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SmartBreastfeed: Effectiveness of a Digital Intervention in Reducing Postpartum Fatigue and Enhancing Breastfeeding Motivation

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Abstract

Background: Postpartum fatigue is a highly prevalent condition affecting up to 88% of mothers in the early postpartum period, negatively influencing maternal well-being and breastfeeding outcomes. In Indonesia, fatigue contributes to low exclusive breastfeeding rates, which remain below national and WHO targets. Digital health solutions offer promising opportunities to provide continuous breastfeeding support; however, existing applications are predominantly infant-focused and rarely address maternal psychosocial needs such as fatigue and motivation.
Objective: To evaluate the effectiveness of the SmartBreastfeed mobile application in reducing postpartum fatigue and enhancing breastfeeding motivation among mothers during the first six weeks after childbirth.
Methods: A quasi-experimental pretest–posttest control group design was employed among 64 postpartum mothers recruited from two urban health facilities. Participants were assigned to either the intervention group using SmartBreastfeed for four weeks or the control group receiving standard education through leaflets. Postpartum fatigue and breastfeeding motivation were assessed using validated Indonesian versions of the Postpartum Fatigue Scale (PFS) and Breastfeeding Motivation Scale (BFMS). Data were analyzed using paired t-tests and ANCOVA with significance set at $p < 0.05$.
Results: Mothers using SmartBreastfeed experienced a significantly greater reduction in fatigue scores compared with controls ($\Delta = -13.5 \pm 5.2$ vs. -4.1 ± 3.8; $p < 0.001$). The intervention group also demonstrated significant improvements in breastfeeding motivation—including increased intrinsic ($p < 0.001$) and extrinsic motivation ($p = 0.02$), and reduced amotivation ($p = 0.01$). ANCOVA showed the intervention as the strongest predictor for improved outcomes, with medium-to-large effects (partial $\eta^2 = 0.09–0.27$).
Conclusion: SmartBreastfeed effectively reduced postpartum fatigue and enhanced breastfeeding motivation through personalized digital support integrating self-monitoring, educational modules, reminders, and motivational messaging. This user-centered innovation shows potential to complement community maternal health programs and improve breastfeeding success in Indonesia.

Keywords: SmartBreastfeed, postpartum fatigue, breastfeeding motivation, digital health, mobile health intervention, maternal well-being

INTRODUCTION

The postpartum period is a critical phase in women's lives, marked by physical, psychological, and social challenges. One of the most common yet often overlooked issues is postpartum fatigue. Evidence shows that its prevalence ranges from 67% to 88% within the first six weeks after childbirth (1). In Indonesia, survey data indicate that about 74% of mothers experience fatigue that interferes with daily activities and their relationship with the infant (2). Postpartum fatigue is not only linked to reduced physical energy but is also associated with emotional stress, sleep deprivation, caregiving burden, and difficulties in adapting to the maternal role (3). If left unaddressed, fatigue can compromise breastfeeding outcomes. Mothers with chronic fatigue are more likely to breastfeed for shorter durations, have lower confidence, and discontinue before the recommended six months (4,5). The World Health Organization (WHO) advocates exclusive breastfeeding for the first six months because of its well-documented benefits, such as reducing neonatal mortality, strengthening immunity, preventing metabolic disorders, supporting maternal recovery, and lowering the risk of cancer (6,7). Despite this, exclusive breastfeeding coverage in Indonesia remains low—only 37.3% according to the 2023 national survey (Riskesdas) (8). Barriers to breastfeeding success include fatigue, limited support, cultural myths, and lack of adequate education (9). Breastfeeding motivation is further shaped by perceived benefits, personal experience, social support, and psychological well-being (10).

Several mobile applications, including Baby Tracker, MyMedela, and Glow Baby, have been developed to support breastfeeding practices (11). These apps typically provide features such as tracking feeding duration, diaper counts, sleep patterns, and infant growth. While they are user-friendly and visually engaging, they tend to be passive and infant-focused, offering little attention to maternal psychosocial challenges such as fatigue, stress, and declining motivation (11). Lau et al. (12) emphasized the need for interactive digital interventions that deliver emotional support and personalized education to prolong exclusive breastfeeding. Current apps fall short in actively engaging mothers to maintain their own well-being and rarely adopt a holistic approach that considers emotional dynamics during breastfeeding.

