Effects of an Early Breastfeeding Education and Proactive Telephone Support Program for Mothers of Preterm Infants: A Quasi-experimental Study

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Abstract: Breast milk is optimal for both term and preterm infants as it provides essential nutrition and immunity. However, mothers of preterm infants often have insufficient milk supply, resulting in low breastfeeding rates, including in Thailand, where this quasi-experimental study was undertaken. We investigated the effects of an early breastfeeding education and proactive telephone support program, including early breastfeeding education and proactive telephone support. This included breastfeeding outcomes, including total breast milk volume, duration of exclusive breastfeeding, and exclusive breastfeeding rates at discharge and three months post-discharge in mothers of preterm infants. The participants included 57 mother-infant dyads and their families. The participants were assigned to either the control group (n = 28) receiving routine care or the experimental group (n = 29) receiving the intervention program. The assignment was done using purposive sampling and matching the number of pregnancies and gestational age between the two groups. Data were collected using the Demographic Characteristics Questionnaire, the Breast Milk Expressing Record Form, the Oral Care with Breast Milk Record Form, and the Breastfeeding Practice and Problems Record Form. Data analysis was performed using the chi-square test, Mann-Whitney U test, independent t-test, and descriptive statistics.

The results indicated that, after receiving the program, the total breast milk volume from day 1 to day 7 and the duration of exclusive breastfeeding in the experimental group were significantly higher and longer than in the control group. At discharge, the rate of exclusive breastfeeding in the experimental group was higher than that of the control group but with no statistical difference. However, the experimental group had a significantly higher exclusive breastfeeding rate at three months than the control group. This study confirmed the program's effectiveness in increasing the exclusive breastfeeding rate at three months. Nurses can integrate this program to promote breastfeeding as a critical component of preterm infant care. Still, a long-term follow-up study requires comprehensive testing of its effectiveness.

Keywords: Breast milk volume, Breastfeeding duration, Breastfeeding program, Breastfeeding rate, Education, Exclusive breastfeeding, Preterm infants, Quasi-experiment

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Introduction

Breast milk provides the most beneficial nutrition for premature infants. It significantly reduces the chances of necrotizing enterocolitis, strengthens the immune system, and improves neurodevelopmental outcomes.[1] It also promotes good bonding and

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attachment between mother and infant, associated with better cognitive and social-emotional development and behavioral outcomes for the child.[2] The World Health Organization (WHO) recommends solely breastfeeding six months after birth, then breastfeeding with suitable solid foods until the child is two years old.[3] In line with this guidance, the Ministry of Public Health (MOPH) of Thailand has implemented a policy to encourage and support breastfeeding following the recommendations of the WHO.[4]

Unfortunately, preterm infants are usually not breastfed because of many factors, such as physiological and neurodevelopment immaturity and poor sucking activity.[5] This can be seen from breastfeeding statistics in Thailand between 2012-2022, which found an increasing exclusive breastfeeding rate of 12.3% (in 2012), 23.1% (in 2016), 14% (in 2019), and 28.2% (in 2022).[6] To promote breastfeeding, the WHO has set the goals of achieving a 6-month-exclusive breastfeeding rate of 50% by 2025 and 70% by 2030.[7] Therefore, the MOPH has adopted this policy in Thailand as well.[4] It is clear that exclusive breastfeeding rates in Thailand remain low and have not reached the goal. Premature babies that have not been breastfed have higher rates of mortality and morbidity, especially neonatal sepsis and necrotizing enterocolitis.[8] These morbidities cause prolonged ventilator support and more extended hospital stays, which adversely affect the economic condition of both the family and the country.[9] To address this issue, it is imperative to determine the underlying causes and provide effective interventions to increase the rate of exclusive breastfeeding.

The main barrier to breastfeeding causing the low breastfeeding rates is that mothers face many challenges in establishing and maintaining an adequate milk supply. Research has indicated that a lack of knowledge among mothers about the benefits of breast milk and maintaining lactation are significant predictors of breastfeeding intention.[10] Normally, mothers are only concerned about their baby's illness and do not focus on expressing milk, resulting in a delay or infrequency in breastfeeding expression.[11] This phenomenon reduces milk volumes after two weeks postpartum, resulting in insufficient milk supply and early weaning from breastfeeding.[12] Additionally, working mothers often have problems with lactation due to stress and fatigue caused by work responsibilities, as well as being unable to pump breast milk as often as desired. As a result, not only is the milk supply reduced, but it also needs to increase for the baby. Therefore, most preterm infants are given formula milk instead of breast milk during the first few weeks, which leads to a failure of exclusive breastfeeding.[13] Nevertheless, the American Academy of Pediatrics recommends that all premature infants receive breast milk.[14]

From this background, breastfeeding is crucial for the growth and development of premature babies. However, incomplete and inaccurate breastfeeding information can affect a mother's attitude and intention. Lack of knowledge about maintaining milk production and incorrect breastfeeding techniques can lead to low confidence and commitment to breastfeeding. Therefore, developing and implementing effective strategies to encourage and promote breastfeeding in these mothers is imperative, ensuring they receive suitable support, assistance, and guidance for prolonged breastfeeding.

