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Effect of Mobile-based Breastfeeding Education on Breastfeeding Experience of Mothers: A Quasi-Experimental Study

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ABSTRACT

Introduction: Breastfeeding is one of the most effective ways to ensure child survival and health. In Iran, over 50% of mothers face breastfeeding difficulties. The breastfeeding duration is related to the breastfeeding experience.

Objective: This study aimed to investigate the impact of mobile-based breastfeeding education on Iranian mothers' breastfeeding experiences.

Materials and Methods: This quasi-experimental study included 81 nursing mothers selected using a multi-stage cluster random sampling method from selected comprehensive health centers in Rasht, Iran. Using the block randomization method, they were allocated to the intervention group (n=41) and control group (n=40). Data were collected using a demographic form and the Breastfeeding Experience Scale (BES), completed 3-5 days after delivery by both groups. The intervention group received a breastfeeding app installed on their Android mobile phones and were asked to read the educational content in the app for two months. After this period, both groups completed the BES again. Independent t-test, chi-square test , Mann–Whitney U test, Kruskal-Wallis test, Wilcoxon test, Shapiro-Wilks test and ANCOVA were used to analyze the data.

Results: In the post-test phase, 81 women participated. The mean age of mothers and their spouses was 29.55±6.56 and 32.93±5.44, respectively. There were no significant differences in demographic, social, or reproductive characteristics between the two groups. The intervention group showed an increase in exclusive breastfeeding rate and a decrease in formula milk use for feeding. The total BES score in intervention and control groups after education was 27.93±7.43 and 32.88±9.89, respectively. The results of ANCOVA showed a significant difference in the total BES score between the two groups after intervention (P=0.001, Eta squared=0.196). Regarding the type of infant feeding (exclusive breastfeeding and mixed feeding), the results showed a significant difference between the two groups after education (P=0.023).

Conclusion: Mobile-based breastfeeding education can positively affect Iranian mothers' breastfeeding experience. Therefore, healthcare providers in north of Iran can utilize educational apps to promote exclusive breastfeeding in women.

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Highlights

- Breastfeeding is one of the most effective ways to ensure children's survival and health.
- Using a proper educational method is an important factor in the effectiveness of breastfeeding.
- Mobile-based breastfeeding education increased the exclusive breastfeeding rate.
- Mobile-based breastfeeding education positively affects the breastfeeding experience of mothers.

Plain Language Summary

Promoting breastfeeding is one of the most important goals of the World Health Organization (WHO) and an effective factor in the growth and development of infants. The breastfeeding experience is influenced by breastfeeding difficulties and mothers' lack of knowledge about how to deal with them. Therefore, choosing the right educational approach is important for improving the knowledge and experience of mothers in breastfeeding and reducing breastfeeding difficulties. In this study, we investigated the effect of breastfeeding education using a mobile app on mothers' breastfeeding experiences. The results showed that the breastfeeding app improved the breastfeeding experiences of women by reducing breastfeeding difficulties.

Introduction

Breastfeeding has proven benefits for the health of mothers and babies [1]. One of the goals of the World Health Organization (WHO) is to reach 70% exclusive breastfeeding at 6 months by 2030 [2]. Currently, the exclusive breastfeeding rate is 44% globally and 49% in Iran [3, 4]. One of the factors affecting the early discontinuation of breastfeeding is the negative breastfeeding experience caused by factors such as breast-related problems, breastfeeding difficulties, infant-related difficulties and social concerns [5]. Breastfeeding difficulties are common among mothers. However, the severity of these difficulties may vary [6]. It can lead to negative consequences such as early cessation of breastfeeding, reduced frequency and duration of breastfeeding, decreased breastfeeding self-efficacy, and increased risk of postpartum anxiety and depression [7, 8].