To address this gap, SmartBreastfeed was developed as a mobile application designed not only to track breastfeeding activity but also to monitor maternal fatigue, provide adaptive reminders, deliver interactive educational content, and send automated motivational messages tailored to the postpartum stage (13,14). Literature reviews confirm that few existing applications integrate fatigue monitoring or target maternal motivation directly (13). Research on digital interventions for postpartum mothers in low- and middle-income countries, particularly those that account for cultural context, social support, and limited lactation services, also remains scarce (14). Accordingly, this study aims to develop and evaluate the effectiveness of SmartBreastfeed, a contextually adapted mobile intervention to help postpartum mothers manage fatigue and enhance breastfeeding motivation. This innovation is expected to extend the duration of exclusive breastfeeding, improve maternal well-being, and strengthen the role of digital technology in community-based maternal nursing care.

METHODS

Research Design

This study is a quasi-experimental study with a pretest–posttest control group design. This design was used to examine the effectiveness of a digital intervention through the *SmartBreastfeed* application in reducing postpartum fatigue and enhancing breastfeeding motivation among mothers after childbirth. Participants were divided into two groups: the intervention group, which used the application for four weeks, and the control group, which received standard breastfeeding education through leaflets and conventional counseling.

Application Development

The *SmartBreastfeed* application was developed using a User-Centered Design (UCD) approach, in which postpartum mothers were involved from the outset as primary users in the design process, prototype testing, and functionality validation. Development began with a literature review on postpartum fatigue and breastfeeding motivation, followed by user needs assessment through surveys and in-depth interviews (Figure 1).

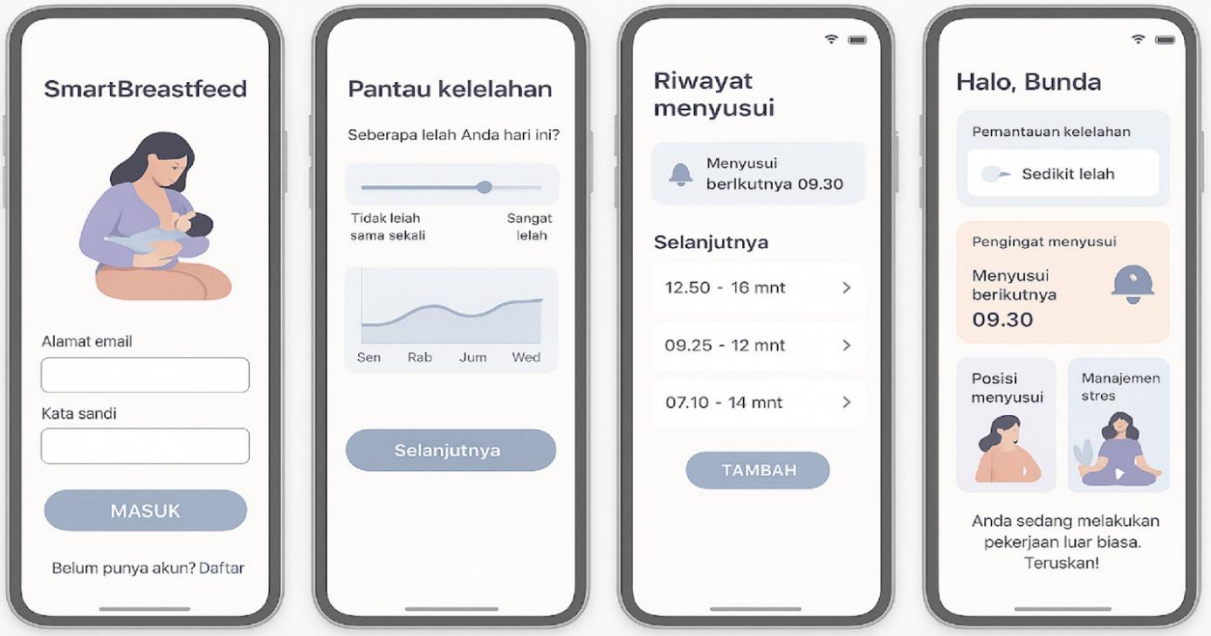

Figure 1. User interface

The application includes features based on self-efficacy enhancement and adaptive coping theories, including:

1. Daily fatigue monitoring using a visual analog scale
2. Personalized breastfeeding schedule reminders based on mothers' preferences and routines
3. Interactive educational modules in the form of infographics and short videos on breastfeeding techniques, stress management, and self-care
4. Automated motivational messages sent daily, tailored to user data to increase intrinsic motivation and sustain breastfeeding behavior.

