

Promoting breastfeeding in Chinese women undergoing cesarean section based on the health belief model

A randomized controlled trial

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Abstract

Background: The high rate of cesarean section is an important factor affecting breastfeeding in China. To improve the nation's current situation of breastfeeding, promoting breastfeeding in women undergoing cesarean section is essential.

Objective: To explore the effects of health belief model-based interventions on breastfeeding knowledge, breastfeeding behaviors, and breastfeeding satisfaction of Chinese cesarean women.

Methods: A total of 346 cesarean section women were enrolled in the randomized controlled trial conducted at a center in Chengdu, China, between July 1, 2018 and August 31, 2018. While the control group (n = 173) received conventional breastfeeding guidance only, the intervention group (n = 173) received additional interventions based on the health belief model. Questionnaires were distributed to assess breastfeeding knowledge, breastfeeding behavior, and breastfeeding satisfaction at discharge, 42 days postpartum, and 4 months postpartum, respectively.

Results: At discharge from hospital, the breastfeeding knowledge score of the intervention group was higher than that of the control group ($Z = -11.753$, $P < .001$). The exclusive breastfeeding rates in the intervention group at the time of discharge, 42 days postpartum, and 4 months postpartum were 67.3%, 60.7%, and 52.9%, respectively, while those of the control group were 41.2%, 41.6%, and 40.4%, respectively. The differences were statistically significant ($\chi^2 = 23.353$, $P < .001$; $\chi^2 = 11.853$, $P < .001$; $\chi^2 = 4.805$, $P = .03$). The breastfeeding satisfaction of the intervention group was also higher than the control group at the time of discharge, 42 days postpartum and 4 months postpartum ($t = 4.955$, $P < .001$; $t = 3.051$, $P = .002$; $Z = -3.801$, $P < .001$).

Conclusion: The health belief model-based interventions can effectively increase breastfeeding knowledge for Chinese cesarean women and improve their breastfeeding behaviors and breastfeeding satisfaction within 4 months after delivery.

Clinical Trial Registration: ChiCTR1900026006 <<http://www.chictr.org.cn/usercenter.aspx>>

Abbreviations: BBQ = the Breastfeeding Behavior Questionnaire, BKQ = the Breastfeeding Knowledge Scale, HBM = health belief model, MBFES = the Maternal Breastfeeding Evaluation Scale.

Keywords: attitudes, cesarean section, exclusive breastfeeding, health belief model, health knowledge, practice

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LH and TD contributed equally to this work.

The authors have no conflicts of interest to disclose.

The datasets generated during and/or analyzed during the current study are publicly available.

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1. Introduction

Breastfeeding has been widely recognized as the most ideal infant feeding method because of its short- and long-term health benefits. Evidence from previous studies suggests that breastfeeding can reduce the risk of maternal ovarian cancer, breast cancer, and type 2 diabetes,^[1-3] increase children's intelligence and immunity,^[4,5] and probably prevent the offspring from overweight and diabetes.^[6,7] According to a systematic review, about 82,300 lives in children younger than 5 years old will be saved annually if the breastfeeding rate rises to 50% worldwide, and 20,000 women can also avoid dying from breast cancer.^[7] However, the situation of breastfeeding in most countries, including China, is not optimistic. From the data released by the Nation Health Commission of the People's Republic of China in 2014, the 6-month exclusive breastfeeding rate in China was only 27.8%, which had dropped by 40% during the past 16 years.^[8]

Cesarean section is an important factor affecting breastfeeding.^[9] Studies have shown that incision pain, postural limitation, and delayed breastfeeding after cesarean section all increase the difficulty of breastfeeding, resulting in the low success rate of breastfeeding among cesarean section women.^[10,11] In addition, women who had undergone cesarean section were found to have a lower willingness to breastfeed, and more feeding difficulties

and challenges than women who had had vaginal delivery.^[12] According to the previous study, the cesarean section rate in China increased from 28.8% in 2008 to 34.9% in 2014.^[13] And one fact that has accounted for this high rate may be the new birth policy issued in 2013 to encourage families to have 2 children, which resulted in the increase in the number of older mothers who needed cesarean section for various reasons.^[14] Therefore, promoting breastfeeding for women undergoing cesarean section is critical to increasing the overall breastfeeding rate in China.