Based on previous studies, the increase of knowledge and skills of mothers in solving breastfeeding difficulties through education can help them deal with the negative breastfeeding experience and its consequences [9, 10]. Traditional teaching methods can be challenging due to various barriers, such as mothers' lack of physical and mental preparation, limited opportunities to learn due to short hospital stays, busy schedules of health workers, the need to attend training at specific times and places and limited access to educational materials. These barriers can make it difficult for mothers to receive adequate and effective education [11, 12]. Health professionals use mobile health (mHealth) services to remove learning barriers, provide medical and health services, manage and monitor patients, make clinical decisions, and educate patients [13, 14]. The WHO has recommended using mobile applications for education as a comprehensive educational method for the health system [15]. Mobile applications eliminate time and place limitations in education, reduce costs, make education accessible to everyone, and facilitate understanding of educational content [16, 17]. Despite the actions of the Iranian Ministry of Health and Medical Education to promote the exclusive breastfeeding rate, it is still less than the desired level [3]. This study aimed to determine the effect of mobile-based breastfeeding education on the breastfeeding experience of nursing mothers in north of Iran.

Material and Methods

This is a quasi-experimental study. The participants were 81 nursing mothers referred to comprehensive health centers in Rasht, Iran, who were selected using a multi-stage cluster random sampling method from 8 centers (two centers from each region). The inclusion criteria were 3-5 days after giving birth, the ability to read and write, being primiparous, practicing either exclusive breastfeeding or mixed feeding (combination of breastfeeding and bottle feeding), no medical contraindications for breastfeeding such as HIV and human T-cell lymphotropic virus infections, no active tuberculosis, no breast herpes, no galactosemia

and phenylketonuria in newborns, and no use of illegal drugs during breastfeeding (based on the health records), having a mobile phone with an Android system, ability to install mobile applications, having healthy and full-term infants, and singleton birth. Exclusion criteria were prescription of infant formula by a physician, unwillingness to continue participation in the study and not using the mobile application at least once a week. The sample size was determined as 34 per group by considering α=0.05, β=0.2, test power=0.8 and an effect size (d)=0.7 according to the expectations of practical difference. By considering a 20% possible sample dropout, it increased to 43 per group (total sample size=86). The participants were allocated to two groups of control and intervention using the block randomization method. A random sequence generation software was employed to facilitate the randomization [18]. In this study, 253 women met the inclusion criteria that 167 of whom did not meet the inclusion criteria or did not participate in the study despite meeting the inclusion criteria. In the block randomization process, 86 units were evenly classified into 11 blocks of 6 units and five blocks of 4 units, resulting in 43 samples in the intervention group and 43 in the control group. In the end, 3 samples from the control group were excluded from the study due to low collaboration and unwilling to continue cooperation and 2 samples from the intervention group were excluded due to unwilling to continue cooperation. Figure 1 shows the flowchart of sampling and allocation processes.

The instruments used in this study included: A demographic form surveying the age and educational level of mothers and their spouses, mothers' occupation, monthly family income, and delivery type; the breastfeeding experience scale (BES) with 30 items and two parts. The first part, with 18 items, assesses breastfeeding difficulties and their severity in the early postpartum period (45-60 days) using a five-point Likert scale from 1 (not at all) to 5 (unbearable). The total score of this domain ranges from 18 to 90, with a higher total score indicating higher breastfeeding difficulties. The first domain included five groups of common breastfeeding difficulties: breast concerns, mechanic concerns, process concerns, milk insufficiency concerns, and social concerns. The second part measures the information about continuing or stopping breastfeeding, the time and reasons for stopping, and the daily consumption of formula milk or other substituted milk [19]. In this study, the valid and reliable Persian version of the BES was used [5].