Conceptual Framework and Review of Literature

Pender's Health Promotion Model (HPM) was used as a framework for this study.[15] It recognizes that behavioral determinants predict health-promoting behaviors. The model has three key components: Individual Characteristics and Experiences, Behavior-specific Cognitions and Affect, and Behavioral Outcomes.[15] The first two components are closely related and significantly impact an individual's behavior.[15] First, Individual Characteristics and Experiences consist of prior related behavior and personal factors. Mothers with prior positive breastfeeding experiences tend to breastfeed

again with subsequent children.[16] Hence, we can anticipate successful breastfeeding in their next child. Personal factors also impact breastfeeding initiation and duration, and research indicates that maternal mental health predicts exclusive breastfeeding duration.[17]

Second, Behavior-specific Cognition and Affect consist of six categories:1) perceived benefits of action (a positive perception resulting from engaging in healthy behaviors); 2) perceived barriers to action (perspectives on the difficulty of and the obstacles to engaging in healthy behaviors); 3) perceived self-efficacy (the evaluation of personal confidence in carrying out a specific health behavior, which is influenced by activity-related effect; greater positive feelings increase perceptions of efficacy); 4) activity-related affect (the personal emotions or sensations felt before, during, and after engaging in a particular health behavior); 5) interpersonal influences (the perceptions related to the behaviors, beliefs, or attitudes of another person that influences a person's thinking); and 6) situational influences (how the environment affects health behaviors).[15] These variables are essential for designing an intervention because they can be modified through nursing interventions. However, factors like hospital environments, maternity leave, workplace facilities, and formula milk advertising can hinder or facilitate breastfeeding opportunities.[18] These components can be challenging to change or modify. As a result, mothers may experience similar factors of influence during their hospitalization. It was considered that the primary investigator (PI) would be unable to control these factors, so situational variables were not included in this study.

From this perspective, more information about breast milk benefits can promote a positive maternal attitude toward breastfeeding and would be correlated with longer breastfeeding duration.[19,20] However, various maternal and preterm infant barriers can disrupt exclusive breastfeeding and can occur at any time, leading to early weaning.[21] Failure to address these issues can disrupt a mother's commitment to exclusive breastfeeding, potentially leading to its discontinuation. Despite their initial intent, mothers may alter their plans following preterm delivery when facing various physical and emotional challenges. Empowering mothers with strategies to surmount these obstacles enhances their confidence in achieving the intended behavior.[22] Research validates that maternal confidence in breastfeeding enhances self-efficacy and promotes higher exclusive breastfeeding rates.[23] Mothers with strong breastfeeding self-efficacy possess higher intentions and can overcome barriers more efficiently, aligning with the theory that higher efficacy reduces perceived barriers.[15]

In addition, experiencing happiness during breastfeeding contributes to maternal satisfaction and commitment to continue breastfeeding. According to Pender,[22] positive feelings enhance perceived self-efficacy, fostering greater confidence in breastfeeding. Moreover, support from healthcare providers and family members influences breastfeeding sustainability, correlating with higher rates of exclusive breastfeeding.[24,25] Additionally, family support has also been reported to promote the maintenance of breast milk production.[26,27] Therefore, healthcare providers and the family are significant sources of social support that directly affect breastfeeding intention.

Although there have been many interventions aimed at promoting breastfeeding in preterm infants, most previous studies needed to be more cohesive and focused solely on providing knowledge and breastfeeding practice.[28] However, more than a single intervention is required to encourage mothers to breastfeed exclusively.[29,30] Presently, more Thai women are employed full-time, which is different from the past. The family context is essential and can affect breastfeeding. Nevertheless, few studies have included the father in breastfeeding support interventions.[31] Therefore, we developed the Early Breastfeeding Education and Proactive Telephone Support Program (EBEPTSP) involving the family to enhance preterm infants' health and increase breastfeeding outcomes, including total breast milk volume and duration and rate of exclusive breastfeeding. Timely recovery

of these infants can lead to earlier discharge, consequently reducing national healthcare costs and promoting earlier family bonding with the baby.