Health belief model is the theory that explains and predicts health-related behaviors. It emphasizes the dominant role of individual's perception in behavioral change, and believes that helping individuals to recognize relevant factors affecting health, including perceived susceptibility, perceived benefits, perceived severity, perceived barriers, and self-efficacy, can enhance their health beliefs and promote health-related behaviors. In many studies, the health belief model has been used as the theoretical basis to inform the design of interventions to change behavior,^[15,16] but few studies have used it to develop interventions to improve mother's breastfeeding behavior. Therefore, the purpose of this study was to explore the effects of health belief model-based interventions on breastfeeding knowledge, breastfeeding behaviors, and breastfeeding satisfaction among Chinese cesarean women.

2. Materials and methods

2.1. Study design and participants

This study was a prospective randomized controlled trial conducted at a public maternity hospital in Chengdu, China. Between July 1, 2018 and August 31, 2018, all women aged at least 18 years and had been admitted to the Department of Obstetrics for cesarean section were eligible, except those having serious diseases or mental illnesses that made them unable to cooperate with the researchers and those who could not breastfeed because of medical contradictions such as AIDS or medications. Women having stillbirth or those infants were transferred to NICU were excluded. The study was approved by the Ethics Committee of West China Second University Hospital, Sichuan University.

2.2. Randomization

After enrollment, the eligible women were completely randomly assigned in a 1:1 ratio to the control group and the intervention group by means of random number table. The randomization procedure was performed by a researcher who was not involved in data collection, and assignments were held in sealed opaque envelopes to ensure randomization concealment. Although the researcher who conducted interventions was unable to be blinded to group allocation, the nurses, participants, and their family members were blinded throughout the study. To avoid contamination between the 2 groups of subjects, they were separated into different rooms.

2.2.1. Intervention. The control group received the following conventional breastfeeding instructions in the hospital: Watching a 30-minute breastfeeding education video on admission, including the benefits of breastfeeding, the timing of breastfeeding, and the correct breastfeeding posture, etc.; After returning to the ward after cesarean section, guided by the charge nurse to

breastfeeding and visited by breastfeeding health education nurse to solve feeding problems; Obtaining a pamphlet for breastfeeding developed by the hospital at discharge. In addition to routine guidance, the intervention group was also guided by the researcher, who was a graduate student trained in breastfeeding. At the time of admission, the researcher investigated the breastfeeding knowledge of mothers in the intervention group and corrected their existing breastfeeding misconceptions according to the findings. And targeted health education based on the health belief model was conducted for each mother to make them full aware of the risk of breastfeeding failure due to the effects of cesarean section (perceived susceptibility), the benefits of breastfeeding for maternal and child health (perceived benefits), the short- and long-term effects of not breastfeeding (perceived severity), and the potential challenges of breastfeeding after cesarean delivery (perceived barriers). Besides, the researcher created a WeChat (a social application widely used in China) group to answer the mothers' questions on breastfeeding at any time. After returning to the ward after cesarean section, the researcher provided hand-in-hand guidance on breastfeeding skills to help mothers enhance their confidence in breastfeeding (self-efficacy) and conducted relevant health education, including early skin contact, regular sucking, on-demand breastfeeding, and treatment of some common breastfeeding problems, such as breast tenderness. Before discharge from the hospital, the breastfeeding knowledge scale was used again to ensure that the mothers had basic knowledge of breastfeeding, and the breastfeeding evaluation scale was used to investigate mothers' breastfeeding satisfaction. Focused interventions were performed on mothers with low breastfeeding satisfaction to help resolve their feeding problems and provide relevant advice. Within 4 months after discharge, the researcher regularly sent breastfeeding-related information to mothers via WeChat platform, and provided timely answers to feeding problems encountered by mothers at home. If necessary, the researcher will advise mothers to visit a breastfeeding clinic.

2.2.2. Data collection. Participants in both groups were followed up to 4 months postpartum and asked to fill in 4 different questionnaires at different time points. The first questionnaire was completed at the time of admission, including the general information questionnaire and the Breastfeeding Knowledge Scale (BKQ). The second questionnaire was completed before discharge from the hospital, including the BKQ, the Breastfeeding Behavior Questionnaire (BBQ), and the Maternal Breastfeeding Evaluation Scale (MBFES). The third and the fourth questionnaires were respectively completed at 42 days and 4 months postpartum, including the BBQ and the MBES. Besides, the researchers obtained the participants' obstetric materials from the hospital case system.

