Effectiveness of "Breast Milk Mother" Mobile Applications to Increase Knowledge and Attitude about Breast Feeding, Time to Release Breast Milk, and Adequacy of Breast Milk for Infants

Abstract

Background: The advancement of information technology opens up new possibilities for integrating mobile health into healthcare services. The Breast Milk Mother applications offer an alternative to provide information on breastfeeding. This study aims to analyze the effectiveness of the Breast Milk Mother mobile applications in increasing knowledge, attitudes, breastfeeding timing, and breast milk adequacy for infants. **Materials and Methods:** This quasiexperimental study with a pre-post control design was conducted in 2022 in Candirejo, Magetan, East Java, Indonesia. The sample consisted of 100 pregnant women in their third trimester until their infants were 7 days old, divided into two groups: intervention (50) and control (50). Purposive sampling was used, with the intervention group receiving the Breast Milk Mother applications, while the control group received breastfeeding counseling. Data on knowledge and attitude were collected using questionnaires and analyzed using the Mann–Whitney U test and Wilcoxon test, with significance set at $p < 0.05$. **Results:** There was no significant difference in knowledge and attitudes between the intervention and control groups before treatment (Z = -0.40, $p > 0.05$ and Z = -0.66, $p > 0.05$). After treatment, significant differences were found (Z = -7.81, $p < 0.001$ and Z = -5.76, $p < 0.001$). In both groups, significant improvements in knowledge and attitudes were observed post treatment (Z = -6.10, $p < 0.001$ for the intervention group and Z = -5.66, $p < 0.001$ for the control group). **Conclusions:** The Breast Milk Mother mobile applications effectively improve knowledge, attitudes, breastfeeding timing, and breast milk adequacy for infants. The Breast Milk Mother mobile applications support exclusive breastfeeding and enhance midwifery services.

Keywords: *Attitude, breastfeeding, breast milk, knowledge, mobile applications*

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Introduction

Breast milk is the best food for infants. Based on study data and global facts in The Lancet Breastfeeding Series in 2016, it proved that exclusive breastfeeding reduced the mortality rate due to infection by 88% in infants aged less than 3 months.[1] Basic Health Research states that the proportion of breastfeeding patterns in infants aged 0–5 months in Indonesia is 37.3%.[2] Efforts to increase the coverage of exclusive breastfeeding are carried out by providing health information. Most people get health information using simple (conventional) methods. Health information conveyed to the public using simple (conventional) methods will not last long. With advances in technology, information capabilities are growing. Information obtained through audio-visual media will last longer, quickly spread over a wider area, and be stored longer. Health information in the global era can be easily accessible through modern technology.[3] One of the mobile users is a breastfeeding mother so that breastfeeding mothers can access information easily.

Health care professionals are increasingly using smartphones in clinical care. Smartphone use can affect patient quality of care and clinical outcomes.[4] One of the implementations is the development of remote nursing services for clients with chronic diseases who are at home (mobile–health). The smartphone application provides the transfer of concepts and content extensively and attractively by using media capacities such as using video, photo, and sound along with written content that leads to a better understanding.[5] Mobile–health

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is the result of the development of e-Health which uses computers as communication and documentation hardware that is integrated between members of health services. Mobile technology enables health-care organizations to extend health-care services by providing a suitable environment to achieve mobile health (mHealth) goals, making some health-care services accessible anywhere and anytime.[6] Mobile and wireless technologies can be used to support the achievement of health goals (mobile-Health). The continued growth of mobile cellular network coverage will provide new opportunities to integrate mobile health into existing e-Health services. A research report from StatCounter regarding mobile users during 2014 stated that Android is the operating system that dominates the circulation of smartphones in Indonesia with a market share of 59.91%.[7] This study used an Android-based application. The breastmilk application is an Android-based educational media that was developed to provide information about breastfeeding, the timing of breastfeeding, and the adequacy of breast milk for infants.