Study Aim and Hypotheses

This study examined the effects of EBEPTSP on total breast milk volume, duration of exclusive breastfeeding, and exclusive breastfeeding rates in mothers of preterm infants. It was hypothesized that the mothers receiving the program would have greater total breast milk volume from day one to day seven after delivery, longer duration of exclusive breastfeeding, and higher exclusive breastfeeding rates at discharge and three months than those who only received usual care.

Methods

Design: A quasi-experimental posttest-only design with a comparison group was used in this study. In writing this report, we followed the TREND statement to improve the reporting quality.[32]

Sampling and Setting: G*Power 3.0.10 was used to calculate the sample size to compare two independent proportions, with a significance level of 0.95 and a power of 0.80. The proportions were obtained from a previous study of a family-centered breastfeeding education intervention on exclusive breastfeeding rates.[33] The calculated sample size was 26 participants for each group. Considering the 20% attrition rate in a previous study,[34] it was determined that the total sample required 62 dyads, 31 in each group, to account for participant dropout. The participants were mother-infant dyads and fathers or family members in the postpartum and neonatal units (sick newborns and neonatal intensive care) at a university hospital in central Thailand. Participants meeting the inclusion criteria were recruited through purposive sampling. The maternal inclusion criteria were: maternal age > 20; singleton birth; intending to breastfeed; not having flat or inverted nipples or a history of breast surgery; being able to read and speak Thai; residing with their husband or family members; having the LINE App for connection; and not having psychiatric symptoms preventing child-rearing. Mothers who could not breastfeed for any reason during the first three months were excluded. The inclusion criteria for the preterm infants were: gestational age between 30-34 weeks, birth weight ≥ 1250 grams, Apgar score at one minute ≥ 3 and five minutes ≥ 5, and no ventilator support in the past 48 hours. The infant exclusion criteria were: having sucking and swallowing problems diagnosed by a doctor; or having congenital anomalies, genetic disorders, birth asphyxia, or chronic illnesses such as bronchopulmonary dysplasia, intraventricular hemorrhage grade 3 or 4, necrotizing enterocolitis, severe sepsis, and gastroesophageal reflux disease. The first 31 mother-infant dyads admitted to the postpartum ward were purposively selected and assigned to the control group. In contrast, the 31 mother-infant dyads admitted after the complete data collection in the control group were matched with the control group in terms of pregnancy number and gestational was assigned to the experimental group.

Ethical Considerations: Approval was granted by the Human Research Ethics Committee of the Faculty of Medicine Ramathibodi Hospital, Mahidol University (COA. MURA2020/404). Participants were informed of the study's objectives, benefits, risks, and rights to seek clarification and discontinue participation without affecting their medical treatment or nursing care. They were assured that their data would remain confidential. The data collection process was initiated only after receiving informed consent forms duly signed by all the participants, indicating their understanding of and agreement to the terms of the study.

Data Collection: Data were collected from October 2021 to March 2022. Once ethical approval was obtained, individuals who fulfilled the inclusion criteria were offered participation in the study by the PI through purposive sampling and were asked to provide informed consent and complete demographic questionnaires. The control group received usual care

and underwent data collection first. After that, the experimental group, matched with the control group in terms of pregnancy number and gestational age, received the EBEPTSP intervention. The PI provided the intervention and collected the data by herself.

Research Instruments: These consisted of four data collection instruments and the intervention program, all developed by the PI.

The Demographic Characteristics Questionnaire includes age, education, marital status, monthly family income, family type, preterm infant's caregiver, maternity leave length, gestation duration, delivery type, gender, birth weight, and APGAR score.

The Breast Milk Expression Record Form was developed for the mother during the first week post-delivery. It captures details such as date, time, and volume for each expression, with a daily summation of the total milk volume expressed over 24 hours, measured in milliliters.

The Oral Care with Breast Milk Record Form records the infant's vital signs of oxygen saturation, heart rate, and respiratory rate. The recording was done before and after the oral care with the breast milk procedure. The normal range for these vital signs is oxygen saturation should be above 90%, heart rate should be between 100-180 beats per minute, and respiratory rate should be between 40-60 breaths per minute.

The Breastfeeding Practice and Problems Record Form inquires about the preterm infant's diet, including milk and food consumed in the past 24 hours, any breastfeeding issues such as breast engorgement, blocked ducts, cracked nipples, and the infant's health status. The form also summarizes the duration of exclusive breastfeeding and categorizes breastfeeding problems weekly from weeks 1 to 8 and then at week 12.