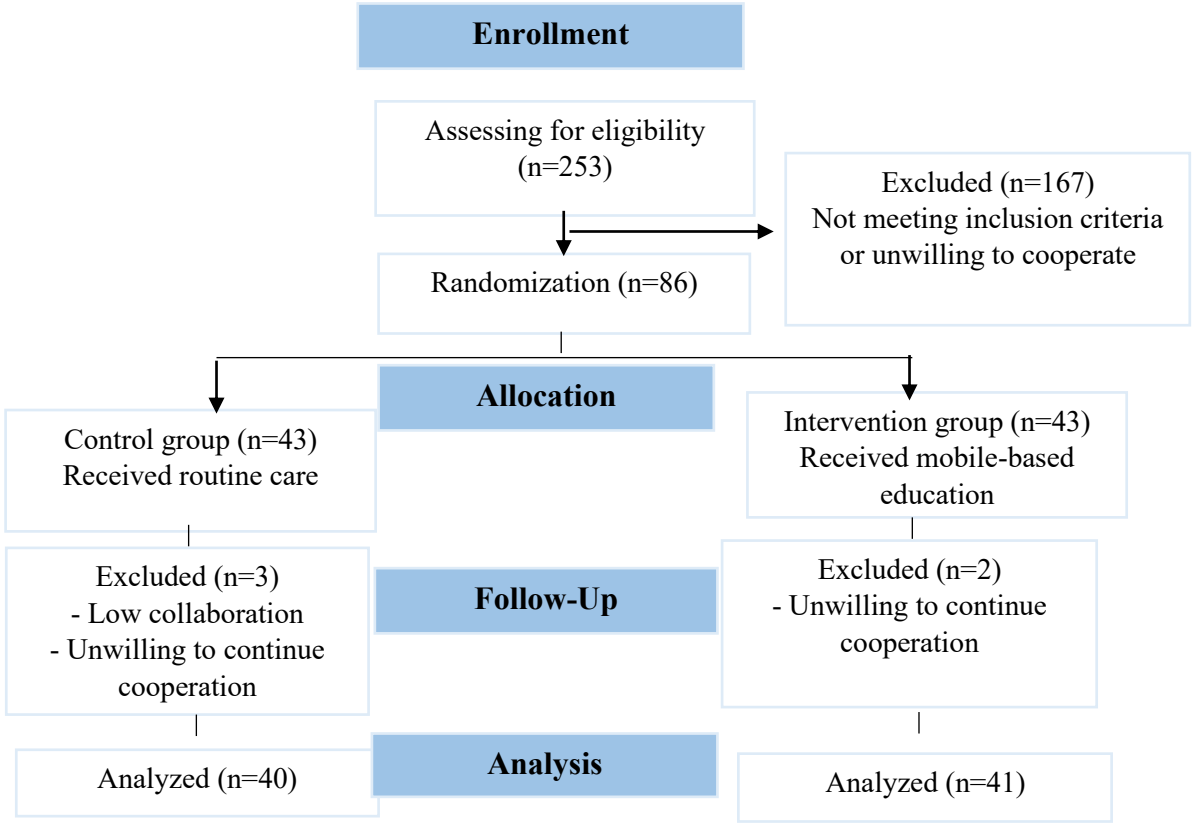

Figure 1. CONSORT diagram of the study

We first explained the study objectives and methods to the participants and ensured the confidentiality of their information. Then, they signed an informed consent form to participate in the study. The women in the control and intervention groups completed the demographic form and the BES 3-5 days after delivery. For the intervention group, the researcher installed the breastfeeding mobile application on the mothers' mobile phones and explained how to use it. This group received the educational intervention alongside standard breastfeeding care. When completing the second part of the BES, a 24-hour reminder recommended by WHO was used to minimize recall bias [20]. The control group received standard breastfeeding care only without any additional intervention. According to a similar study [21], each mother in the intervention group received the educational program for 8 weeks. The content of the educational application was prepared with the cooperation of seven reproductive health experts and one software engineer and based on the "breastfeeding mothers guide" of the Iranian Ministry of Health and Medical Education. The topics included the importance of breastfeeding, risks of formula feeding, different breastfeeding situations, how to assess breastfeeding adequacy, breast milk pumping and hand expression, breast milk storage and reuse and how to manage common breast and breastfeeding problems. During the 8-week intervention, mothers were advised to read different educational materials of the application twice a week, and text messages containing the benefits of breastfeeding were sent to them [22]. To minimize the possible access of the control group to the educational application, the application was installed and explanations were provided in a separate room for the intervention group. The researcher provided their mobile phone number to mothers in both groups to answer their possible questions. After 8 weeks of education, both groups completed the BES again after two months when the mothers visited the centers for vaccination. After the end of the study, educational application was provided to the control group. Data collection was done from July to November 2022.

An independent t-test was used to compare the quantitative variables, while chi-square test (or Fisher's exact test) was employed for qualitative variables. The Shapiro-Wilks test was used to evaluate the normality of data distribution for the total BES score before and after the educational intervention. The mean pre-test score of the BES was compared between the two groups using an independent t-test. The mean post-test score of the BES was compared using ANCOVA. If the data distribution was abnormal, the Mann-Whitney U test was used to compare univariate analyses, and the Kruskal-Wallis test and the Wilcoxon test were used for within-group comparisons. The data were analyzed in SPSS software version 16 and the significance level was set at 0.05.