The BKQ used in the present study was compiled by Zhao and AA in 2008^[17] and revised by Zhu et al^[18] in 2015. It has been validated in Chinese maternal women with the Cronbach alpha coefficient being 0.820, suggesting a good internal consistency.^[18] It contains 25 items related to breastfeeding knowledge, including the benefits of breastfeeding, breastfeeding techniques, and the storage and use of breast milk. Each item has a Likert type scale ranging from 1 to 5 points. A higher total score indicates higher levels of breastfeeding knowledge. The pilot survey of this study showed that the Cronbach alpha coefficient of this scale was 0.887.

The BBQ was designed by the researchers themselves, including feeding methods, daily feeding frequency, breast swelling and pain levels, bottle use, and breastfeeding problem-solving, etc. Certain changes were made to the entries in the questionnaire depending on the time of the survey.

The MBFES was a 30-item measurement to evaluate breastfeeding satisfaction.^[19] It contains 3 dimensions: maternal satisfaction, infant satisfaction, and maternal lifestyle. The Cronbach alpha coefficient of the scale and each dimension was between 0.80 and 0.93. After cross-cultural translation, Hai Jing developed the Chinese version of the MBES, with a total of 29 items and 3 dimensions.^[20] Being verified, the Chinese version of MBFES has a Cronbach's alpha coefficient ranging between 0.839 and 0.952, and its content validity index was 0.896. The pilot survey showed that the Cronbach alpha coefficient of the scale in this study was 0.821.

2.2.3. Statistical analysis. Sample size was calculated by the formula of comparative group studies. According to the previous study,^[21] the exclusive breastfeeding rate at 4 months postpartum in Chinese women undergoing cesarean section is about 40%. Assuming that HBM-based interventions would increase exclusive breastfeeding rates by 15% at 4 months postpartum, a sample size of 288 (144 per group) would be required with an error of 0.05 (2-sided comparison) and a power of 80%. Taking into account the loss of follow-up, the sample size was expanded by 20%, and the total sample size was 346 (173 per group).

The data obtained were double entered into the Epidata software, and statistical analyses were performed using SPSS program version 21.0 (IBM, Armonk, NY). For quantitative data, *t* test and Mann–Whitney *U* test were used to analyze the differences between the 2 groups, and for qualitative data, χ^2 and Fisher exact test were used. Significance was set as $P < .05$.

3. Results

A total of 346 women were recruited, but only 306 participants completed the study. Among them, 5 were excluded due to invalid questionnaires, 21 dropped out, and 14 were lost track of after discharge (see the flow diagram for details). The intervention group and the control group did not differ significantly either in demographics or in obstetric characteristics such as maternal history, gestational weeks, gestational weight gain, etc. ($P < .05$) (Table 1).

There was no significant difference in breastfeeding knowledge scores between the 2 groups at admission. At discharge, however, breastfeeding knowledge scores of the intervention group were significantly higher than those of the control group ($Z = -11.753$, $P < .001$) (Table 2).

At the time of discharge, 42 days postpartum, and 4 months postpartum, the exclusive breastfeeding rates in the intervention group (67.3%, 60.7%, 52.9% respectively) were significantly higher than those in the control group (41.2%, 41.6%, 40.4% respectively) ($\chi^2 = 23.353$, $P < .001$; $\chi^2 = 11.853$, $P < .001$; $\chi^2 = 4.805$, $P = .03$). In addition, fewer mothers in the intervention group had cracked nipples or had to give up exclusive breastfeeding due to insufficient breast milk ($P < .05$). At discharge, the intervention group had more breastfeeding times per day than the control group, with less swelling and pain in the breast. Besides, more mothers in the intervention group (83.2%) adhered to on-demand breastfeeding at 4 months postpartum than the control group (64.2%). At 42 days and 4 months

Table 1

Demographic and obstetric characteristics in the intervention and control groups.

