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# Impact of theory of planned behavior based intervention on breastfeeding patterns of the mothers with preterm infants: a randomized trial

Shirin Okhovat<sup>1</sup>, Mojgan Janighorban<sup>2\*</sup> and Ashraf Kazemi<sup>3</sup>

## Abstract

**Background** The birth of a preterm infant is considered a crisis for the mother and the family. Given the significance of breastfeeding for these high-risk infants, failure to initiate and maintain exclusive breastfeeding in this group of infants is a prevalent and serious problem. The aim of this research was to investigate the impact of Theory of Planned Behavior based intervention on breastfeeding patterns of the mothers with preterm infants: a randomized trial.

**Materials and methods** This study is a field trial conducted in Isfahan, Iran in 2021–2022. It included 72 mothers of late preterm infants, divided into the intervention ( $n = 36$ ) and control ( $n = 36$ ) groups. The intervention group received four training sessions focused on breastfeeding patterns based on the Theory of Planned Behavior. Before, immediately after, and two and four months after the intervention, the constructs of the Theory of Planned Behavior related to breastfeeding patterns were assessed using a researcher-made questionnaire, and the infant's breastfeeding pattern was recorded. Statistical analysis was performed using SPSS version 19, g repeated measures ANCOVA, Bonferroni post hoc test, and chi-square test.

**Results** The results indicated that immediately after the intervention, as well as two and four months later, the mean scores for attitude ( $P < 0.001$ ), subjective norms ( $P < 0.001$ ), perceived behavioral control ( $P < 0.001$ ), and behavioral intention ( $P < 0.001$ ) were significantly higher in the intervention group than in the control group. Additionally, the results showed that, the rate of breastfeeding immediately, two months, and four months after the intervention was significantly higher in the intervention group than before the intervention ( $P < 0.001$ ). However, in the control group, the rate of breastfeeding immediately, two months, and four months after the intervention was significantly lower than before the intervention ( $P < 0.001$ ).

**Conclusion** Interventions based on the Theory of Planned Behavior can improve exclusive breastfeeding in late preterm infants by changing the attitudes, subjective norms, perceived behavioral control and the behavioral intentions of the mothers of preterm infants.

**Trial registration** "IRCTID: IRCT20210524051392N1", 13/06/2021.

\*Correspondence:

Mojgan Janighorban  
janighorban@nm.mui.ac.ir; mojanjanighorban@gmail.com

Full list of author information is available at the end of the article



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**Keywords** Breast feeding, Exclusive breastfeeding, Infant, Premature birth, Theory of planned behavior

## Background

The promotion of breastfeeding at a global level has the potential to prevent the annual deaths of 823,000 children under the age of 5 and 20,000 women due to breast cancer [1]. A global strategic goal has been set to ensure that at least 50% of infants under 6 months old are exclusively breastfed by 2025 [2]. But the actual rate of exclusive breastfeeding for infants aged 0–6 months was only 44% between 2015 and 2020 [3]. In Iran, the overall rate of exclusive breastfeeding is 53%, ranging from 48% in urban areas and 68% in rural areas [4].

Premature Birth and admission to a neonatal intensive care unit (NICU) predict the cessation of exclusive breastfeeding [5, 6]. Compared to term infants, late preterm infants are less likely to be exclusively breastfed [7]. A study in Brazil on preterm infants found that the rate of exclusive breastfeeding at the time of discharge was 85.2%. However, this rate decreased to 75% and 46.3%, 15 and 30 days later respectively [8]. In a study in China, the rate of exclusive breastfeeding among preterm 6-month-old infants was only 22.5% [9]. Another study in Italy found that 66% of preterm infants were breastfed at discharge and only 27% of them were exclusively breastfed [10].

