

Original Research

Received 24 May 2026

Revised 27 June 2026

Accepted 19 July 2026

Natural Resources for Human Health 2026, Vol. 6 (9s): 423–440

KEYWORDS:

Health Belief Model, virtual health promotion, exclusive breastfeeding, multigravida mothers, breastfeeding practices.

Effectiveness of a Virtual Health Promotion Program based on the Health Belief Model in Improving Health Beliefs and Exclusive Breastfeeding Practices among Multigravida Mothers in Indonesia

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ABSTRACT:

Objective: To evaluate the effectiveness of a virtual health promotion programme based on the Health Belief Model (HBM) in improving HBM-related health beliefs and exclusive breastfeeding practices among multigravida mothers in the working area of Puskesmas Medan Tuntungan, Indonesia.

Methods: A quasi-experimental, two-group pretest–posttest design was conducted from February to June 2026. Sixty multigravida mothers were allocated to an intervention group ($n = 30$) receiving HBM-based virtual health promotion or a control group ($n = 30$) receiving routine maternal and child health education. HBM-related health beliefs and exclusive breastfeeding practices were assessed before and after the intervention. Statistical analyses were performed according to data distribution and measurement scale.

Results: The intervention group demonstrated a substantial increase in total HBM scores, from 67.43 ± 7.25 at baseline to 83.67 ± 6.14 after the intervention, representing a mean increase of 16.24 points ($p < 0.001$). Improvements were observed across all six HBM constructs, with the largest increase in self-efficacy (4.28 points). The proportion of mothers reporting good exclusive breastfeeding practices increased from 46.7% to 86.7% in the intervention group, whereas the control group increased from 43.3% to 56.7%.

Conclusion: A virtual health promotion programme grounded in the HBM was associated with improved maternal health beliefs and exclusive breastfeeding practices among multigravida mothers. This approach may provide a flexible and feasible strategy for strengthening breastfeeding promotion within primary healthcare services.

1. INTRODUCTION

Breastfeeding is a critical public health intervention for promoting infant survival, growth, and long-term health. Breast milk provides essential nutrients, immunological factors, hormones, enzymes, and bioactive components required for optimal infant development, while exclusive breastfeeding for the first six months, without additional food or fluids, is recommended to maximize these benefits. Exclusive breastfeeding reduces the risk of infectious diseases, including respiratory infections and diarrhoea, and contributes to improved cognitive and long-term health outcomes for children. Nevertheless, global progress remains insufficient [1,2]. In 2024, approximately 48% of infants younger than six months were exclusively breastfed worldwide, remaining below the global target of 50% for 2025. This persistent gap indicates that increasing exclusive breastfeeding requires interventions that address not only the availability of information but also the behavioral and psychological determinants underlying mothers' breastfeeding decisions and practices [3-5].

In Indonesia, exclusive breastfeeding remains influenced by a complex interaction of individual, interpersonal, and contextual factors despite the availability of breastfeeding promotion through health facilities, community health services, counselling, and maternal-child health programmes [6]. Knowledge alone does not necessarily translate into sustained breastfeeding behavior, as mothers' perceptions of benefits and barriers, family support, previous breastfeeding experiences, social environment, employment conditions, and support from health professionals may shape their ability and willingness to breastfeed exclusively. These factors are particularly relevant among multigravida mothers, whose previous pregnancy and breastfeeding experiences may function either as facilitators or barriers. Previous difficulties, such as perceived insufficient milk production, nipple or breastfeeding pain, poor infant attachment, fatigue, or inadequate family support, may reinforce negative expectations and reduce confidence in subsequent breastfeeding attempts. Therefore, effective breastfeeding promotion for multigravida mothers should move beyond information provision toward interventions that deliberately modify health beliefs and strengthen confidence in sustaining exclusive breastfeeding [7,8].

The Health Belief Model (HBM) provides a theoretically grounded framework for addressing these behavioral determinants. HBM proposes that health behavior is shaped by perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy [9]. Applied to breastfeeding, these constructs can explain how mothers perceive the health risks associated with suboptimal infant feeding, evaluate the benefits of exclusive breastfeeding, anticipate barriers, respond to cues that encourage breastfeeding, and judge their ability to maintain exclusive breastfeeding for six months. Evidence from Indonesia indicates that several HBM constructs, including perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action, are associated with exclusive breastfeeding practices [10,11]. Other studies similarly indicate that maternal perceptions, knowledge, and attitudes are relevant to breastfeeding behavior and that HBM-based counselling can support exclusive breastfeeding [12-15]. However, much of the existing evidence has focused on identifying associations between HBM constructs and breastfeeding behavior or evaluating conventional educational approaches, rather than testing a theoretically integrated HBM intervention delivered through a virtual health-promotion programme, particularly among multigravida mothers.