	Intervention group n = 171	Control group n = 170	P
Age, y* mean \pm SD	33.47 \pm 4.63	32.55 \pm 4.18	.06
Ethnicity [†] n (%)			.72
Han	168 (98.2)	166 (97.6)	
Minority	3 (1.8)	4 (2.4)	
Education [‡] n (%)			.05
Junior high	8 (4.7)	8 (4.7)	
Senior high	16 (9.4)	9 (5.3)	
Junior college	44 (25.7)	28 (16.5)	
University or above	103 (60.2)	125 (73.5)	
Occupation [‡] n (%)			.32
Technical	25 (14.6)	17 (10.1)	
Institutions	51 (29.8)	42 (24.9)	
Staff	42 (24.6)	57 (33.7)	
Freelance	34 (19.9)	34 (20.1)	
Others	19 (11.1)	19 (11.2)	
Monthly family income (RMB) [‡] n (%)			.98
<3000	5 (2.9)	5 (2.9)	
3001–5000	31 (18.1)	28 (16.5)	
5001–10,000	62 (36.3)	63 (37.1)	
>10,000	73 (42.7)	74 (43.5)	
Tobacco and alcohol history [‡] n (%)			.55
Yes	5 (2.9)	7 (4.1)	
No	166 (97.1)	163 (95.9)	
Pregnancy complications [‡] n (%)			.08
Yes	34 (19.9)	22 (12.9)	
No	137 (80.1)	148 (87.1)	
Maternal history [‡] n (%)			.12
Primipara	81 (47.4)	95 (55.9)	
Multipara	90 (52.6)	75 (44.1)	
Gestational weeks* median (IQR)	39 (0.6)	39 (1.475)	.95
Gestational weight gain, kg* mean \pm SD	13.83 \pm 4.31	13.02 \pm 4.50	.09
Breastfeeding experience [‡] n (%)			.14
Yes	85 (49.7)	71 (41.8)	
No	86 (50.3)	99 (58.2)	
Anesthesia type [‡] n (%)			.11
Combined spinal-epidural	140 (81.9)	135 (79.4)	
General anesthesia	27 (15.8)	23 (13.5)	
Continuous epidural anesthesia	4 (2.3)	12 (7.1)	
Length of the postpartum stay* median (IQR)	3 (1)	3 (1)	.62
Infant sex [‡] n (%)			.55
Boy	94 (55.0)	88 (51.8)	
Girl	77 (45.0)	82 (48.2)	

* Normally distribution data used independent *t* test; non-normal data used Mann–Whitney *U* test.

[†] Group comparisons were made using a Fisher exact test.

[‡] Group comparisons were made using a χ^2 test.

postpartum, fewer mothers with bottle-feeding and breastfeeding problems were found in the intervention group ($P < .05$). The 2 groups also differed in problem solving when they encountered difficulties in breastfeeding after discharge. More mothers in the intervention group chose to seek help from medical staffs and go to breastfeeding clinics than consulting community staffs ($P < .05$) (Table 3).

The intervention group had significantly higher breastfeeding satisfaction than the control group at the time of discharge, 42 days postpartum, and 4 months postpartum ($t = 4.955$, $P < .001$; $t = 3.051$, $P = .002$; $Z = -3.801$, $P < .001$) (Table 4).

Table 2
Comparison of breastfeeding knowledge scores between the intervention and control groups*.

Variables	Intervention (n = 171)		Control (n = 170)		t	P
	Mean	SD	Mean	SD		
At admission*	102.25	11.22	100.32	11.38	1.580	.12
At discharge†	121.00	(9.00)	104.00	(16.25)	-11.753	<.001‡
Difference‡	15.00	(13.00)	2.00	(5.00)	-12.325	<.001‡

* Group comparisons were made using an independent t test unless otherwise indicated.
 † Values are medians (IQR). Group comparisons were made using a Mann-Whitney test.
 ‡ Value is significant (P < .05).

Table 3
Comparison of breastfeeding behavior between the intervention and control groups*.