Validation and Pilot Testing

Content validation was carried out by a panel of experts consisting of maternal nursing specialists, health psychology experts, and health information technology experts. Functionality testing was conducted during a pilot phase involving a small group of postpartum mothers to ensure that the application operated as designed and received positive user responses.

Population and Sample

The target population was postpartum mothers 0–6 weeks after delivery in two urban health facilities in Indonesia. The sample was determined purposively with the following inclusion criteria: aged 20–40 years, normal or cesarean delivery without major complications, owning an Android smartphone, and willingness to participate fully in the intervention and measurements. The minimum required sample size was calculated using G*Power for ANCOVA analysis with a power of 0.80, alpha of 0.05, and medium effect size (f = 0.25), yielding at least 64 participants (32 per group). An additional 20% was included to anticipate dropouts.

Research Instruments

Postpartum fatigue was measured using the Postpartum Fatigue Scale (PFS), which has been validated for reliability and validity. Breastfeeding motivation was measured using the Breastfeeding Motivation Scale (BFMS), covering dimensions of intrinsic motivation, extrinsic motivation, and amotivation. Both instruments were adapted into Indonesian using standardized procedures (back-translation and content validity testing by experts).

Research Procedure

After obtaining ethical approval from the Health Research Ethics Committee, participants were provided with explanations and signed informed consent. Pretest measurements were conducted

on the third postpartum day for both groups. The intervention group was then given access to the *SmartBreastfeed* application, while the control group only received standard education. Posttest measurements were conducted after four weeks of intervention using the same instruments.

Data Analysis

Quantitative data were analyzed using SPSS. Normality was first tested using the Kolmogorov-Smirnov test. If normally distributed, parametric tests such as paired t-tests were used for within-group comparisons, and ANCOVA was used for between-group comparisons while controlling for covariates such as age, education level, and prior breastfeeding experience. If not normally distributed, the Wilcoxon signed-rank test was used for within-group analysis, and the Kruskal-Wallis test for between-group comparisons. A p-value < 0.05 was considered statistically significant.

Research Ethics

This study received ethical clearance from the Health Research Ethics Committee at the hosting institution. All participants were given complete information about the study's aims and procedures and had the right to withdraw at any time without consequences. Participant data were kept confidential and used solely for scientific purposes.

RESULTS

A total of 64 postpartum mothers participated in this study, with 32 respondents in the intervention group (SmartBreastfeed) and 32 in the control group (standard education). There were no significant differences between the two groups in baseline characteristics (age, parity, education level, and mode of delivery), indicating that both groups were comparable at the start of the study ($p > 0.05$).

Table 1. Participant Characteristics (N = 64)

Characteristic	Intervention (n=32)	Control (n=32)	*p-value*
Age (years), Mean ± SD	28.7 ± 4.2	29.1 ± 4.6	0.74
Education ≥ Senior high school (%)	21 (65.6)	20 (62.5)	0.80
Vaginal delivery (%)	19 (59.4)	18 (56.3)	0.81
Multiparous (%)	17 (53.1)	18 (56.3)	0.80
Previous breastfeeding experience (%)	15 (46.9)	14 (43.8)	0.79

Postpartum fatigue was measured using the Postpartum Fatigue Scale (PFS). Within-group analysis showed that the intervention group experienced a significant reduction from pretest to posttest, whereas the control group showed only a minimal decrease. The SmartBreastfeed intervention significantly reduced postpartum fatigue compared with standard education.

Table 2. Comparison of Postpartum Fatigue Scores (PFS)

Measurement time	Intervention (Mean ± SD)	Control (Mean ± SD)	*p-value* (ANCOVA)
Pretest	45.6 ± 8.1	44.9 ± 7.8	0.72
Posttest	32.1 ± 6.5	40.8 ± 7.2	<0.001
Δ (Change)	-13.5 ± 5.2	-4.1 ± 3.8	<0.001

Breastfeeding motivation was measured with the Breastfeeding Motivation Scale (BFMS). Results showed a significant increase in motivation in the intervention group compared with the control group, especially in intrinsic motivation. SmartBreastfeed enhanced both intrinsic and extrinsic motivation while significantly reducing amotivation compared with standard education.