Several studies have investigated the reasons for discontinuing exclusive breastfeeding. One month after birth, 70.3% of Italian mothers of preterm infants experienced problems such as pain, fatigue, lack of milk and cracked nipples, while only half of them received support from healthcare providers. Factors such as the perception of having insufficient milk, suboptimal infant growth, mastitis, and the mother's return to work have been identified as reasons for discontinuing exclusive breastfeeding by the infant's third month of life [11]. Evaluation of mothers of late preterm infants during the initial 6 to 8 weeks after delivery has revealed significant breastfeeding difficulties. The unpredictable feeding patterns exhibited by these infants can cause distress to mothers, leading to various breastfeeding challenges and feelings of fatigue and stress caused by these difficulties [12]. A survey of Iranian mothers with children aged 6 to 24 months indicated that 50% of them had an unfavorable average breastfeeding knowledge, whereas 24.4% had poor breastfeeding knowledge. Moreover 61.9% of these mothers had an unfavorable attitude towards breastfeeding and only 50.7% of them had a favorable breastfeeding [13]. Problems related to nipples, insufficient milk, inadequate educational services related to breastfeeding, insufficient attention, guidance and care for mothers by the healthcare personnel, lack of support from husband and family, and postpartum stress and psychological

pressure are among the reasons for reducing the amount of breastfeeding among a group of Iranian mothers [14]. The inability to effectively address the challenges mothers face in the exclusive breastfeeding, the absence of consistent social support for breastfeeding mothers, and the negative societal attitudes towards breastfeeding can lead to the premature cessation of breastfeeding [15].

Strong intentions and positive attitudes towards breastfeeding have been correlated with exclusive breastfeeding of infants at 4 to 6 months of age [16]. A mother's intention to breastfeed and her breastfeeding self-efficacy are key predictors of breastfeeding duration [17]. Enhancing mothers' knowledge about breastfeeding and recognizing the supportive role of their partners, healthcare providers, and grandmothers can improve the breastfeeding status of mothers [13]. Healthcare providers play a critical role in the initiation and continuation of exclusive breastfeeding. Web-based breastfeeding education and supportive interventions by the healthcare providers after the infant's discharge from the hospital, through providing home care can be effective [11, 18, 19]. Therefore, the available evidence highlights the significance of implementing interventions that encompass multifaceted support at the individual, social, political, and financial levels to increase the initiation and duration of exclusive breastfeeding [18].

Additionally, social psychological theories can be used as a useful tool in the implementation of effective interventions [20]. Intention to engage in breastfeeding behaviors plays a critical role in the initiation and maintenance of exclusive breastfeeding. Based on the theory of planned behavior, behavioral intention, influenced by attitude, subjective norms, and perceived behavioral control, serves as the primary driver of actual behavior. Beliefs about the possible consequences of a behavior lead to a favorable or unfavorable attitude towards the behavior. Moreover, beliefs related to the expectations of others lead to perceived social pressure or subjective norm. An individual's beliefs about the presence of factors that either facilitate or hinder a specific behavior contribute to her perceived behavioral control or self-efficacy. The more favorable the attitude and subjective norm and the greater the perceived control, the stronger will be the individual's intention to perform the desired behavior [21]. The theory of planned behavior has been utilized to predict many health-related behaviors including breastfeeding [22]. The intervention based on the theory of planned behavior has improved the attitudes, subjective norms, behavioral control, intentions and higher rates of breastfeeding in post-cesarean mothers [23]. However, the results of a systematic review of observational studies

on the relationship between the constructs of the theory of planned behavior and breastfeeding are contradictory and warrant further investigation [17]. Given the current disparity between the rate of exclusive breastfeeding, especially among preterm infants, and the WHO recommendations, continued efforts and effective interventions are needed to achieve global goals for the promotion of exclusive breastfeeding [24]. Therefore, this study aimed to examine the impact of a theory of planned behavior based intervention on breastfeeding patterns of mothers with preterm infants.