The purpose of the study is to analyze the effectiveness of using the Mother ASI mobile application to increase knowledge, attitudes about breastfeeding, timing of breastfeeding, and the adequacy of breast milk for infants.

Materials and Methods

This study used a quasiexperimental design with a pre-post test and control approach. The study was conducted in 2022 at Candirejo, Magetan, East Java, Indonesia, from April to June 2022. The research involved 100 pregnant women in their third trimester until their infants were 7 days old. The sample was divided into two groups: an intervention group (50), which received the *Breast Milk Mother* application, and a control group (50), which received direct breastfeeding counseling [Figure 1]. The sampling technique used was purposive sampling, where only mothers who met specific criteria were included in the study. The inclusion criteria consisted of pregnant women in their third trimester until they were breastfeeding infants aged 7 days, owning a smartphone with the Android operating system, and willing to install the *Breast Milk Mother* mobile application. Exclusion criteria included mothers who could not be monitored during the study (e.g., moving residences), those who experienced childbirth complications such as postpartum hemorrhage or infections, and infants with congenital abnormalities.

The research instruments included questionnaires to assess the respondents' characteristics, knowledge, and attitudes. Respondent characteristics included age, education, occupation, and parity. The knowledge questionnaire consisted of 30 closed dichotomous questions (true or false), while the attitude questionnaire comprised 30 closed statements using a Likert scale for agreement: strongly agree (SA), agree (A), uncertain (U), disagree (DA), and strongly disagree (SDA). The validity of the questionnaire was tested using Pearson's bivariate correlation, while reliability was tested using

Cronbach's alpha. Validity and reliability tests were conducted on pregnant women in their third trimester and breastfeeding mothers of infants aged 7 days in the Maospati Public Health Center area. A total of 30 knowledge questions were declared valid with an r value of 3.61, and the attitude questionnaire was also deemed valid with an r value of 3.61. The reliability of the knowledge and attitude questionnaires was found to be dependable with a Cronbach's alpha of 0.73.

In the study, the sampling and pretest questionnaires were first administered. The intervention group was then asked to download and use the *Breast Milk Mother* application and complete the post-test questionnaire. The control group received breastfeeding counseling and also completed the post-test questionnaire. After data collection, coding was performed, and the data were entered into a computer. Changes in the mean (SD) values of knowledge and attitudes between groups before and after the intervention were compared using the Mann–Whitney U test and Wilcoxon test. Data analysis was conducted using the *Statistical Package for Social Sciences* (SPSS) version 16.0 (IBM Corp., Armonk, NY, USA). A p value of < 0.05 was considered statistically significant.

Ethical considerations

Research permission was obtained from the Ethics Committee of the Health Polytechnic of the Ministry of Health Surabaya (No. EA/903/KEPK-Poltekkes_Sby/V/2022). Written informed consent forms were obtained from participants prior to the study.

Results

Based on the research findings, the characteristics of respondents in both groups were similar: Most were aged 20–25 years, were housewives, had secondary education, and were primiparous. Both groups were homogeneous in all characteristics (aged $\chi^2 = 0.43$, df = 3, $p > 0.05$; work $\chi^2 = 0.60$, df = 3, $p > 0.05$; education $\chi^2 = 0.72$, df = 2, $p > 0.05$; and parity $\chi^2 = 0.39$, df = 1, $p > 0.05$) [Table 1].

Mann–Whitney test showed there was no significant difference in knowledge and attitudes between the intervention and control groups before treatment ($Z = -0.40$, $p > 0.05$ and $Z = -0.66$, $p > 0.05$). This absence of difference indicates that the knowledge and attitude levels of the two groups were comparable before the intervention, making them suitable for comparison. However, after the intervention, significant differences were observed in the mean knowledge and attitude scores between the two groups ($Z = -7.81$, $p < 0.001$ for knowledge; $Z = -5.76$, $p < 0.001$ for attitude) [Table 2].