Variables	At discharge					42 d postpartum					4 mos postpartum				
	Intervention n = 171	Control n = 170	χ ²	df	P	Intervention n = 163	Control n = 161	χ ²	df	P	Intervention n = 155	Control n = 151	χ ²	df	P
Feeding method, n (%)			23.353	1	<.001‡			11.853	1	.001‡			4.805	1	.03‡
Exclusive breastfeeding	115 (67.3)	70 (41.2)				99 (60.7)	67 (41.6)				82 (52.9)	61 (40.4)			
Nonexclusive breastfeeding	56 (32.7)	100 (58.8)				64 (39.3)	94 (58.4)				73 (47.1)	90 (59.6)			
Reason for nonexclusive breastfeeding, n (%)															
Insufficient milk	52 (30.4)	72 (42.4)	9.577	1	.002‡	58 (35.6)	86 (53.4)	10.432	1	.001‡	43 (27.7)	63 (41.7)	6.602	1	.01‡
Need of premature formula milk	3 (1.8)	14 (8.2)	2.762	1	.10	-	-	-	-	-	-	-	-	-	-
Medication	3 (1.8)	13 (7.6)	2.278	1	.13	0	3 (1.9)	-	-	.12†	2 (1.3)	7 (4.6)	-	-	.10†
Baby sucking difficulty	3 (1.8)	3 (1.8)	-	-	.67†	9 (5.5)	9 (5.6)	0.001	1	.98	7 (4.5)	6 (4.0)	0.055	1	.81
Poor weight gain	-	-	-	-	-	3 (1.8)	8 (5.0)	2.417	1	.12	5 (3.2)	10 (6.6)	1.858	1	.17
Work	-	-	-	-	-	3 (1.8)	1 (0.6)	-	-	.62†	2 (1.3)	0	-	-	.50†
Daily breastfeeding frequency, n (%)			39.912	-	<.001†‡			3.613	2	.16			4.185	2	.12
<4 times	1 (0.6)	8 (4.7)				9 (5.5)	4 (2.5)				27 (17.4)	34 (22.5)			
4-7 times	59 (34.5)	108 (63.5)				75 (46.0)	65 (40.4)				101 (65.2)	102 (67.5)			
≥8 times	111 (64.9)	54 (31.8)				79 (48.5)	92 (57.1)				27 (17.4)	15 (9.9)			
Breastfeeding at night			-	-	.72†			0.238	1	.63			8.978	1	.003‡
Yes	168 (98.2)	166 (97.6)				154 (94.5)	154 (95.7)				131 (84.5)	106 (70.2)			
No	3 (1.8)	4 (2.4)				9 (5.5)	7 (4.3)				24 (15.5)	45 (29.8)			
Feeding manner			-	-	.37†			1.490	1	.22			14.281	1	<.001‡
At regular interval	1 (0.6)	3 (1.8)				11 (6.7)	17 (10.6)				26 (16.8)	54 (35.8)			
On demand	170 (99.4)	167 (98.2)				152 (93.3)	144 (89.4)				129 (83.2)	97 (64.2)			
Breast swelling and pain			24.647	3	<.001‡			6.733	3	.08			3.617	2	.16
No	86 (50.3)	44 (25.9)				25 (15.3)	41 (25.5)				88 (56.8)	88 (58.3)			
Mild	57 (33.3)	72 (42.4)				82 (50.3)	66 (41.0)				61 (39.4)	50 (33.1)			
Moderate	25 (14.6)	43 (25.3)				47 (28.8)	41 (25.5)				6 (3.9)	13 (8.6)			
Severe	3 (1.8)	11 (6.4)				9 (5.5)	13 (8.1)				-	-			
Cracked nipples			22.899	1	<.001‡			7.140	1	.008‡			6.112	1	.01‡
Yes	40 (23.4)	82 (48.2)				60 (36.8)	83 (51.6)				24 (15.8)	41 (27.5)			
No	131 (76.6)	88 (51.8)				103 (63.2)	78 (48.4)				128 (84.2)	108 (72.5)			
Bottle use			-	-	-			6.047	1	.01‡			5.247	1	.02‡
Yes	-	-				103 (63.2)	122 (75.8)				86 (55.5)	103 (68.2)			
No	-	-				60 (36.8)	39 (24.2)				69 (44.5)	48 (31.8)			
Breastfeeding problems			-	-	-			10.084	1	.001‡			4.961	1	.03‡
Yes	-	-				92 (56.4)	118 (73.3)				42 (27.1)	59 (39.1)			
No	-	-				71 (43.6)	43 (26.7)				113 (72.9)	92 (60.9)			
Solutions to breastfeeding problems															
On their own	-	-	-	-	-	93 (57.1)	101 (63.1)	1.240	1	.27	97 (62.6)	103 (68.2)	1.071	1	.30
Consulting community	-	-	-	-	-	68 (41.7)	73 (45.3)	0.433	1	.51	77 (49.7)	99 (65.6)	7.899	1	.005‡
Consulting medical staffs	-	-	-	-	-	72 (44.4)	54 (33.8)	3.865	1	.05‡	73 (47.1)	34 (22.5)	20.322	1	<.001‡
Seeking help from family	-	-	-	-	-	71 (43.6)	49 (30.4)	5.982	1	.01‡	68 (44.2)	67 (44.4)	0.001	1	.97
Going to breastfeeding clinics	-	-	-	-	-	61 (37.4)	43 (26.7)	4.267	1	.04‡	54 (34.8)	39 (25.8)	2.936	1	.09