The Early Breastfeeding Education and Proactive Telephone Support Program

The EBEPTSP is based on Pender's Health Promotion Model[15] and existing literature. The program is composed of five steps: 1) establishing relationships and providing information about the advantages of breastfeeding for the preterm infant; 2) providing breastfeeding knowledge and family support and encouragement; 3) providing VDO clips of the infant; 4) breastfeeding practice and recommending kangaroo mother care at home; and 5) breastfeeding telephone support. It promotes breastfeeding outcomes by increasing the perceived benefits of breastfeeding, the perceived self-efficacy to breastfeed, breastfeeding-related affect, and interpersonal influences while decreasing perceived barriers to breastfeeding. It was reviewed by five experts, resulting in the index of item-objective congruence (IOC) score of 0.95. It was revised based on their recommendations. The program with specific details and implementation information is shown in **Appendix, Table 1.**

A *ten-minute instructional video* by the Thai Breastfeeding Center Foundation demonstrates correct breastfeeding techniques and positioning. The PI received permission to use this tool. It can be downloaded from their website using the following link: https://library.thaibf.com/handle/023548404.11/411

The *Booklet for Promoting Breastfeeding of Preterm Infants* was developed by the PI from a literature review. It covers breastfeeding benefits, milk production, maintaining milk supply, breast milk expression and storage, common breastfeeding issues, and the advantages of skin-to-skin contact (kangaroo care) for premature babies. The booklet's content validity and language appropriateness were confirmed by five experts, including a neonatologist, a breastfeeding specialist nurse, a nursing instructor specializing in breastfeeding, and two preterm infant professional nurses, resulting in an IOC score of 0.94.

Usual Care: Usual care comprises the baby's daily routine, including bathing, feeding on time, and promoting sleep. In addition, drug administration and monitoring for any infant problems that may require immediate medical attention were provided. The nurses advised the mother about how to express her breast milk and transfer it to the hospital. When the baby was close to coming home, the nurses called the mothers

to learn to take care of their babies at the hospital. They emphasized how to observe the abnormalities that should be brought the infant to the doctor before an appointment. Parents are also given the option to seek nursing counseling via telephone if needed after the infant's discharge.

Data Analysis: This was done using IBM® SPSS Statistics version 21. The demographic data were analyzed using mean, percentage, frequency, and standard deviation and compared using Fisher's Exact test, the chi-square, and the Mann-Whitney U test. The total milk volume from days 1 to 7 was compared using the independent t-test. The duration of exclusive breastfeeding was compared using the Mann-Whitney U test. The proportions of exclusive breastfeeding at discharge and three months were evaluated using the chi-square and Fisher's exact tests, respectively. Before analyzing the data, all statistical assumptions were tested, and none of them were violated.

Results

Participant characteristics

The study enrolled 62 mothers of preterm infants, with 31 in each group. The participant attrition rate was 9.7% in the control group and 6.5% in the experimental group due to maternal hypertension requiring medications incompatible with breastfeeding and being unable to contact them. Thus, the program was completed by 57 participants, with 28 in the control group and 29 in the experimental group. **Table 2** shows that the control and experimental groups had an average maternal age of approximately 31 years and an average maternity leave of 55.71 days and 79.41 days, respectively. Most participants in both groups were first-time mothers with at least a bachelor's degree. More than half were either housewives or employed. There were no statistically significant differences in maternal characteristics between the control and experimental groups.

Table 2. Maternal characteristics comparison between groups

Characteristics	Control group (n = 28) n (%)	Experimental group (n = 29) n (%)	Test statistics	p-value
Mothers				
Age (years)			369.5	.559[a]
Mean (SD)	31.04 (5.47)	31.90 (4.60)		
Median (IQR)	32.00 (8.00)	32.00 (7.00)		
Family income in THB (USD)			340	.289[a]
Mean	42,214 (1,172)	49,931 (1,387)		
(SD)	(21,884/ 608)	(25,776/ 716)		
Median	40,000 (1,111)	40,000 (1,111)		
(IQR)	(20000/ 556)	(40,000 /1,111)		
Maternity leave (days)			319	.123[a]
Mean (SD)	55.71 (56.40)	79.41 (68.90)		
Median (IQR)	90.00 (90.00)	90 (53.00)		
Number of pregnancies			2.459	.117[c]
Primipara	21 (75)	16 (55.2)		
Multipara	7 (25)	13 (44.8)		
Education level			2.725	.099[c]
High school	9 (32.1)	4 (13.8)		
Bachelor's degree and higher	19 (67.9)	25 (86.2)		

Table 2. Maternal characteristics comparison between groups (Cont.)