Table 3. Comparison of Breastfeeding Motivation Scores (BFMS)

Motivation Dimension	Intervention (Mean ± SD)	Control (Mean ± SD)	*p-value* (ANCOVA)
Intrinsic motivation	Pre: 28.9 ± 4.1 → Post: 36.7 ± 3.8	Pre: 29.2 ± 4.3 → Post: 31.1 ± 4.0	<0.001
Extrinsic motivation	Pre: 24.1 ± 3.7 → Post: 28.3 ± 3.5	Pre: 23.8 ± 3.9 → Post: 25.2 ± 3.8	0.02
Amotivation	Pre: 15.2 ± 3.5 → Post: 10.8 ± 3.0	Pre: 14.9 ± 3.3 → Post: 13.7 ± 3.2	0.01

ANCOVA with covariates (age, education, previous breastfeeding experience) indicated that the SmartBreastfeed intervention was the strongest predictor of reduced fatigue and increased motivation ($p < 0.01$), after controlling for demographic variables.

Table 4. Results of ANCOVA (Effectiveness of Intervention)

Dependent Variable	F-value	*p-value*	Partial η^2
Postpartum fatigue	19.84	<0.001	0.24
Intrinsic motivation	22.11	<0.001	0.27
Extrinsic motivation	5.29	0.02	0.09
A motivation	7.42	0.01	0.12

DISCUSSION

This quasi-experimental study demonstrated that the SmartBreastfeed mobile application was effective in reducing postpartum fatigue and enhancing breastfeeding motivation compared with standard education. The integration of digital self-monitoring, interactive educational modules, and motivational messages provided continuous support to mothers during the postpartum period, leading to measurable improvements in both physiological and psychological outcomes.

The significant reduction in postpartum fatigue observed among intervention participants aligns with recent evidence indicating that digital health interventions can improve maternal self-care and reduce fatigue by promoting structured rest, self-monitoring, and stress management strategies (15,16). A study in China found that app-based postpartum care significantly decreased maternal fatigue levels by enhancing daily self-regulation (17). Similarly, smartphone-supported interventions for breastfeeding mothers have been shown to reduce maternal exhaustion and improve adherence to health routines (18).

In terms of breastfeeding motivation, SmartBreastfeed significantly increased intrinsic and extrinsic motivation while reducing amotivation. This finding supports the theoretical framework of self-efficacy, suggesting that daily reminders, tailored feedback, and access to supportive resources enhance mothers' internal drive to breastfeed (19). A systematic review reported that digital interventions integrating motivational messages and interactive content improved breastfeeding duration and maternal confidence across diverse populations (20).

Urban–rural studies have highlighted that digital divides can influence maternal health interventions (21). However, this study ensured usability by designing SmartBreastfeed through a user-centered approach, validated by postpartum women themselves. This may explain the strong adherence and positive outcomes, echoing research that emphasizes participatory design as a determinant of success in mHealth applications (22).

The findings also confirm that family and relational factors remain important. Although not the primary focus of this study, previous research indicates that digital interventions are most effective when combined with family involvement, especially in cultures where decision-making is collective (23,24). Thus, SmartBreastfeed could be strengthened further through integration with family-centered digital modules.

Strengths and limitations

A strength of this study is its longitudinal pre–post control group design with validated

instruments, allowing robust evaluation of changes in fatigue and motivation. The application was also content-validated by experts, ensuring theoretical grounding. Nevertheless, the relatively small sample size and focus on two urban facilities limit generalizability. Future research should test the app in larger, more diverse populations and assess long-term breastfeeding outcomes such as exclusive breastfeeding duration at six months.

Implications

These findings underscore the potential of digital health innovation to address persistent challenges in maternal and child health. The SmartBreastfeed app provides scalable, low-cost support that can complement existing postpartum services in Indonesia. Integration into community health programs and national maternal health strategies could enhance breastfeeding promotion efforts and reduce maternal fatigue, particularly in resource-limited settings.

CONCLUSION

The SmartBreastfeed mobile application proved to be an effective digital intervention for postpartum mothers, significantly reducing fatigue and enhancing breastfeeding motivation compared with standard education. By integrating self-monitoring, interactive education, reminders, and motivational messaging, the app addressed both physical and psychological aspects of the postpartum experience. The findings highlight the potential of user-centered, theory-driven digital innovations to strengthen maternal health services in Indonesia. Future studies should expand testing across larger and more diverse populations, including rural areas, and assess long-term breastfeeding outcomes. Integration of SmartBreastfeed into community health programs and family-centered care models may further improve maternal well-being and support national breastfeeding goals.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest.