## Methods

This field trial was conducted from May 2021 to January 2022 on 72 mothers of preterm infants hospitalized in two large specialized neonatal hospitals in Isfahan, Iran. Mothers whose preterm infants were hospitalized in the NICU were invited to participate in the study. Inclusion criteria were literacy, having an infant with the gestational age of 34 to 36 weeks and 6 days, singleton birth, stable infant condition for initiation of breastfeeding directly from the breast, and the absence of any contraindications to breastfeeding in both mother and infant. Exclusion criteria included cessation of breastfeeding for maternal or neonatal reasons, infant death during the study period, maternal history of postpartum depression confirmed by a psychiatrist, and mothers' unwillingness to continue participating in the study. Convenience sampling method was used for sampling. The researcher became acquainted with the participants by visiting the neonatal intensive care unit and the breastfeeding mothers' room and invited them to participate in the study. The sample size was determined to be 36 subjects with 80% test power and an alpha value of 5% and  $d=0.7s$ , considering 10% of dropout in each group. After completing the written informed consent form, the eligible mothers were randomly assigned to the intervention and control groups. To ensure random allocation of participants, a randomization process was conducted using two sets of cards labeled "control" and "intervention." These cards were placed in a bag, and the participating mothers were asked to select a card without seeing its contents and then the mothers were assigned to either the intervention group or the control group based on the card selected. The mothers were blinded after assignment to interventions. Random allocation continued in this way until each group reached the desired size. The first author created the allocation sequence, enrolled the participants, and assigned the participants to interventions. she has a master's degree in midwifery. The data collection tool was a 5-part researcher-made questionnaire. This tool facilitated the evaluation of various demographic characteristics (age, occupation and education of parents), reproductive and neonatal records (type

of delivery, sex of the infant, birth order, gestational age of the baby at birth, birth weight, length of hospital stay, and age of infant at discharge), and breastfeeding patterns (exclusive breastfeeding, combined breastfeeding and formula feeding, formula feeding). The face validity and content validity of the constructs of the theory of planned behavior of the questionnaire were qualitatively assessed using the opinions of 10 experts in reproductive health, health education and neonatal nursing. The content validity ratio and content validity index of the questionnaire were also calculated using the opinions of the same experts. After making the necessary modifications, the final questionnaire was compiled, consisting of a total of 23 questions. These questions were categorized into different constructs of the theory of planned behavior, including attitude (11 questions), subjective norm (6 questions), perceived behavioral control (5 questions), and behavioral intention (1 three-option question). Scoring of the three constructs of attitude, subjective norm, and perceived behavioral control was based on a 5-point Likert scale [1–5] ranging from strongly disagree (score 1) to strongly agree (score 5) for direct scoring, and strongly disagree (score 5) to strongly agree (score 1) for reverse scoring. In the attitude, subjective norms and perceived behavioral control constructs, 7,4,4 questions were scored directly and 4,2,1 questions were scored inversely. Behavioral intention was assessed using a three-option question. The minimum and the maximum scores of the questionnaire were 22 and 110 respectively. To test the reliability of the questionnaire, it was completed by 15 eligible mothers of preterm infants in two phases, with a two-week interval between each phase. The internal reliability of the entire questionnaire was calculated using Cronbach's alpha, resulting in a value of 0.849. The components of the questionnaire also demonstrated acceptable internal reliability, with attitude having a Cronbach's alpha of 0.734, subjective norm having  $\alpha=0.747$ , and perceived behavioral control with  $\alpha=0.819$ . The stability of the questionnaire was also confirmed with Pearson's correlation coefficient of 0.946.

In this study, in order to perform the intervention, four training sessions, each lasting 60 to 90 min, were designed during 4 days. The sessions were performed consecutively or intermittent during one week depending on the opinion of the mothers and in the hospital before the discharge of the new born. Given the covid-19 pandemic, these sessions were held in a group (at least two and maximum 4 mothers, and a researcher) during one week with prior coordination and observance of social distance and health protocols. A variety of methods were used to enhance each construct of the theory of planned behavior, including lectures, standard educational videos, question and answer sessions, group discussions, individual counseling and role playing. The content of the

sessions, their scheduling and the manner of performing the sessions were the same for all mothers. At the beginning of the sessions, the mothers of the intervention group committed to us ethically not to exchange information with other mothers. This matter was written in the informed consent.

In the first session, the aim was to change attitudes by addressing the need to alter behavioral beliefs and evaluate the consequences. To this end, the session began with an introduction to the objectives and the overall work process, followed by a screening of a standard educational video and the participants were familiarized with the significance, procedure, and methods of breastfeeding. Then, in order to identify behavioral beliefs and outcome evaluations, the brainstorming method was used. Next, the expressed opinions were discussed. The processes of valuing and prioritizing exclusive breastfeeding were strengthened in the participating mothers. Also comprehensive, accurate, evidence-based, and realistic information and statistics were provided in clear and simple language. An educational booklet was also given to the mothers.