Characteristics	Control group (n = 28) n (%)	Experimental group (n = 29) n (%)	Test statistics	p-value
Occupation			.169	.681[c]
Housewife and employee	16 (57.1)	15 (51.7)		
Own business and government officer	12 (42.9)	14 (48.3)		
Type of family				
Nuclear family	12 (42.9)	7 (25)	.022	.881[c]
Extended family	16 (57.1)	21 (75)		
Other caregivers			-	0.79[b]
No	7 (25)	2 (6.9)		
Yes	21(75)	27 (93.1)		

Note: a = Mann-Whitney U test, b = Fisher's exact test, c = Chi-square test

Regarding infant gestational age, two-thirds of the infants were born between 33 and 34 weeks and had a birth weight equal to or greater than 1500 grams. Most of them were delivered through cesarean section. The average duration of hospital stay for the experimental group infants was 18.72 days, while it was 15.75 days for the control group. The demographic characteristics of both groups did not show any differences in terms of statistical significance, as shown in **Table 3.**

Table 3. Preterm infants' characteristics comparison between groups

Characteristics	Control group (n = 28) n (%)	Experimental group (n = 29) n (%)	Test statistics	p-value
Infants				
Gestational age (week)			.035	.851[c]
30-32	9 (32.1)	10 (34.5)		
33-34	19 (67.9)	19 (65.5)		
Type of delivery			.877	.349[c]
Normal labor	11 (39.3)	8 (27.6)		
Cesarean section	17 (60.7)	21 (72.4)		
Gender			.026	.872[c]
Boy	17 (60.7)	17 (58.6)		
Girl	11 (39.3)	12 (41.4)		
Birth weight (gram)			-	1.000[b]
1,500	3 (10.7)	3 (10.3)		
≥ 1,500	25 (89.3)	26 (89.7)		
Apgar score (at 1 min)			381.5	.671[a]
Mean (SD)	7.71 (1.58)	7.79 (1.24)		
Median (IQR)	8 (2.00)	8 (0)		

Table 3. Preterm infants' characteristics comparison between groups (Cont.)

Characteristics	Control group (n = 28) n (%)	Experimental group (n = 29) n (%)	Test statistics	p-value
Apgar score (at 5 min)			404	972[a]
Mean (SD)	9.25 (0.80)	9.28 (0.70)		
Median (IQR)	9 (1.00)	9 (1.00)		
Length of stay (day)				
Mean (SD)	15.75 (9.64)	18.72 (13.74)	380.5	.684[a]
Median (IQR)	11.5 (15.25)	15 (19.00)		

Note: a = Mann-Whitney U test, b = Fisher's exact test, c = Chi-square test

Effects of the Early Breastfeeding Education and Proactive Telephone Support Program

The study used an independent t-test to compare total milk volume from day one to day seven between the control and experimental groups, revealing a significantly greater mean total breast milk volume in the experimental group ($p < .05$). The study used the Mann-Whitney U test to analyze the duration of exclusive breastfeeding, showing that the experimental group had a significantly longer duration than the control group ($p < .05$). At discharge, the proportion of mothers who exclusively breastfed in the experimental group was higher than that in the control group. However, this association was not statistically significant in either group ($p > .05$). After the three-month follow-up, the proportion of mothers who exclusively breastfed in the experimental group was higher than that in the control group. A statistically significant association between both groups was demonstrated by the Pearson chi-square test ($p < .05$), as indicated in **Table 4**.

Table 4. Comparison of total milk volume from day 1 to day 7, duration and rates of exclusive breastfeeding at discharge and 3 months between groups

Variable	Control group (n = 28)	Experimental group (n = 29)	p-value
Total milk volume (ml), Mean (SD)	1,033.9(769.42)	1,582.93(1,165.83)	.04[a]
The duration of exclusive breastfeeding (days)			
Min-Max	0-79	0-82	
Mean (SD)	20.25 (33.04)	35.21 (34.28)	
Median (IQR)	0 (59)	27 (74)	.018[b]
Exclusive breastfeeding at discharge, n (%)			
Yes	2 (7.1)	7 (24.1)	1.44[c]
No	26 (92.9)	22 (75.9)	
Exclusive breastfeeding at 3 months, n (%)			
Yes	8 (28.6)	16 (55.2)	.04[c]
No	20 (71.4)	13 (44.8)	

Note: a = independent t-test, b = Mann-Whitney U test, c = Chi-square test

Discussion

The findings confirm the effectiveness of the EBEPTSP in improving breastfeeding outcomes for mothers of preterm infants. This includes an increase in total breast milk volume from day one to day seven after delivery, duration of exclusive breastfeeding, and exclusive breastfeeding rates at discharge and three months. The program's success is attributed to early discussions with mothers during the postpartum phase, emphasizing the benefits of breast milk and motivating them to express milk for their preterm babies. This approach enhances the perceived benefits of breastfeeding and encourages the mother's intention to express breast milk. According to Pender, when individuals perceive the benefits of a specific action, they are more likely to engage in healthy behaviors.[22] In this case, regular and continuous breast milk pumping is healthy. Research conducted in the past has indicated that starting the expression of milk early on can lead to an earlier onset of lactogenesis stage II, which can increase milk volume.[35]