* Group comparisons were made using a χ² test unless otherwise indicated.
 † Group comparison was made using a Fisher exact test.
 ‡ Value is significant (P < .05).

Table 4
Comparison of breastfeeding satisfaction between the intervention and control groups*.

Variables	Intervention group Mean \pm SD	Control group Mean \pm SD	t	P
At discharge	120.89 \pm 10.90	114.68 \pm 12.23	4.955	<.001 [‡]
42 d postpartum	121.10 \pm 12.38	117.12 \pm 10.94	3.051	.002 [‡]
4 mo postpartum [†]	122.00 (20.00)	114.50 (20.25)	-3.801	<.001 [‡]

* Group comparisons were made using an independent *t* test unless otherwise indicated.

[†] Group comparisons were made using a Mann-Whitney test; results are median (IQR).

[‡] Value is significant (*P* < .05).

4. Discussion

In this study, the health belief model was used as a theoretical basis to develop a systematic, personalized intervention program to improve the breastfeeding status of Chinese cesarean women. The HBM assumes that 5 valuable aspects are associated with health-related actions, namely, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy.^[16] Based on this, the researcher gave corresponding personalized interventions to the intervention group, and the results showed that HBM-based interventions could exert positive effects on breastfeeding knowledge, breastfeeding behaviors, and breastfeeding satisfaction of women undergoing cesarean section.

4.1. HBM-based interventions can increase breastfeeding knowledge for women with cesarean section

The success of breastfeeding is closely related to mother's breastfeeding knowledge. Previous studies have shown that appropriate health education can improve mothers' breastfeeding knowledge and promote their breastfeeding behaviors.^[22] Consistent with this, the breastfeeding knowledge scores of the intervention group and the control group in the present study were all improved at discharge. What's more, the intervention group receiving HBM-based health education scored higher at discharge than the control group receiving only conventional breastfeeding guidance, with no statistical difference between the 2 groups at admission. It suggests that HBM-based breastfeeding interventions can significantly improve breastfeeding knowledge, as found by Huang et al.^[23] The possible reason is that the researcher provided more targeted guidance for the mothers in the intervention group in according with their knowledge of breastfeeding at admission, so that they could better understand the breastfeeding knowledge. In addition, supplemental knowledge points have been added to help them fully realize the risk of breastfeeding failure due to the effects of cesarean section (perceived susceptibility), the benefits of breastfeeding for maternal and child health (perceived benefits), the short- and long-term effects of not breastfeeding (perceived severity), and the potential challenges of breastfeeding after cesarean delivery (perceived barriers), which strengthened their breastfeeding willingness according to the HBM and mobilized their initiative to master breastfeeding knowledge.

4.2. HBM-based interventions can improve breastfeeding behaviors within 4 months after cesarean section

The present study showed that HBM-based interventions were associated with better breastfeeding behaviors in women undergoing cesarean section women. The exclusive breastfeed-