The second session focused on improving subjective norms by identifying the normative beliefs. This involved exploring who, from the mothers' viewpoint, was influential in their breastfeeding process. The mothers were asked to role-play the thoughts of these important people. Then, the behaviors and attitudes of these individuals were analyzed through group discussion. During this session, mothers were trained to overcome the obstacles they may face in breastfeeding and to gain support from those around them. A brochure was also given to the mothers to improve the perceptions and views of the people around the mother regarding breastfeeding. The mothers were asked to pass on this education to their close relatives. Finally, an attempt was made to form group norms approved by the mothers.

To improve of perceived behavioral control, improvement of control beliefs (beliefs about factors that can hinder or facilitate exclusive breastfeeding) and also improvement of perceived power (successful breastfeeding is possible and they can overcome breastfeeding difficulties) were addressed. They were then taught ways to overcome these problems. The key points of breastfeeding were explained using baby moulage and film screening. In order to provide the mothers with a successful breastfeeding model and to hear her experiences in overcoming breastfeeding problems, a mother with experience in breastfeeding a preterm infant was asked to answer the mothers' questions and share her experiences either in person or via video call. This mother, whose infant previously was admitted to the neonatal intensive care unit due to premature birth and later discharged, was introduced to us and she agreed to cooperate.

In the last session, the content of the previous sessions was reviewed and the mothers' questions were answered. Individuals' intentions regarding exclusive breastfeeding were assessed using a scenario pre-designed by the researcher, and the questions posed by the mothers were answered. The researcher participated in the discussion and analyzed the scenario, and then the guidebook on the principles of breastfeeding for preterm infants was also provided to the mothers. This book was compiled by the researchers based on national guidelines and reference books. During the four months following the end of the intervention, four telephone calls (once a month) were made to explore issues related to breastfeeding based on the constructs of the theory of planned behavior, and to provide necessary advice and recommendations. The control group received routine breastfeeding care and education in the hospital.

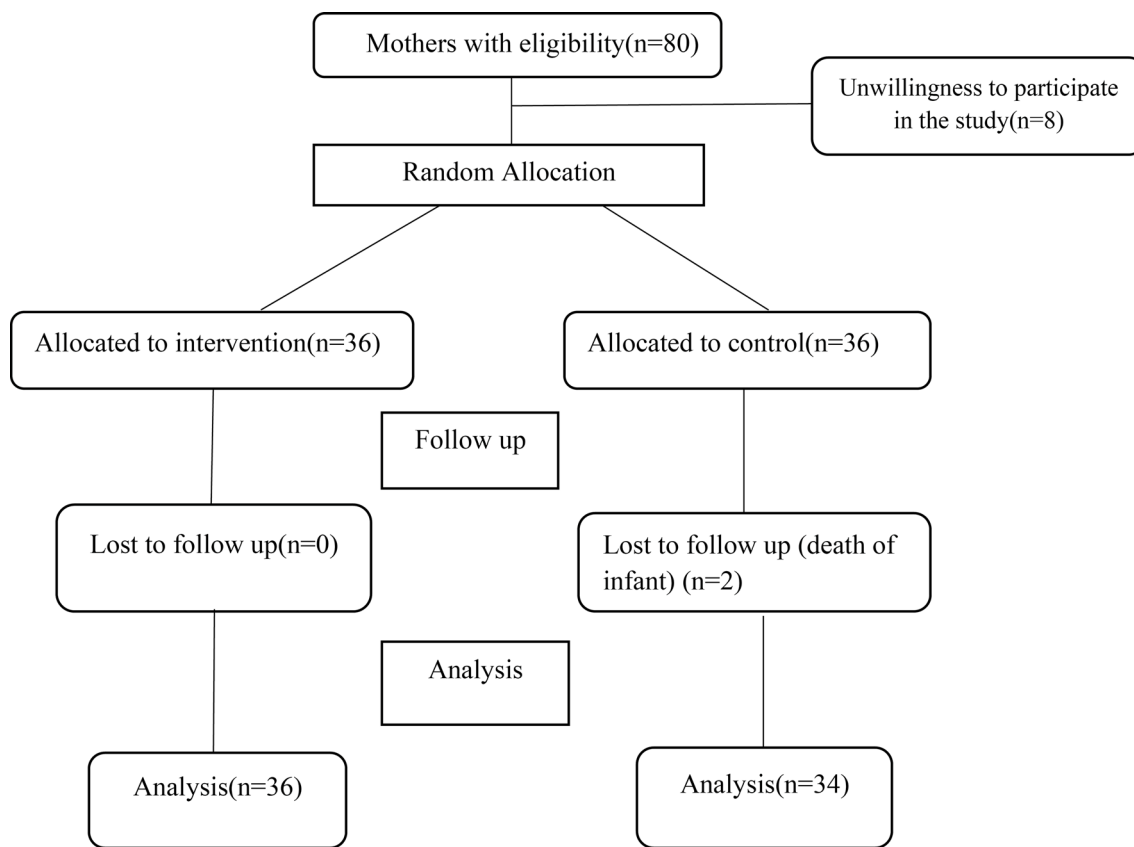
The Theory of Planned Behavior questionnaire was completed by both groups before, immediately after, and 2 and 4 months after the intervention. Questionnaires were distributed to and completed by the mothers through various channels, including mobile applications of WhatsApp and Telegram, mail delivery to their doorsteps, or in-person administration at the health centers where the mothers sought care for their babies. Mothers completed the questionnaires themselves without any interference from the researcher. Data analysis was performed using SPSS19 at a 5% error level using descriptive and analytical statistical tests, repeated measures ANCOVA, Bonferroni and Sidak post hoc tests, Chi-square test, Mann-Whitney test, Fisher's exact test and independent t-test.