Mothers who understand the benefits of breast milk can maintain breast milk volume despite stress and separation from their infants. They put their best effort into ensuring enough milk for their baby. One of the most significant barriers to breastfeeding is insufficient milk supply. Mothers who succeed in maintaining an adequate supply also report fewer barriers to breastfeeding, as outlined in the conceptual framework. This finding is consistent with the work of Topothai et al., who noted that inadequate milk supply is one of the most common problems that can impact exclusive breastfeeding rates.[36]

The EBEPTSP increased exclusive breastfeeding duration and rates. The PI provided breastfeeding knowledge related to maintaining milk supply, common breastfeeding problems, breastfeeding techniques and correct position, and the advantages of kangaroo care for preterm infants with family members' participation. These activities could reduce their perception of breastfeeding barriers by enhancing maternal understanding of potential issues and encouraging proactive problem-solving. This result agrees with prior research where mothers in a supportive care program received breastfeeding education and training, which resulted in increased milk volume through frequent pumping and a longer duration of exclusive breastfeeding by two months.[37] The PI also provided daily video clips of the baby to mothers. This helped reduce their stress and anxiety while expressing breast milk. Strengthening the mother-baby bond motivates mothers, as does consistent pumping, leading to more extended lactation periods and positive breastfeeding experiences.[38] The mothers eagerly anticipated the daily video clips, which boosted happiness, motivation, and discipline in milk pumping.

According to Pender, positive feelings influence perceived self-efficacy.[22] In our study, mothers were guided in breastfeeding techniques, reinforcing their self-efficacy through mastery of these experiences and helping them feel confident to care for their babies at home. Moreover, the PI verbally persuaded the mothers to believe in their abilities by complimenting the mothers who put effort into all their practices. Additionally, the PI fostered positive emotions by sharing information about the infants' symptoms and medical care during hospitalization. The PI also provided opportunities for the mothers to express their feelings, answer questions and exchange ideas with each other regularly, which helped to reduce their anxiety. The study concluded that these activities helped enhance self-efficacy through verbal persuasion, enactive mastery experiences, and emotional or physical arousal. A similar study has shown that breastfeeding training can lead to higher self-efficacy and more extended breastfeeding durations.[23]

Moreover, the EBEPTSP increased interpersonal influences, and the PI discussed the effects of the role of the family in successful breastfeeding. A previous study found that breastfeeding behaviors are strongly associated with perceived family support.[26] Grandmothers and husbands actively assist mothers in baby care in

Thai society. The fathers in this study facilitated the transportation of breast milk, assisted with housework and feeding, and provided infants with nighttime care. Supportive families increase the chances of breastfeeding because they allow mothers to rest, alleviate fatigue, and enable sufficient time for breast milk expression, which is a crucial factor in sustaining milk supply and prolonging exclusive breastfeeding. Previous studies revealed that husbands who understood their role in supporting breastfeeding mothers during postnatal care, such as providing verbal encouragement and sharing household duties, can increase exclusive breastfeeding duration.[27] This support also increases interpersonal influences, directly impacting breastfeeding behavior, which aligns with the conceptual framework.

Regarding social support, the PI provided continuous telephone support for breastfeeding assessment, issue resolution, and monitoring infant nutrition. Mothers could seek help anytime, receiving immediate responses for quick problem-solving and knowledge reinforcement. Emotional support fostered satisfaction and maternal confidence, aligning with findings that mothers appreciated healthcare professionals' advice and psychological support during and after hospitalization.[25] Suggestions and solving problems by the PI helped the mother overcome her breastfeeding barriers and increased her self-efficacy, encouraging the mother to breastfeed continuously for a longer time. This is consistent with studies on structured telephone support provided by healthcare professionals and its impact on enhanced self-efficacy and extended breastfeeding duration.[39] Therefore, healthcare providers and the family are the significant social support resources that directly affect breastfeeding intention. This is consistent with a study involving professional telephone support with mobile counseling calls, which found that participants in the telephone support group maintained higher exclusive breastfeeding rates after hospital discharge.[24]

This study found no significant difference in exclusive breastfeeding rates at discharge between the two groups due to the presence of preterm babies who were born with very low birth weight before 32 weeks of gestational age. As recommended, a human milk fortifier was added to the breast milk to ensure sufficient energy.[40] After discharge, the catch-up growth formula milk was given until the baby showed improved weight gain. Eventually, they transitioned exclusively to breast milk with the approval of a neonatologist. These uncontrollable factors explain the non-significant result related to breastfeeding rates at discharge.