ing rates of the intervention group were significantly higher than those of the control group at the time of discharge, 42 days postpartum, and 4 months postpartum (*P* < .05). According to previous studies, women undergoing cesarean section have lower levels of prolactin than women who give birth naturally.^[24] Therefore, the former began lactation later and had fewer milk in volume, which is the primary reason for them to give up exclusive breastfeeding in the early stage.^[25] Other than that, the physical discomfort and postural limitation after cesarean section often makes it hard to achieve early skin-to-skin contact between mothers and infants, which has been proved to have a negative impact on milk secretion.^[15] In the present study, women in the intervention group had a higher level of breastfeeding knowledge and received breastfeeding technology training and health education from the researcher after cesarean section. Therefore, they were able to take right postures to reduce incision pain during breastfeeding, and promote milk secretion through effective methods, such as starting breast milk expression as soon as possible, increasing the number and duration of daily lactation,^[26] so that fewer women in the intervention group gave up exclusive breastfeeding due to lack of milk. Apart from this, in line with the findings of Huang et al,^[23] the incidence of bottle feeding, cracked nipple, and breast swelling due to unreasonable feeding methods in the intervention group were also lower than those in the control group, and more mothers in the intervention group continued to breastfeed at night and on demand.

A birth cohort study of a Swedish population showed that breastfeeding problems are related to early breastfeeding cessation.^[26] A Norwegian cohort study also concluded that the risk of cessation of exclusive breastfeeding for mothers with breastfeeding problems was 1.79 times higher than that for mothers without breastfeeding during the first month after discharge.^[27] In the present study, fewer mothers had breastfeeding problems in the intervention group at 42 days postpartum and 4 months postpartum, and more mothers chose to seek medical help and go to the breastfeeding clinics than in the control group when they had breastfeeding problems. However, the majority of mothers in both the groups still preferred to solve problems on their own or consult community workers. This may be due to a sharp decrease in contact with medical staffs after discharge, and the community health resources are relatively more accessible. In view of problem that no personnel is dedicated to provide professional breastfeeding guidance in Chinese communities, it is imperative to raise the awareness of Chinese women to seek professional breastfeeding assistance and to build a complete community-based breastfeeding management system in China. Additionally, breastfeeding clinics can provide continuous support for women and solve feeding problems effectively. Studies have found that breastfeeding

clinics can enhance mothers' confidence in breastfeeding and increase the exclusive breastfeeding rate at 6 months postpartum.^[28] But only 37.4% and 34.8% of the intervention group and only 26.7% and 15.8% of the control group in this study chose to go to breastfeeding clinics at 42 days and 4 months postpartum to solve their problems, suggesting that hospitals should further publicize breastfeeding clinics and improve its awareness among women.

4.3. HBM-based interventions can improve breastfeeding satisfaction within 4 months after cesarean section

HBM-based interventions implemented in the present study included enhancing mother's breastfeeding self-efficacy, which was recognized as the dominant factor influencing breastfeeding satisfaction in a previous study.^[29] Studies have also proved that feeding methods have a certain impact on maternal satisfaction of breastfeeding. Mothers who are exclusive breastfeeding and almost exclusive breastfeeding had higher satisfaction with breastfeeding than mothers who are not.^[20] Therefore, the intervention group in the present study whose exclusive breastfeeding rate was higher had higher breastfeeding satisfaction than the control group. Moreover, the results suggest that compared with the control group, the breastfeeding satisfaction of the intervention group showed no sign of decline within 4 months after delivery, which confirms the effectiveness of continuous online counseling. Thus, given the time and labor costs of face-to-face interventions, this approach is recommended to promote breastfeeding for cesarean women after discharge.

5. Limitations

Despite the findings though, the study has some limitations. First, the study was conducted in only 1 hospital, which may restrict the generalization of the results because the sample was not representative enough. Second, contamination may have not been completely controlled because the intervention group and the control group were in the same ward. Third, the follow-up period was not long enough due to time constraints. Finally, it was found from the results that as the postpartum time goes, the gap between the exclusive breastfeeding rate of the intervention group and the control group seems to be gradually narrowing. This may be due to the limited effectiveness of non-face-to-face interventions after discharge, or the fact that factors affecting exclusive breastfeeding have changed over time after discharge, which had not been fully considered by researchers. Therefore, future research should take this aspect more carefully.

6. Conclusion

The present study has demonstrated that HBM-based interventions can effectively increase breastfeeding knowledge for Chinese cesarean women and improve their breastfeeding behaviors and breastfeeding satisfaction within 4 months after delivery. This is an initial attempt to introduce the health beliefs model as a theoretical guide to develop new measures to promote breastfeeding. It suggests that medical professionals can provide personalized help to build women's health beliefs in breastfeeding, thereby increasing the exclusive breastfeeding rate and achieving higher breastfeeding satisfaction.

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