#### **Ethical considerations**

This study was approved by the ethics committee of Isfahan University of Medical Sciences with the ethics code IR.MUI.NUREMA.REC.1400.012. Participation of the mothers in this study was completely voluntary and optional. Written informed consent was obtained from all mothers, and they were assured of the confidentiality of the information. They were fully informed of the study procedures and told that they could withdraw from the study at any time.

#### **Results**

A total of 72 mothers with preterm infants participated in this study (36 mothers in each group), and two mothers were excluded from the control group because the infant died during the study (Fig. 1). The characteristics of the study participants are shown in Table 1. There was no statistically significant difference between the two groups with respect to age, education and occupation of the mothers and spouses, gestational age, birth weight, length of hospital stay, infant age at discharge, type of



**Fig. 1** consort diagram

delivery, sex and birth order. Among all of the newborns, prematurity was the cause of hospitalization. (Table 1).

The mean scores of attitude, subjective norms, perceived behavioral control and the total questionnaire score are shown in Table 2, along with the results of the repeated measures ANOVA. Based on the results of the repeated measures ANOVA, a significant effect of the intervention group was observed at the 5% error level and, rejecting the null hypothesis of equal mean scores of perceived behavioral control between the two groups ( $p < 0.001$ ). Moreover, the effect of time and the effect of group\*time interaction (change in different time levels between the two groups) were found to be significant ( $p < 0.001$ ).

Based on Sidak's post hoc test between the two groups, no significant difference was observed in the structure of attitude, subjective norms, and perceived behavioral control before the intervention. However, the mean scores of the constructs in the intervention group immediately after the intervention, two months after the intervention and four months after the intervention were significantly higher than in the control group (Table 2).

The frequency of mothers' intention to breastfeed is shown in Table 3. The results indicated that in the intervention group, there was an increase in the frequency

of the mothers' intention to breastfeed exclusively during the study. Conversely, there was a decrease in the frequency of the mothers' intentions to use combined feeding, which includes both breast milk and formula. In the control group, the results showed a decrease in the frequency of mothers intending to have exclusive breastfeeding and combined feeding (breast milk and formula). In contrast, there was an increase in the frequency with which mothers intended to feed their infants formula (Table 3).

The frequency of mothers' breastfeeding patterns is shown in Table 4. The results indicated an increase in exclusive breastfeeding in the intervention group and a decrease in the combined use of breast milk and formula. Before the study, seven infants (19.4%) were exclusively fed with formula; but this number decreased to zero immediately after the intervention and at two months and four months after the intervention. In the control group, exclusive breastfeeding decreased, the combined use of breast milk and formula varied, and the use of formula increased. Before the intervention, no infants were fed formula, but four months after the intervention, the percentage increased to 44.1%, with a total of 15 infants being fed formula (Table 4).