Virtual health promotion provides an opportunity to overcome some limitations of conventional face-to-face breastfeeding education by offering accessible, flexible, repeatable, and potentially continuous support through digital platforms. Emerging evidence suggests that virtual breastfeeding counselling can improve breastfeeding self-efficacy and exclusive breastfeeding outcomes, while video-based peer support may facilitate sustained breastfeeding support during the postpartum period [16-18]. However, virtual breastfeeding interventions have not necessarily been designed explicitly around the multidimensional HBM constructs that determine mothers' health beliefs and behavioral decisions. Conversely, HBM-based interventions have demonstrated potential for improving breastfeeding-related outcomes, but evidence remains limited regarding their integration with a structured virtual delivery model and their effectiveness specifically among multigravida mothers in the Indonesian primary healthcare context. This creates an important research gap: evidence is still insufficient on whether a virtual health-promotion programme systematically targeting HBM constructs can simultaneously modify mothers' health beliefs and translate these changes into improved exclusive breastfeeding practices.

This study therefore addresses this gap by evaluating the effectiveness of a virtual health promotion programme explicitly based on the Health Belief Model among multigravida mothers in Indonesia. The study is novel in integrating a theory-driven behavioral framework with a digitally delivered health-promotion strategy and in simultaneously examining changes in HBM-related health beliefs and actual exclusive breastfeeding practices rather than focusing solely on knowledge or breastfeeding

self-efficacy. The intervention is further contextualized to the needs of multigravida mothers, whose previous breastfeeding experiences may influence perceived benefits, barriers, susceptibility, severity, cues to action, and self-efficacy. Conducted within the primary healthcare setting of Medan Tuntungan, Indonesia, this study aims to determine whether the HBM-based virtual programme can improve mothers' health beliefs and increase the likelihood of practicing exclusive breastfeeding. The findings are expected to provide evidence for scalable, theory-informed, and digitally accessible breastfeeding promotion strategies that can be integrated into primary healthcare services in Indonesia.

2. MATERIALS AND METHODS

2.1 Study Design and Setting

This study employed a quasi-experimental, two-group pretest–posttest design to evaluate the effectiveness of a virtual health promotion programme based on the Health Belief Model (HBM) in improving health beliefs and exclusive breastfeeding practices among multigravida mothers. Participants were assigned to either an intervention group receiving the HBM-based virtual health promotion programme or a control group receiving routine maternal and child health education through existing health services. Assessments were conducted before the intervention (pretest) and after its completion (posttest), with outcomes comprising HBM-related health beliefs and exclusive breastfeeding practices.

The study was conducted in the working area of Puskesmas Medan Tuntungan, Medan City, North Sumatra, Indonesia, from February to June 2026. This setting provides routine maternal and child health services and was considered appropriate for evaluating a behavioural health-promotion intervention among multigravida mothers. The study involved participant recruitment and eligibility screening, informed consent, baseline assessment, group allocation, intervention delivery, post-intervention assessment, data processing, and statistical analysis. The same outcome measures were administered at both assessment points to evaluate within-group changes and differences in changes between the intervention and control groups (see figure 1).

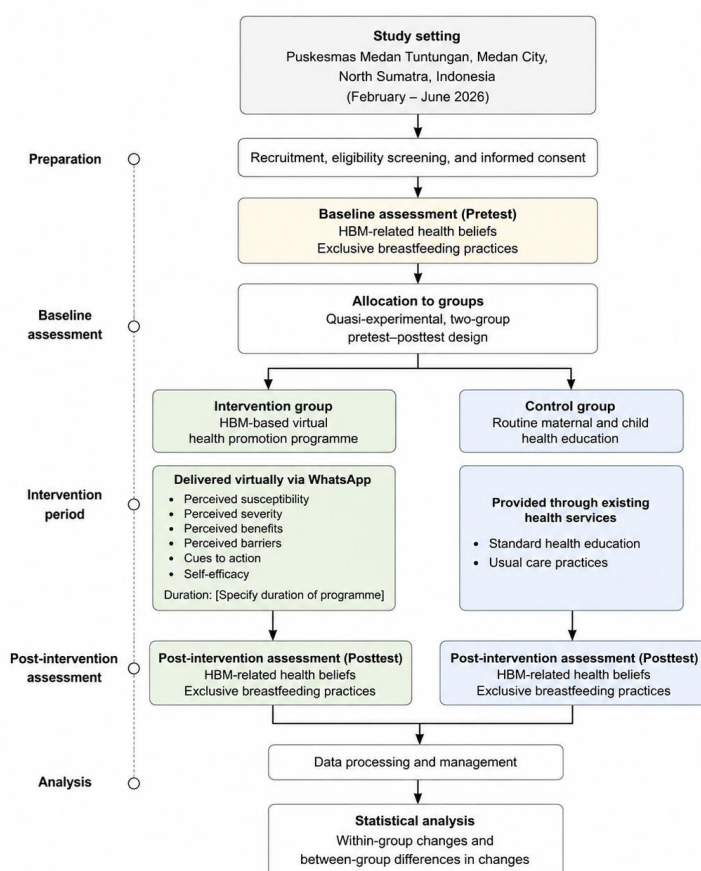


Figure 1. Study design and participant flow

2.2 Study Population and Participants

The study population comprised multigravida mothers residing in the working area of Puskesmas Medan Tuntungan who met the predefined eligibility criteria. A total of 60 participants were included in the study, with 30 participants allocated to the intervention group and 30 to the control group. Participants were eligible if they were multigravida mothers residing within the study area, were willing to participate and provide written informed consent, had access to a smartphone and internet connection, were able to use WhatsApp or other digital communication media used in the programme, were able to read and understand the study information, and were willing to complete the pretest and posttest assessments and participate throughout the intervention period. Participants were excluded if they had a health condition identified by a healthcare professional that substantially interfered with breastfeeding or participation in the programme, were unable to complete the intervention, withdrew from the study, or failed to complete either the pretest or posttest assessment.