The Wilcoxon test showed that in both groups, significant improvements in knowledge and attitudes were observed post treatment ($Z = -6.10$, $p < 0.001$ for the intervention group and $Z = -5.66$, $p < 0.001$ for the control group). In the intervention group, the mean knowledge score
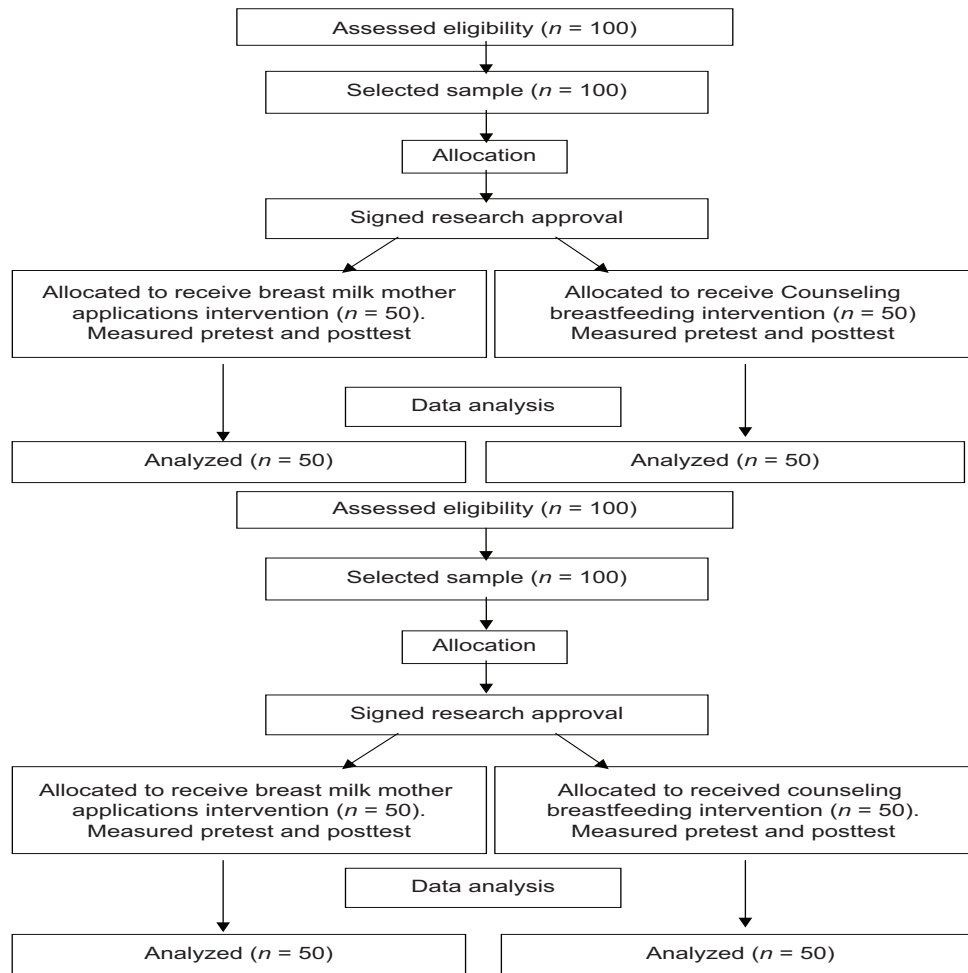
Figure 1: Flowchart of research participants

increased from 67.73 before the intervention to 85.67 after, reflecting a 33.04% improvement. Similarly, the mean attitude score rose from 71.72 to 85.39, marking a 20.82% improvement.

In the control group, significant differences were also found between pre- and post-treatment scores for both knowledge (Z = -5.66, p < 0.001) and attitude (Z = -5.32, p < 0.001). The mean knowledge score increased from 66.73 to 72.99, representing a 12.80% improvement, while the mean attitude score increased from 70.44 to 73.23, indicating a 4.27% improvement [Table 2].