**Table 1** Characteristics of the study participants (mothers, spouses and infants) in the two groups

Variable	Intervention group		Control group		
	Mean (SD)	No. (%)	Mean (SD)	No. (%)	
Mother's age (year)	29.72	5.26	31.24	7.54	
Husband's age (year)	34.25	5.88	35.12	7.08	
Gestational age (week)	34.73	0.70	34.80	0.72	
Birth weight (grams)	1795.97	558.73	1923.56	622.85	
Duration of hospitalization (days)	2.81	1.80	3.38	2.50	
Infant's age at time of discharge (days)	12.03	6.76	15.06	8.06	
Mother's education	High school	10	27.8	9	6.5
	Diploma	14	38.9	16	47.1
	Academic	12	33.3	9	26.5
Husband's education	High school	12	33.3	11	32.4
	Diploma	14	38.9	14	41.2
	Academic	10	27.8	9	26.5
Mother's job	Housewife	35	97.2	32	94.1
	Employed	1	2.8	2	5.9
Husband's job	Worker	10	27.8	5	14.7
	Employee	5	13.9	6	17.6
	Self-employed	21	58.3	23	67.6
Type of delivery	Vaginal	6	16.7	5	14.7
	caesarian	30	83.3	29	85.3
Infant's sex	Female	13	36.1	15	44.1
	Male	23	63.9	19	55.9
Infant's birth rank	1	10	27.8	14	41.2
	2	16	44.4	13	38.2
	3 and more	10	27.8	7	20.6
Total	36	100	34	100	

## Discussion

The aim of the present study was to evaluate the effect of an intervention based on the Theory of Planned Behavior on the breastfeeding pattern of mothers with preterm infants. The results of the study showed that the mean scores of all three constructs of attitude, subjective norms and perceived behavioral control regarding exclusive breastfeeding as well as the total score of the questionnaire increased significantly over time in the intervention group, reaching their highest level four months after the intervention. By contrast, the mean scores of all three constructs as well as the total score of the questionnaire decreased significantly in the control group over the course of the study, reaching their lowest level four months after the intervention. Applying the theory of planned behavior to breastfeeding among primiparous mothers with term infants in Zhang's study in China resulted in improvements in the mothers' attitudes, perceived behavioral control, and knowledge. Moreover, this intervention increased the rates of exclusive and continuous breastfeeding among these mothers [25]. Regarding the relationship between the constructs of the theory of planned behavior and exclusive breastfeeding, Parker et al. indicated that mothers of preterm infants have different attitudes toward breastfeeding, and that positive and negative attitudes have influenced their breastfeeding decisions [26]. Optimal attitudes toward exclusive breastfeeding was predictive of longer duration of breastfeeding in Finnish mothers of preterm infants with the gestational age of less than 35 weeks [27]. Creating and enhancing positive attitudes toward exclusive breastfeeding among mothers of preterm infants by increasing their knowledge and information about and appreciation

**Table 2** Mean scores of attitude, subjective norms, perceived behavioral control and the total score of the questionnaire before, immediately after, two months and four months after the intervention in the two groups

