore the array of factors comprising attitudes, perceived control, and social norms that influence breastfeeding among mothers of preterm infants.

We found positive and negative factors among all domains. With respect to attitudes, mothers felt that breastfeeding was a way to connect or bond, that feeding a preterm infant breast milk was a healthy and protective measure, and that breast milk alone may be insufficient for a growing preterm infant. Regarding perceived control, mothers felt a lack of control due to the immature feeding skills of their preterm infants, need for supplementation through bottles, low milk supply, and competing priorities that limited frequent pumping. Mothers felt empowered to breastfeed with support from family and hospital staff. Regarding social norms, family, friends, hospital providers, WIC, and the media were reported by mothers as having varying support for breastfeeding.

Development of effective interventions that maximize provision of mother's breast milk among mothers of preterm infants is a public health priority because breastfeeding is a modifiable practice that can reduce the risk of short- and long-term prematurity morbidities. Because many of the unique challenges faced by mothers of preterm infants occur during the first weeks or months of hospitalization, multiple interventions to support mothers of preterm infants have occurred within the confines of the hospital setting. These efforts, however, have focused predominately on practices that occur *early* in the hospital period, such as early initiation of mother's milk production, prenatal and early postnatal education, and skin-to-skin care.[16–18] As the trend for provision of mother's milk at the point of hospital discharge has increased in the past decade,[9] developing interventions that focus on the challenges faced by mothers of preterm infants *later* in the hospital stay and post-discharge has become more relevant.

Because we interviewed mothers after their preterm infants' discharge home, we were able to explore several factors that occur later in the hospitalization and after discharge that prevent mothers of preterm infants from achieving their breastfeeding goals. Several mothers described a tension between wanting to directly breastfeed *before* infant discharge in the NICU and feeling like this process was holding back their infants' more rapid discharge home. Mothers stated that NICU providers directly told them that establishment of breastfeeding could occur better in the home setting. This advice contradicts previous literature that oral feedings at the breast, more frequent breastfeeding episodes, and early gestational age at the time of first breastfeeding attempt in the NICU setting are associated with longer duration of breastfeeding during the hospital and post-discharge periods.[19–23] Furthermore, lactation support in the home environment among mothers of preterm infants is not consistent and lactation consultants in the community generally do not have the same expertise with the unique issues of mother-preterm infant dyads as NICU-specific lactation consultants. Considering that many mothers of preterm infants stop breastfeeding in the weeks after discharge, interventions that address barriers to directly breastfeeding in the NICU time period may represent a pathway toward supporting mothers in prolonging lactation.

Mothers in our study mentioned several important barriers toward prolonged lactation that fit within the TPB framework. Mothers' beliefs that breast milk was insufficient for a growing preterm infant represented a negative attitude toward breastfeeding, which was enforced by negative social norms from hospital providers who recommended fortification through bottles or formula after discharge to maximize growth. Fortification of mother's milk is recommended for preterm infants during the NICU time period, as faster growth during the NICU time period is associated with improved neurodevelopment.[24,25] However, current evidence supporting the use of fortification after discharge among mother's own milk fed very low birth weight infants is limited. The small studies that have examined use of fortification among very low birth weight infants post-discharge have not shown improvements in neurodevelopment.[26,27] Despite the uncertainty of the benefit of post-discharge fortification among very low birth weight infants, fortification with use of formula or fortifiers for some or all feedings at infant discharge is extremely common in U.S. NICUs.[28] Potential intervention strategies may focus on educating mothers and hospital staff on the difference between the known benefits of fortification early in the hospitalization period versus post-discharge to increase recognition that the need for fortification after discharge is not well established, and perhaps may be considered on a case-by-case basis.[29] In instances where staff advise fortification after discharge to maintain growth, fortification strategies may be adjusted to optimally support mothers' lactation goals. For example, if a mother desires direct breastfeeding, a limited number of bottles with higher caloric density (e.g., 28 or 30 kcal/oz) could provide more opportunities for breastfeeding than all or most feedings by bottle with fortifier to 24 kcal/oz. Finally, another potential intervention to support prolonged lactation among mothers of preterm infants may include communication of clear plans for lactation and criteria to wean fortification to post-discharge providers.