Therefore, the EBEPTSP successfully increased milk supply and achieved higher exclusive breastfeeding rates at three months. The findings provide comprehensive knowledge about the different variable constructs involved in the intervention. They also confirm the interventions' impact, which increased perceived benefits and perceived self-efficacy of breastfeeding, enhanced breastfeeding-related affect and interpersonal influences and reduced perceived barriers to breastfeeding.

Limitations and Recommendations

A few limitations were noted in this study. The study was only conducted in a single university hospital, a tertiary care setting in central Thailand. Therefore, this might limit the generalizability of the study to other populations. Additionally, threats to internal validity cannot be avoided because a quasi-experimental design was utilized. Bias might have occurred due to the PI collecting the data by herself. Further studies should be undertaken in other regions in Thailand with larger sample sizes and using randomized controlled trials to compare results and enhance the program effectiveness with long-term follow-up to six months.

Conclusions and Implications for Nursing Practice

The program was demonstrably successful in improving breastfeeding outcomes for mothers of

preterm infants using various strategies. Nurses can easily integrate the program into their routine care. Nurse administrators should consider incorporating this program into their standard nursing services. This would involve expanding staff nurses' breastfeeding knowledge and skills, encompassing information, advice, practice, and problem-solving techniques for mothers. Therefore, novice and beginner nurses, who have expertise and potential but limited experience, should receive training to help them implement the program efficiently.

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Appendix

Table 1. Description of content of the EBEPTSP

Session	Objectives	Activities
1. First meeting: 6-12 hours after delivery in post-partum unit (30 minutes)	1. To provide information about the benefits of breastfeeding 2. To encourage a positive attitude toward breastfeeding and motivate the mother's intention to express breast milk regularly and continuously 3. To increase breastfeeding self-efficacy	- Provide information about the benefits of breast milk for infants - Explain and demonstrate how to hand-express breast milk and having the mother practice until she can do it correctly by herself - Suggest the mother to collect her colostrum and send it to the ward for the infant's oral care - Provide the mother with breast milk storage and record forms - Instruct the mother to record milk volume and submit it via the LINE application for milk production evaluation
2. Second meeting: 24-48 hours after delivery in neonatal unit (60 minutes)	1. To increase their breastfeeding knowledge 2. To increase interpersonal influences 3. To increase breastfeeding self-efficacy	- Provide breastfeeding knowledge to the mother and family members - Demonstrate breast milk expression with an electric pump; Offer assistance and encouragement as needed - In the case of NPO or feeding via a gavage tube, the infants would be given oral care with breast milk every three hours. - Inform the family members about how they can assist breastfeeding mothers and emphasize the importance of their involvement
3. Video clips of the babies, while they stayed in the hospital, were given to the mother.	1. To increase the bonding between the mother and baby, which promotes breastfeeding-related affect 2. To encourage mothers to express their breast milk regularly	- The PI records a one-minute video clip of the baby's various gestures with a short audio commentary. - The video clip is sent once a day to the mother via the LINE application until the baby is allowed to go home.
4. Third meeting: breastfeeding practice one to two days before infant is ready to be discharged. (45 minutes)	1. To increase their skills and perceive breastfeeding self-efficacy 2. To decrease the perception of breastfeeding barriers 3. To decrease mother-infant separation and increase the positive feelings about breastfeeding	- The mother watches the video presentation on breastfeeding techniques. - The mother practices breastfeeding while the PI observes, advises, and provides assistance. - The PI compliments the mother whenever she can do it by herself. - The mother receives training until she gains confidence and can get into the proper breastfeeding position without assistance. - The PI also helps the mother complete the kangaroo care steps, which they are advised to do for seven consecutive days.

Table 1. Description of content of the EBEPTSP (Cont.)

Session	Objectives	Activities
5. Breastfeeding telephone support Once a week, every week during the first two months after delivery, with the last in the 3rd month (15-30 minutes)	1. To increase interpersonal influence 2. To evaluate, suggest, and solve breastfeeding problems and monitor the infant's milk and food intake	- Provide telephone support weekly for two months after delivery and into the 3rd month or until breastfeeding is stopped - In each conversation, the PI assesses the breastfeeding problems and provides suggestions and encouragement based on the issues. - The mother is asked about the infant's type of milk, kinds of food, and their health.