Results

The mean age of mothers and their spouses was 29.55±6.56 and 32.93±5.44, respectively. It was found that 55.8% of mothers and 52.3% of spouses had a university education. Also, 79.1% of mothers were housewives, 90.7% had a moderate monthly income level, and 74.4% had given birth by a cesarean section. There was no significant difference in demographic data and type of delivery between the two groups (Table 1).

The mean total score of the BES before the intervention was 38.51±7.08 and 35.63±8.91 in the intervention and control groups, respectively. The independent t-test and Mann-Whitney U test results showed no significant difference between the two groups in total BES score and the BES domains of breast concerns, process concerns, mechanic concerns, milk insufficiency concerns, or social concerns before the intervention. After the intervention, mechanic concerns (P=0.01, Eta squared=0.082), process concerns (P=0.001, Eta Squared=0.183), milk insufficiency concerns (P=0.001, Eta Squared=0.189) and total BES score (P=0.001, Eta Squared=0.196) were significantly lower in the intervention group than in the control group . However, breast concerns and social concerns were not significantly different between the two groups after the intervention (Table 2).

Exclusive breastfeeding rate in the intervention group increased from 39.5% to 50% after the intervention, while the control group experienced a decrease from 48.9% to 41.4%. Also, in the control group, 17.08% of mothers completely stopped breastfeeding, where the most common reasons included insufficient milk concerns, inadequate weight gains of the baby, and the baby's difficulty with latching on. In the control group, 17.08% of mothers completely ceased breastfeeding, where the most common reasons included insufficient milk concerns, inadequate weight gain in the baby, the baby's difficulties with latching on, the baby's difficulties with sucking, and difficulty with positioning the baby during breastfeeding. On average, mothers stopped breastfeeding in 40-50 days. A significant difference in the type of infant feeding (P=0.023) was observed after the intervention between the two groups (Table 3).

Table 1. Sociodemographic characteristics of the participants in two groups at baseline (n=86)

Variables		Mean±SD/No. (%)		P
		Intervention Group (n=43)	Control Group (n=43)	
Mother's age (y)		30.49±6.47	28.07±5.30	0.061*
Mother's education	High school or lower	16(37.2)	22(51.2)	0.193**
	University education	27(62.8)	21(48.8)	
Mother's occupation	Housewife	32(74.4)	36(83.7)	0.368***
	Employed	11(25.6)	7(16.3)	
Spouse's age (y)		33.81±5.60	32.81±5.50	0.133*
Spouse' education	High school or lower	19 (44.2)	22(51.2)	0.517**
	University education	24(55.8)	21(48.8)	
Monthly family income	Low	3(7)	4(9.3)	0.713***
	Moderate	40(93)	38(88.4)	
	High	0	1(2.3)	
Type of delivery	Vaginal	13(30.2)	9(20.9)	0.323**
	Cesarean section	30(69.8)	34(79.1)	

*Independent t-test, **Chi-square test, ***Fisher's exact test

In comparing the changes in daily use of formula milk for infants in mothers who had mixed feeding at the start of the study, the mothers in the intervention group reported a 28.4% decrease after the education, while those in the control group had a 27.5% increase in their daily use of formula milk.

Discussion

The present study investigated the effects of mobile-based breastfeeding education on the breastfeeding experience of Iranian nursing mothers. The results showed that the breastfeeding experience of women in the in-

Table 2. Comparison of the BES scores between the two groups after the intervention (n=81)

Variables	Mean±SD (95% CI, Lower-Upper)			
	Post-test Phase			
	Intervention Group (n=40)	Control Group (n=41)	P*	Partial Eta Squared
Total score	27.93±7.43 (24.65–29.14)	32.88±9.89 (31.65-36.09)	0.001	0.196
Breast concerns	3.60 ±1.15 (3.15-4.08)	3.83±1.77 (3.35-4.27)	0.549	0.005
Process concerns	9.15±2.79 (7.68-9.34)	10.44±3.13 (10.23-11.88)	0.001	0.183
Mechanic concerns	6.58±2.62 (5.58-7.35)	8.02±3.40 (7.24-9)	0.010	0.082
Milk insufficiency concerns	4.75 ±2.27 (3.97-5.51)	7.05±3.49 (6.29-7.81)	0.001	0.189
Social concerns	3.85±1.67 (3.26–4.05)	3.54±1.61 (3.33-4.11)	0.818	0.001

BES: Breastfeeding experience scale.