Variable	Measurement time	Mean ± SD		**p-value (effect size)		
		Intervention	Control	Group	Time	Interaction effect
Attitude	Before intervention	34.81 ± 6.06	36.56 ± 5.19	$p < 0.001$ ( $\eta^2 = 0.675$ )	$p < 0.001$ ( $\eta^2 = 0.468$ )	$p < 0.001$ ( $\eta^2 = 0.681$ )
	Immediately after	47.25 ± 5.00	36.41 ± 5.44			
	Two months after	51.19 ± 3.35	33.41 ± 6.37			
	Four months after	53.56 ± 2.25	31.76 ± 7.11			
Subjective norms	Before intervention	18.72 ± 3.44	19.71 ± 2.94	$p < 0.001$ ( $\eta^2 = 0.671$ )	$p < 0.001$ ( $\eta^2 = 0.493$ )	$p < 0.001$ ( $\eta^2 = 0.666$ )
	Immediately after	25.50 ± 2.52	19.79 ± 3.19			
	Two months after	27.94 ± 1.67	18.09 ± 3.53			
	Four months after	29.22 ± 1.38	17.71 ± 3.67			
Perceived behavioral control	Before intervention	15.06 ± 3.32	15.88 ± 3.59	$p < 0.001$ ( $\eta^2 = 0.498$ )	$p < 0.001$ ( $\eta^2 = 0.382$ )	$p < 0.001$ ( $\eta^2 = 0.593$ )
	Immediately after	20.75 ± 3.09	15.88 ± 3.77			
	Two months after	22.75 ± 1.87	14.65 ± 3.45			
	Four months after	23.86 ± 2.42	13.62 ± 4.65			
Total questionnaire	Before intervention	68.58 ± 11.65	72.15 ± 10.43	$p < 0.001$ ( $\eta^2 = 0.674$ )	$p < 0.001$ ( $\eta^2 = 0.535$ )	$p < 0.001$ ( $\eta^2 = 0.726$ )
	Immediately after	93.50 ± 9.17	72.09 ± 10.96			
	Two months after	101.89 ± 5.49	66.15 ± 12.06			
	Four months after	106.64 ± 4.19	63.09 ± 14.26			

**Table 3** Frequency distribution of breastfeeding intention of the mothers in the two groups

Group	Breastfeeding intention	Before intervention		Immediately after		Two months after		Four months after		p-value <sup>a</sup>
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)		
Intervention	Exclusive breastfeeding	9	25	28	77.8	35	97.2	35	97.2	p < 0.001
	Breastfeeding and formula	16	44.4	8	22.2	1	2.8	1	2.8	
	Formula	11	30.6	0	0.0	0	0.0	0	0.0	
	Total	36	100	36	100	36	100	36	100	
Control	Exclusive breastfeeding	12	35.3	12	35.3	5	14.7	5	14.7	p < 0.001
	Breastfeeding and formula	18	52.9	18	52.9	16	47.1	11	32.4	
	Formula	4	11.8	4	11.8	13	38.2	18	52.9	
	Total	34	100	34	100	34	100	34	100	
p-value <sup>a</sup>		0.153		0.001		p < 0.001		p < 0.001		

<sup>a</sup>calculated based on the chi-square test**Table 4** Frequency distribution of the breastfeeding pattern of the mothers in the two groups

Group	Breastfeeding pattern	Before intervention		Immediately after		Two months after		Four months after		p-value <sup>a</sup>
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)		
Intervention	Exclusive breastfeeding	10	27.8	31	86.1	35	97.2	35	97.2	p < 0.001
	Breastfeeding and formula	19	52.8	5	13.9	1	2.8	1	2.8	
	Formula	7	19.4	0	0.0	0	0.0	0	0.0	
	Total	36	100	36	100	36	100	36	100	
Control	Exclusive breastfeeding	22	64.7	11	32.4	6	17.6	6	17.6	p < 0.001
	Breastfeeding and formula	12	35.3	23	67.6	15	44.1	13	38.2	
	Formula	0	0	0	0	13	38.2	15	44.1	
	Total	34	100	34	100	34	100	34	100	
p-value <sup>a</sup>		0.001		p < 0.001		p < 0.001		p < 0.001		

<sup>a</sup>calculated based on the chi-square test

of the benefits of breastfeeding, identifying positive and negative beliefs of mothers, reinforcing positive beliefs, correcting any negative beliefs, and persuading of mothers can increase the intention and duration of exclusive breastfeeding.

A study on American mothers showed that subjective norms were associated with exclusive breastfeeding among mothers of preterm infants with the gestational age of less than 37 weeks. Participants in this study reported receiving support for and against exclusive breastfeeding from hospital staff, family members, friends, and the media [26]. A study conducted on mothers living in the United Arab Emirates also found that family support and health-care jobs were significantly associated with longer duration of exclusive breastfeeding [28]. Husband or family support influenced monthly success of exclusive breastfeeding among Indonesian term infants up to 6 months of age [29]. It seems that identifying and analyzing mothers' normative beliefs, using strategies to gain support from those around them and improving their views on exclusive breastfeeding can influence their intention and duration of exclusive breastfeeding.