ผลของโปรแกรมการให้ความรู้เรื่องการเลี้ยงลูกด้วยนมแม่โดยเร็วและการติดตามทางโทรศัพท์เชิงรุกสำหรับมารดาของทารกเกิดก่อนกำหนด: การวิจัยกึ่งทดลอง

สุธาสินี แซ่หุ่ง เรณู พุกบุญมี ทิพวัลย์ ดารามาศ ณัฐกมล ชาญสาธิตพร ประชา นันท์นฤมิต*

บทคัดย่อ: นมแม่เป็นสารอาหารที่เหมาะสมที่สุดสำหรับทารกเกิดก่อนกำหนดเพราะให้ทั้งสารอาหารและภูมิคุ้มกันที่จำเป็นแก่ทารก แต่มารดาในกลุ่มนี้มักจะมีน้ำนมไม่เพียงพอ ส่งผลให้อัตราการเลี้ยงลูกด้วยนมแม่ในประเทศไทยยังอยู่ในระดับต่ำ งานวิจัยกึ่งทดลองนี้ศึกษาผลของโปรแกรมการให้ความรู้เรื่องการเลี้ยงลูกด้วยนมแม่โดยเร็วและการติดตามทางโทรศัพท์เชิงรุกต่อผลลัพธ์การเลี้ยงลูกด้วยนมแม่ ซึ่งได้แก่ ปริมาณน้ำนมแม่ ระยะเวลาการเลี้ยงลูกด้วยนมแม่ และอัตราการเลี้ยงลูกด้วยนมแม่เพียงอย่างเดียวเมื่อจำหน่ายและสามเดือนในมารดาของทารกเกิดก่อนกำหนด กลุ่มตัวอย่างคือ มารดา-ทารก 57 คู่ และสมาชิกในครอบครัว กลุ่มตัวอย่างได้รับการคัดเลือกแบบเจาะจง กลุ่มควบคุม (n = 28) ได้รับการดูแลตามปกติ หลังจากเก็บข้อมูลในกลุ่มควบคุมครบถ้วนแล้วกลุ่มทดลองจะถูกเลือกโดยการจับคู่จำนวนการตั้งครรภ์และอายุครรภ์กับกลุ่มควบคุม (n = 29) และได้รับโปรแกรมส่งเสริมการเลี้ยงลูกด้วยนมแม่ เก็บรวบรวมข้อมูลโดยใช้แบบสอบถามข้อมูลส่วนบุคคล แบบบันทึกการปีบเก็บน้ำนม แบบบันทึกการเคลือบช่องปากทารกด้วยนมแม่ และแบบบันทึกการให้อาหารทารกและปัญหาการเลี้ยงลูกด้วยนมแม่ วิเคราะห์ข้อมูลโดยใช้สถิติพรรณนา การทดสอบที การทดสอบแมน-วิทนีย์ ยู และการทดสอบไคสแควร์

ผลการวิจัยพบว่า หลังจากได้รับโปรแกรม ปริมาณน้ำนมแม่รวมตั้งแต่วันที่ 1 ถึงวันที่ 7 และระยะเวลาการเลี้ยงลูกด้วยนมแม่อย่างเดียวในกลุ่มทดลองมากกว่าและยาวนานกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ ในวันจำหน่ายออกจากโรงพยาบาล อัตราการเลี้ยงลูกด้วยนมแม่อย่างเดียวในกลุ่มทดลองสูงกว่ากลุ่มควบคุมแต่ไม่มีความแตกต่างทางสถิติ อย่างไรก็ตาม หลังจากผ่านไปสามเดือน กลุ่มทดลองมีอัตราการเลี้ยงลูกด้วยนมแม่อย่างเดียวสูงกว่าอย่างมีนัยสำคัญทางสถิติ การศึกษาครั้งนี้ยืนยันประสิทธิผลของโปรแกรมในการเพิ่มอัตราการเลี้ยงลูกด้วยนมแม่อย่างเดียวในช่วงสามเดือน พยาบาลสามารถบูรณาการโปรแกรมนี้เพื่อส่งเสริมการเลี้ยงลูกด้วยนมแม่ซึ่งเป็นองค์ประกอบที่สำคัญของการดูแลทารกเกิดก่อนกำหนด แต่ทั้งนี้ควรมีการศึกษาติดตามประสิทธิผลของโปรแกรมในระยะยาวเพิ่มเติมด้วย

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คำสำคัญ: ปริมาณน้ำนมแม่ ระยะเวลาการเลี้ยงลูกด้วยนมแม่ โปรแกรมการเลี้ยงลูกด้วยนมแม่ อัตราการเลี้ยงลูกด้วยนมแม่ การให้ความรู้ การเลี้ยงลูกด้วยนมแม่อย่างเดียว ทารกเกิดก่อนกำหนด การวิจัยกึ่งทดลอง

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