Within the TPB framework, mothers also stressed the lack of control they felt in directly breastfeeding due to the immaturity of infant oromotor skills. This may be addressed by educating and supporting mothers in non-nutritive sucking, which can improve oromotor readiness and provide comfort to mothers, and has been performed as early as 31 to 33 weeks of corrected gestational age.[19,20,23,30] Furthermore, mothers in our study stated that infants ''got used to bottles,'' and therefore preferred bottles over the breast when they were beginning to learn to feed, presumably because that was the most frequent practice in their NICUs. Typically, assessment of oromotor skills by trained professionals in the NICU occurs with bottle feeding, not breastfeeding; thus, hospital teams become accustomed to the need to frequently assess oral feeding skills with bottles. This could be addressed by bolstering lactation training among speech and language or occupational therapists, which assesses preterm infant feeding, or, conversely, by bolstering oromotor skill assessment among lactation consultants and nurses. Perhaps the biggest barrier to more frequent episodes of direct breastfeeding in the NICU period, as mentioned by many mothers in our study, is mother-infant separation and mothers' difficulty actually visiting the NICU with their many competing priorities. At a local level, this could be addressed by providing assistance with parking, transportation, child care, or meals, which may help mothers visit the NICU more frequently. At a larger level, state policies that support paid maternity leave and breastfeeding in the workplace have been associated with higher rates of breastfeeding among preterm infants, compared to states without such policies.[31]

Other factors we identified that comprised domains of the TPB have been previously described among mothers of preterm infants.[32–36] These include mothers' beliefs that breast milk is healthy and protective, that feeding the infant at the breast is a source of bonding, and that hospital staff can be an incredible source of support. Barriers that mothers in our study reported, such as logistical challenges, low milk supply, exhaustion, and stress of milk production have also been described previously.[32–36]

Strengths of our study are the use of an established framework to understand health behaviors and inform development of interventions to change health behaviors, and inclusion of mothers across three NICUs in three states with diverse perspectives and exposures to hospital lactation practices. However, it is possible that different perspectives may have emerged if we interviewed mothers from different NICUs or if we focused our analysis on mothers with a specific subgroup of preterm infants, such as very low birth weight or late preterm infants. A limitation of our study is that mothers may have been reluctant to criticize the support from NICU providers or speak negatively about their experiences producing milk. We tried to minimize this by using interviewers who did not work in the NICU setting and by reviewing with mothers during recruitment that their responses were anonymous. Researcher bias is a possibility in qualitative research; we minimized this by using three coders, discussing discrepancies, and investigator triangulation.

Conclusion

Developing interventions that maximize longer duration of breastfeeding continues to be a crucial need to optimize the health and development of preterm infants. Addressing barriers to transitioning to direct breastfeeding in the NICU time period represents a promising pathway toward maximize breastfeeding support of mothers after NICU discharge. Intervention targets may include education on the benefits of direct breastfeeding to mothers and staff, supporting mothers in more frequent NICU visitation, and assessment of oral feeding skills while breastfeeding. Effective interventions may also incorporate mothers' post-discharge lactation goals, provide post-discharge lactation support with personnel who have expertise in the unique needs of mother-preterm infant dyads, and communicate feeding plans to post-discharge care providers who maximize opportunities for breastfeeding.

Acknowledgments

We acknowledge Ileana Herrera and Chanel Peguero who performed Spanish-speaking interviews and the mothers who participated in this study. No competing financial interests exist for the remaining authors.

Disclosure Statement

M.G.P. is a member of the research board of a nonprofit milk bank. This is a voluntary position.

Funding Information

This work was funded by the Eunice Kennedy Shriver National Institute for Child Health and Development at the National Institute of Health (R01 HD095060; PI M.G.P./S.S.H.).