*ANCOVA

Table 3. Comparing the type of infant feeding after the intervention between the two groups (n=43)

Variables		No. (%)		P*
		Intervention Group	Control Group	
Pre-test	EBF	17(39.5)	21(48.9)	0.023
	Mix	26(60.5)	22(51.1)	
Post-test	EBF	20(50)	17(41.4)	0.023
	Mix	20(50)	17(41.4)	
	Formula	0	7(17.08)	

EBF: Exclusive breastfeedinG; Mix: Mixed feeding (breast milk+bottle feeding).

*Chi-square test

tervention group improved significantly compared to the control group. Breastfeeding problems and the use of formula milk in the intervention group decreased, and their exclusive breastfeeding rate increased compared to that of the control group. These results are consistent with the findings of systematic review studies, which suggested that mobile-based education can help alleviate the difficulties with breastfeeding [23, 24]. The results are against the findings of Eksioglu et al. and Lewkowitz et al. [25, 26], which may be due to differences in educational content and the characteristics of participants. Providing regular text messages about the benefits of breastfeeding twice a week in the present study seems to be effective in increasing mothers' motivation to continue exclusive breastfeeding.

In the present study, breast concerns decreased after education in the intervention group, but this decrease was not statistically significant compared to the control group. This finding is in contrast with the results of Eksioglu et al. and Crasta et al. [25, 27], which can be due to the difference in the method and duration of education. It seems that the combination of mHealth and face-to-face education can effectively reduce breast concerns in north Iranian mothers. The timing of education may also affect the outcomes. The present study provided education only after delivery due to time limitations, whereas in other studies, the integration of prenatal and postnatal education with a greater emphasis on prenatal education showed effectiveness in reducing breastfeeding difficulties and promoting exclusive breastfeeding [9، 14].

In our study, the mothers' concern about insufficient milk to meet the baby's nutritional needs and the baby's inappropriate weight gain seems to be mainly due to the baby's high crying and the mother's misunderstanding of the baby's nutritional and behavioral patterns. Ensuring the adequacy of breastfeeding, increasing the mother's awareness, and reassuring the mother of breastfeeding adequacy can strengthen their understanding of milk sufficiency and provide them with a positive breastfeeding experience. The intervention group in the present study experienced significantly fewer breastfeeding difficulties related to breast engorgement and reported less worry about insufficient milk than the control group. These findings are consistent with the results of some related studies [28-31]. In the current study, breastfeeding-related social concerns did not significantly decrease after education. This is consistent with the results of some related studies which suggested that addressing social concerns requires measures beyond individual education, such as the formation of breastfeeding support groups including peers, family members, and the healthcare system [32, 33].

Overall, mobile-based breastfeeding education improved the breastfeeding experience of nursing mothers. It could reduce their breastfeeding difficulties and increase the exclusive breastfeeding rate. The study had limitations. Despite the recommendation to the women in the intervention group to read the educational content in the application at least once a week, some of them had a lack of cooperation, and the researcher had to send an SMS reminder weekly. During the study, to minimize communication between the intervention and control groups, we tried to explain the application to the intervention group in a separate room. Also, it is possible that, despite the recommendations to women to only use the installed application, they have used other methods to gain knowledge and improve their breastfeeding experience.

In conclusion, mobile-based breastfeeding education has a positive effect on improving the breastfeeding experience of women in north of Iran. Using a mobile application for breastfeeding education can encourage mothers to give exclusive breastfeeding, increase their awareness of self-management methods in case of having breastfeeding problems, and improve their empowerment. Integrating mobile-based education with face-to-face education starting from late pregnancy is recommended for future studies.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of Guilan University of Medical Sciences (Code: IR.GUMS.REC.1401.164). The procedures in this study are in accordance with the ethical guidelines.

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Authors' contributions

Study design: Sedighe Rezaie-Chamani; Data collection: Sedighe Rezaie-Chamani and Mona Aram; Statistical analyses: Saman Maroufizadeh; Writing the original draft: Mona Aram, Sedighe Rezaie Chamani and Zahra Bostani Khalesi; Review, editing and final approval: All authors.

Conflict of interest

The authors declare no conflict of interest.

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