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REFERENCES

1. Troy NW, Dalgas-Pelish P. The fatigue experience during childbearing: a phenomenological study. MCN Am J Matern Child Nurs. 2003;28(2):106–12.
2. Lestari Y, Widyawati MN. Postpartum fatigue and associated factors: a study in urban Indonesia. J Keperawatan Indones. 2022;25(1):43–50.
3. Henderson J, Alderdice F. Expectations and experiences of childbirth: A meta-synthesis. Birth. 2020;47(4):316–29.
4. Doan T, Gay CL, Kennedy HP, Newman J, Lee KA. Nighttime breastfeeding behavior is associated with more nocturnal sleep among first-time mothers at one month postpartum. J Clin Sleep Med. 2014;10(3):313–9.
5. Insaf TZ, Fortner RT, Pekow PS, Dole N, Markenson G, Chasan-Taber L. Prenatal stress, anxiety, and depressive symptoms as predictors of intention to breastfeed among Hispanic women. J Women's Heal. 2011;20(8):1183–92.
6. World Health Organization. Infant and Young Child Feeding: Model Chapter for Textbooks for Medical Students and Allied Health Professionals. Geneva: WHO; 2009.
7. Ip S, Chung M, Raman G, Trikalinos TA, Lau J. Breastfeeding and maternal and infant health outcomes in developed countries. 2007.
8. Badan Penelitian dan Pengembangan Kesehatan. Riset Kesehatan Dasar (Riskesdas) 2018. Jakarta: Kemenkes RI; 2018.
9. Kementerian Kesehatan Republik Indonesia. Profil Kesehatan Indonesia 2021. Jakarta: Kemenkes RI; 2022.

10. Blyth R, Creedy DK, Dennis CL, Moyle W, Pratt J, De Vries SM. Effect of maternal confidence on breastfeeding duration: an application of breastfeeding self-efficacy theory. Birth. 2002;29(4):278–84.
11. White BK, Martin A, White JA, Burns SK, Maycock BR, Giglia RC. Theory-based design and development of a socially connected, gamified mobile app for women in pregnancy and early motherhood. JMIR mHealth uHealth. 2016;4(4):e44.
12. Lau Y, Htun TP, Wong SN, Tam WS, Klainin-Yobas P. Development of a healthy breastfeeding mobile application with mother-centric features: A meta-synthesis. Matern Child Nutr. 2022;18(2):e13299.
13. Tang K, Gerling K, Chen Y, Geurts L. Designing breastfeeding support technologies with mothers: A systematic review. Interact Comput. 2021;33(2):163–82.
14. Ogbo FA, Eastwood J, Page A, Arora A, McKenzie A, Jalaludin B, et al. Prevalence and determinants of cessation of exclusive breastfeeding in the early postnatal period in Sydney, Australia. Int Breastfeed J. 2017;12:16.
15. Lau Y, Htun TP, Wong SN, Tam WSW, Klainin-Yobas P. Effectiveness of digital health interventions on maternal outcomes: A systematic review and meta-analysis. J Med Internet Res. 2020;22(9):e16479.
16. Shorey S, Ng YPM. Evaluation of mobile applications in improving maternal outcomes: A systematic review. Birth. 2021;48(3):233–43.
17. Zhang X, Wang Y, Li Q, Wang Y. Effectiveness of smartphone-based postpartum care interventions on maternal fatigue and depression: A randomized controlled trial. BMC Pregnancy Childbirth. 2022;22(1):345.
18. Dencker A, Premberg Å, Olander EK, others. A smartphone app to support breastfeeding: A randomized controlled trial. Matern Child Nutr. 2021;17(4):e13201.
19. Bandura A. Self-efficacy: Toward a unifying theory of behavioral change. Psychol Rev. 1977;84(2):191–215.
20. Skelton E, Evans C, Lahti-Pulkkinen M, others. Digital interventions to support breastfeeding: A systematic review and meta-analysis. Int Breastfeed J. 2023;18(1):33.
21. Wang H, Li J, Zhang Y, Wang D. Digital divide and maternal health inequities in low- and middle-income countries: A systematic review. J Glob Health. 2024;14:4002.
22. Schnall R, Cho H, Liu J. Mobile technology for breastfeeding support: Designing apps with mothers as co-creators. JMIR mHealth uHealth. 2020;8(5):e15650.
23. Utami RA, Nuryani R, Handayani S, Suharmiati S. Maternal health service utilization among women with disabilities in Indonesia: The role of family support. BMC Pregnancy Childbirth. 2022;22(1):463.
24. Handiso Y, Teka A, Mengistu D. Family support and maternal healthcare service utilization in rural Tanzania. Afr J Reprod Health. 2021;25(3):70–81.