Discussion

Monitoring of breast milk expenditure and adequacy of breast milk needs to be carried out for breastfeeding mothers, given the importance of infants getting breast milk as early as possible and exclusively. The use of technology, especially the use of smartphones, tablets, and so on, is increasing in all walks of life, from the level of economy, education, occupation, and age. Smartphones are no longer a luxury item because they are affordable and easily accessible to the public. The applications offered also vary according to user needs.

This study was conducted to assess the effectiveness of the use of the Breast milk Mother mobile applications on changes in the level of knowledge and attitudes of mothers about breast feeding, monitoring the timing of breastfeeding and the adequacy of breast milk for infants. Interesting findings resulted from this study, where there were significant differences in the average knowledge and attitudes after the intervention was carried out. These results are consistent with changes in knowledge and attitude scores which show significant differences between the control and intervention groups. Breastmilk Mother application makes it easy for users to obtain information about breastfeeding and the adequacy of breast milk for infants so that it is effective in increasing knowledge and attitudes. The results of this study are in line with research conducted by Dalton *et al*., which showed that the increasing use of mobile apps can improve mothers' understanding and knowledge of personal health and health care choices, as well as improve their ability to make informed choices during pregnancy.[8]

Furthermore, the results of this study also support research conducted by Ismayanty *et al*., which showed that the

Table 1: Demographic characteristics of group participants, Breast Milk Mother applications, and counseling breast feeding

Variable	Breast Milk Mother application n (%)	Counseling breast feeding** n (%)	Test*	p
Age			0.43*df=3	0.93
20-25 years	21 (42)	23 (46)		
26-30 years old	12 (24)	13 (23)		
31-35 years old	10 (20)	8 (16)		
>35 years old	7 (14)	6 (12)		
Work			0.60*df=3	0.90
Housewife	29 (38)	27 (34)		
Self-employed	6 (12)	8 (16)		
Employee	13 (26)	12 (24)		
Civil servant	2 (4)	3 (6)		
Education			0.72*df=2	0.70
Primary	2 (4)	4 (8)		
Secondary	36 (72)	35 (70)		
Higher	12 (24)	11 (22)		
Parity			0.39*df=1	0.53
Primipara	30 (60)	33 (66)		
Multipara	20 (40)	17 (34)		

*Chi-square, **Counseling Breast Feeding

Table 2: Mean (SD) of knowledge and attitudes before and after intervention in groups, Breast Milk Mother applications, and counseling breast feeding

Variable	Group		Test	p
	Breast Milk Mother applications n=50, mean (SD)	Counseling breast feeding***, n=50, mean (SD)		
Knowledge				
Before intervention	67.73 (13.56)	66.73 (12.91)	Z*=-0.40	0.69
After intervention	85.67 (3.38)	72.99 (8.31)	Z*=-7.81	<0.001
Enhancement (%)	33.04 (34.81)	12.80 (22.76)	Z*=-4.29	<0.001
Results	Z**=-6.10, p=<0.001	Z**=-5.66, p=<0.001		
Attitude				
Before intervention	71.72 (9.03)	70.44 (9.49)	Z*=-0.66	0.51
After intervention	85.39 (7.55)	73.23 (9.31)	Z*=-5.76	<0.001
Enhancement (%)	20.82 (18.52)	4.27 (5.04)	Z*=-6.30	<0.001
Results	Z**=-6.10, p=<0.001	Z=-5.32**, p=<0.001		

*Mann–Whitney, **Wilcoxon, ***Counseling Breast Feeding

use of the Pregnancy Risk Early Detection Application (DDILAN) can increase pregnant women's knowledge and attitudes about pregnancy risks.[9]

The results showed that the characteristics of respondents between the intervention group and the control group including age, education, occupation, and parity did not show significant differences with $p > 0.05$ (homogeneous), so the two groups deserved to be compared. Age affects a person in thinking, behaving, and doing an action that is obtained from the maturity of thinking based on experience. The results showed most of the respondents with secondary education. A person's level of education can affect the

level of knowledge he has. This affects the ability to receive, understand, and process the information obtained. Understanding and receiving information for someone with higher education is better than that for someone with less education. Higher education will be able to form high knowledge in a person.[10] For someone with a higher level of education, it will be easier to receive information, which in turn will increase knowledge and better attitudes. The results of this study are in accordance with Azwar's opinion, which states that the formation of attitudes occurs because of the influence of the media, in addition to one's personal, cultural, and emotional experiences. Parity affects knowledge and attitudes because of the experience

factor. Especially in multiparous parity, pregnancy and breastfeeding provide their own experiences in infant care and breastfeeding.[11]