Regarding the relationship between perceived behavioral control and exclusive breastfeeding, the results of a study in China showed that the support, encouragement and education of mothers with preterm infants by skilled,

up-to-date and trained nurses could improve the breastfeeding skills of mothers and increase breastfeeding rates [30]. The results of a cross-sectional study of Iranian mothers with infants under 6 months of age indicated that perceived behavioral control plays a major role in mothers' intention to breastfeed exclusively and exclusive breastfeeding behavior [31]. Encouragement by hospital staff, friends and family as facilitators and lack of skill in oral feeding of preterm infants, perceived infant preference for bottle feeding and other concurrent maternal responsibilities have been reported as barriers to exclusive breastfeeding in mothers with preterm infants [26]. Perceived behavioral control was the most important factor influencing the intention of exclusive breastfeeding behavior among pregnant mothers. Strong intentions to breastfeed exclusively were three times higher in individuals with high perceived behavioral control [32]. Our study attempted to identify and discuss the facilitators and barriers to exclusive breastfeeding, provide practical solutions to remove the barriers and use the facilitators, and share successful peers' experiences in this regard to control positive beliefs and strengthen the possibility of successful breastfeeding in mothers. Moreover, during the four months following the intervention, participants were provided with the necessary advice and support through four telephone calls. The results of a study in Iran showed that continuous supportive telephone counseling

can improve breastfeeding self-efficacy among mothers of late preterm infants [33]. The results of a systematic review revealed that the most important successful group strategies to support and maintain breastfeeding in the postpartum period, combine peer support with the management and counseling by healthcare providers [34].

Based on the results of our study, among the mothers of the intervention group, 35 mothers had the intention and behavior of exclusive breastfeeding two and four months after the study. Only one mother used combined feeding for her infant and no infant was fed formula. However, in the control group, the intention and behavior of exclusive breastfeeding and combined feeding decreased, and the intention to use formula increased. In the intervention group of wen' study, higher exclusive breastfeeding rates were reported at five days (86.4%), two weeks (77.3%) and one month (74.2%) after the study [23]. A survey of mothers of preterm infants in China found that exclusive breastfeeding had a significant positive relationship with self-efficacy and social support [35]. Moreover, comprehensive support within health systems, including the development of policies to promote exclusive breastfeeding, staff training and advice to mothers at critical times such as the birth of preterm, sick and small babies, can play a role in increasing the rate of exclusive breastfeeding [36]. It appears that strengthening mothers' self-efficacy, providing social support, and offering advice and support from trained health care providers can increase the rate of exclusive breastfeeding.

### Limitations and recommendations

The participants in our study were mothers of late preterm singleton infants. Thus, the results cannot be generalized to mothers with early preterm infants, multiple births and term infants. To gain a more comprehensive understanding of breastfeeding practices and outcomes in different populations, using researcher made questionnaire, is recommended that further studies be conducted specifically focusing on mothers with early preterm infants and multiple births separately.

### Conclusion

Interventions based on the theory of planned behavior by skilled and motivated healthcare providers can prevent late preterm infants from being deprived of breastfeeding. Creating a positive attitude towards exclusive breastfeeding, changing normative beliefs, education, support and counseling to overcome barriers to exclusive breastfeeding among mothers of preterm infants can increase the rate of exclusive breastfeeding in this group of infants.

### Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12889-024-20059-x>.

Supplementary Material 1

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### Author contributions

SH. O, A. K and M.J, were involved in the study conception, design and implementation. SH. O, implemented the intervention. A. K and M.J, analyzed the data. M.J, wrote the draft of manuscript. All authors read and approved the final manuscript.

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### Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

### Declarations

#### Ethics approval and consent to participate

This research was approved by the Ethics Committee of Isfahan University of Medical Sciences with the ethics code of IR.MUI.NUREMA.REC.1400.012. Participation in this study was entirely voluntary. Written informed consent was obtained from all of participants.

#### Consent for publication

'Not applicable.'

#### Competing interests

The authors declare no competing interests.

#### Author details

<sup>1</sup>MS in midwifery, Isfahan university of medical sciences, Isfahan, Iran

<sup>2</sup>Nursing and Midwifery Care Research Center, Isfahan University of Medical Sciences, Isfahan, Iran

<sup>3</sup>Reproductive Health Department, Isfahan University of Medical Sciences, Isfahan, Iran

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