References

1. Section on Breastfeeding. Breastfeeding and the use of human milk. *Pediatrics* 2012;129:e827–e841.
2. Sisk PM, Lambeth TM, Rojas MA, et al. Necrotizing enterocolitis and growth in preterm infants fed predominantly maternal milk, pasteurized donor milk, or preterm formula: A retrospective study. *Am J Perinatol* 2017;34:676–683.
3. Furman L, Taylor G, Minich N, et al. The effect of maternal milk on neonatal morbidity of very low-birth-weight infants. *Arch Pediatr Adolesc Med* 2003;157:66–71.
4. Vohr BR, Poindexter BB, Dusick AM, et al. Beneficial effects of breast milk in the neonatal intensive care unit on the developmental outcome of extremely low birth weight infants at 18 months of age. *Pediatrics* 2006;118:e115–e123.
5. Meinzen-Derr J, Poindexter B, Wrage L, et al. Role of human milk in extremely low birth weight infants' risk of necrotizing enterocolitis or death. *J Perinatol* 2009;29:57–62.
6. Colaizy TT, Saftlas AF, Morriss FH, Jr. Maternal intention to breast-feed and breast-feeding outcomes in term and preterm infants: Pregnancy Risk Assessment Monitoring System (PRAMS), 2000–2003. *Public Health Nutr* 2012; 15:702–710.
7. Reddy UM, Rice MM, Grobman WA, et al. Serious maternal complications after early preterm delivery (24–33 weeks' gestation). *Am J Obstet Gynecol* 2015;213:538.e1–e9.
8. Matias SL, Dewey KG, Quesenberry CP, Jr., et al. Maternal prepregnancy obesity and insulin treatment during pregnancy are independently associated with delayed lactogenesis in women with recent gestational diabetes mellitus. *Am J Clin Nutr* 2014;99:115–121.
9. Parker MG, Greenberg LT, Edwards EM, et al. National trends in the provision of human milk at hospital discharge among very low-birth-weight infants. *JAMA Pediatr* 2019; 173:961–968.
10. Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process* 1991;50:179–211.
11. Guo JL, Wang TF, Liao JY, et al. Efficacy of the theory of planned behavior in predicting breastfeeding: Meta-analysis and structural equation modeling. *Appl Nurs Res* 2016;29: 37–42.
12. McMillan B, Conner M, Green J, et al. Using an extended theory of planned behaviour to inform interventions aimed at increasing breastfeeding uptake in primiparas experiencing material deprivation. *Br J Health Psychol* 2009; 14(Pt 2):379–403.
13. Khoury AJ, Moazzem SW, Jarjoura CM, et al. Breastfeeding initiation in low-income women: Role of attitudes, support, and perceived control. *Womens Health Issues* 2005; 15:64–72.
14. Bernard HR. Research Methods in Anthropology: Qualitative and Quantitative Approaches, 3rd ed. Walnut Creek, CA: Altamira, 2002.
15. Corbin J, Strauss A. Basics of Qualitative Research, 3rd ed. Thousand Oaks, CA: SAGE Publications, Inc., 2011.
16. Parker MG, Patel AL. Using quality improvement to increase human milk use for preterm infants. *Semin Perinatol* 2017;41:175–186.
17. Lee HC, Kurtin PS, Wight NE, et al. A quality improvement project to increase breast milk use in very low birth weight infants. *Pediatrics* 2012;130:e1679–e1687.
18. Parker MG, Gupta M, Melvin P, et al. Racial and ethnic disparities in the use of mother's milk feeding for very low birth weight infants in Massachusetts. *J Pediatr* 2019;204: 131–141.