In the intervention group and the control group, it was shown that the knowledge and attitude variables before and after treatment showed significant differences ($p < 0.001$). Although there was an increase in both the intervention group and the control group, the increase in knowledge and attitudes was better in the intervention group. The results of this study are in line with the research of Novianty, N., which shows that the ATENF breastfeeding applications, educational media, and leaflets can increase knowledge. Although both can increase knowledge, there are differences, seen from the average value, indicating that knowledge is better in the intervention group. ATENF breastfeeding education media based on Android application can increase the knowledge of pregnant women and breastfeeding mothers.[12] The results of this study are also supported by research in Thailand by Wang et al.,[13] showing that the MoomMae application has the potential to increase public awareness of breastfeeding. Combining educational activities using web-based support through discussion forums is the most effective way to improve breastfeeding outcomes and the implementation of exclusive breastfeeding in the long term.

Knowledge is the result of knowing and occurs after people sense certain objects. Sensing occurs through the five human senses, namely, the senses of sight, hearing, smell, taste, and touch. Most human knowledge is obtained through the eyes and ears. Knowledge is a very important domain in shaping one's actions (overt behavior). Knowledge will determine attitude. Good knowledge is not necessarily followed by a supportive attitude and vice versa.[14] The breastmilk mother application is one of the Android-based nonpharmacological treatments. The breastmilk mother application is a new application with timing of breastfeeding and the adequacy of breast milk for infants and effective to increasing knowledge and attitudes.

Various studies show that the use of m-Health can change a person's knowledge, attitude, and health behavior. Future Internet-based breastfeeding interventions using electronic technology can be considered as an effort to increase interaction with mothers and personalize breastfeeding intervention content according to mothers' needs.[15] Research shows that technology-based breastfeeding education is not only an acceptable way to support breastfeeding for low-income women after discharge from hospital but also the preferred method for obtaining breastfeeding information.[16] Other research states that the Baby Buddy app is a well-designed platform that can be used to change breastfeeding behavior.[17] A study by Meedya, S. et al. showed that respondents in research on breastfeeding applications stated that the applications were well designed, easy to use,

interactive, and evidence-based with credible information sources. The Persuasive System Design Model which involves the active participation of respondents in the development of breastfeeding applications informs that the development of mobile health applications is acceptable and can be used for breastfeeding respondents and is evidence-based.[18] A study in Vietnam by Doan et al. showed that smartphone-based interventions can be effective in increasing breastfeeding in Vietnam.[19] The limitations of this study include the sample being restricted to a single area as the study was conducted only in Candirejo, Magetan, East Java, Indonesia. Additionally, the study only covered pregnant women in their third trimester until their infants were 7 days old. The long-term impact of the Breast Milk Mother application on breastfeeding behavior and breast milk adequacy has not yet been fully evaluated over a longer period.

Conclusion

Breast Milk Mother mobile applications are effective to increase knowledge, attitudes, timing of breastfeeding, and the adequacy of breast milk for infants.

The Breast Milk Mother mobile applications can be applied to pregnant women and breastfeeding mothers to prepare for breastfeeding and support exclusive breastfeeding. The role of health workers is needed to be able to monitor breast milk output and the adequacy of breast milk for infants for the success of exclusive breastfeeding using the Breast Milk Mother mobile applications. This can create good conditions for pregnant and breastfeeding mothers to continue using the Breast Milk Mother mobile applications. Further research can be conducted to evaluate changes in breastfeeding mothers' behavior.

Conflicts of interest

Nothing to declare.

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