19. Briere CE, McGrath JM, Cong X, et al. Direct-breastfeeding premature infants in the neonatal intensive care unit. *J Hum Lact* 2015;31:386–392.
20. Briere CE, McGrath JM, Cong X, et al. Direct-breastfeeding in the neonatal intensive care unit and breastfeeding duration for premature infants. *Appl Nurs Res* 2016;32: 47–51.
21. Casavant SG, McGrath JM, Burke G, et al. Caregiving factors affecting breastfeeding duration within a neonatal intensive care unit. *Adv Neonatal Care* 2015;15:421–428.
22. Pineda R. Direct breast-feeding in the neonatal intensive care unit: Is it important? *J Perinatol* 2011;31:540–545.
23. Maastrup R, Hansen BM, Kronborg H, et al. Breastfeeding progression in preterm infants is influenced by factors in infants, mothers and clinical practice: The results of a national cohort study with high breastfeeding initiation rates. *PLoS One* 2014;9:e108208.
24. Brown JV, Embleton ND, Harding JE, et al. Multi-nutrient fortification of human milk for preterm infants. *Cochrane Database Syst Rev* 2016;5:CD000343.
25. Goldberg DL, Becker PJ, Brigham K, et al. Identifying malnutrition in preterm and neonatal populations: Recommended indicators. *J Acad Nutr Diet* 2018;118:1571–1582.
26. O'Connor DL, Khan S, Weishuhn K, et al. Growth and nutrient intakes of human milk-fed preterm infants provided with extra energy and nutrients after hospital discharge. *Pediatrics* 2008;121:766–776.
27. Zachariassen G. Nutrition, growth, and allergic diseases among very preterm infants after hospital discharge. *Dan Med J* 2013;60:B4588.
28. Belfort MB, Edwards EM, Greenberg LT, et al. Diet, weight gain, and head growth in hospitalized U.S. very preterm infants. *Am J Clin Nutr* 2019; 109:1373–1379.
29. Noble LM, Okogbule-Wonodi AC, Young MA. ABM Clinical Protocol #12: Transitioning the breastfeeding preterm infant from the neonatal intensive care unit to home, revised 2018. *Breastfeed Med* 2018;13:230–236.
30. Pinchevski-Kadir S, Shust-Barequet S, Zajicek M, et al. Direct feeding at the breast is associated with breast milk feeding duration among preterm infants. *Nutrients* 2017;9:1202.
31. Parker MG. States with Supportive Breastfeeding Policies Have Higher Rates of Discharge Home on Any Human Milk among Surviving VLBW Infants. 2019. Vermont Oxford Network NICU by the Numbers. Available at https://public.vtoxford.org/nicu-by-the-numbers/states-with-supportive-breastfeeding-policies-have-higher-rates-of-discharge-home-on-any-human-milk-among-surviving-vlbw-infants/ (accessed April 30, 2020).
32. Parker MG, Lopera AM, Kalluri NS, et al. ''I Felt Like I Was a Part of Trying to Keep My Baby Alive'': Perspectives of hispanic and non-hispanic black mothers in providing milk for their very preterm infants. *Breastfeed Med* 2018;13:657–665.
33. Rossman B, Kratovil AL, Greene MM, et al. ''I have faith in my milk'': The meaning of milk for mothers of very low birth weight infants hospitalized in the neonatal intensive care unit. *J Hum Lact* 2013;29:359–365.
34. Sisk P, Quandt S, Parson N, et al. Breast milk expression and maintenance in mothers of very low birth weight infants: Supports and barriers. *J Hum Lact* 2010;26:368–375.
35. Bower K, Burnette T, Lewis D, et al. ''I Had One Job and That Was To Make Milk''. *J Hum Lact* 2017;33:188–194.
36. Hurst N, Engebretson J, Mahoney JS. Providing mother's own milk in the context of the NICU: A paradoxical experience. *J Hum Lact* 2013;29:366–373.

Address correspondence to:
Margaret G. Parker, MD, MPH
Department of Pediatrics
Boston Medical Center
Boston University School of Medicine
801 Albany Street, Room 2010
Boston, MA 02118
USA

E-mail: margaret.parker@bmc.org