Before enrolment, eligible mothers received an explanation of the study objectives, procedures, potential benefits, confidentiality arrangements, voluntary nature of participation, and their right to withdraw at any time without consequences for their healthcare services. Written informed consent was obtained from each participant before baseline assessment.

2.3 Sample Size and Group Allocation

The study included 60 multigravida mothers, comprising 30 participants in the intervention group and 30 participants in the control group. Participants were identified from the eligible target population in the study setting and enrolled according to the predefined inclusion and exclusion criteria. Group allocation was performed according to the study protocol and field conditions.

Before the intervention, all participants completed the baseline assessment of HBM-related health beliefs and exclusive breastfeeding practices. Following baseline assessment, participants in the intervention group received the structured virtual health promotion programme, whereas participants in the control group continued to receive routine health education available through the primary healthcare service. Because this study used a quasi-experimental design rather than a randomized controlled trial, no computer-generated randomization sequence or allocation concealment procedure was used. The absence of randomization was considered in the interpretation of between-group differences.

2.4 Virtual Health Promotion Programme Based on the Health Belief Model

The intervention consisted of a structured virtual health promotion programme developed according to the constructs of the Health Belief Model. The programme was designed to address the psychological and behavioural determinants of exclusive breastfeeding rather than focusing solely on the delivery of breastfeeding information. The intervention targeted six HBM-related domains: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. Intervention content addressed the health consequences associated with suboptimal infant feeding, the benefits of exclusive breastfeeding for mothers and infants, common breastfeeding barriers and strategies for overcoming them, practical approaches to maintaining exclusive breastfeeding, sources of social and family support, cues that encourage breastfeeding behaviour, and strategies to strengthen mothers' confidence in maintaining exclusive breastfeeding.

The programme was delivered virtually using digital communication media, including WhatsApp, educational videos, digital educational materials, and online communication or mentoring. Intervention materials were provided according to a predefined schedule over [4 weeks]. The virtual format enabled participants to access educational materials flexibly and repeatedly and to communicate with the research team when clarification or additional support was required. The intervention was structured to facilitate progressive reinforcement of HBM constructs. Educational messages were designed to increase mothers' awareness of the potential health consequences of not practising exclusive breastfeeding, strengthen perceptions of the benefits of exclusive breastfeeding, identify and address perceived barriers, provide cues to action, and reinforce self-efficacy. Participants were also encouraged to discuss breastfeeding-related difficulties and seek clarification through the designated virtual communication channel. Intervention participation was monitored through participant engagement with the virtual programme. Attendance or participation, completion of scheduled materials, interaction with the programme, and relevant deviations from the intervention schedule were documented by the research team.

2.5 Control Group

Participants in the control group received routine maternal and child health education provided through the existing healthcare services at Puskesmas Medan Tuntungan. Routine education represented the standard health information available to mothers and was not supplemented with the structured virtual HBM-based programme during the intervention period. The control condition was maintained to provide a comparison with usual health education and to determine whether changes in health beliefs and exclusive breastfeeding practices were greater among mothers exposed to the HBM-based virtual programme. After completion of the study assessments, the control group could be provided with the educational materials as an ethical consideration, where applicable.

2.6 Measurement of Health Beliefs Based on the Health Belief Model

Health beliefs were assessed using a structured questionnaire based on the constructs of the Health Belief Model relevant to exclusive breastfeeding. The instrument assessed perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. Each HBM construct was assessed using items reflecting mothers' perceptions and beliefs regarding exclusive breastfeeding. The questionnaire was administered at baseline and again after completion of the intervention using the same administration and scoring procedures. Higher scores indicated more favourable health beliefs toward exclusive breastfeeding, according to the scoring framework of the instrument. The questionnaire was reviewed for content relevance and comprehensibility before implementation. Where applicable, the validity and reliability characteristics of the instrument were established based on the procedures and evidence available for the Indonesian study population. The internal consistency of the instrument used in the present study was evaluated and reported using the appropriate reliability coefficient.

2.7 Assessment of Exclusive Breastfeeding Practices

Exclusive breastfeeding practice was assessed using a structured questionnaire developed according to indicators of exclusive breastfeeding during the first six months of life. The assessment focused on whether mothers practised exclusive breastfeeding in accordance with the recommended definition, without routinely providing other foods or liquids during the specified exclusive breastfeeding period. The same instrument and assessment procedures were used at baseline and post-intervention. Exclusive breastfeeding practice was analysed as an outcome of the intervention to determine whether improvements in HBM-related health beliefs were accompanied by changes in breastfeeding behaviour.

2.8 Data Collection Procedures

Data collection was conducted in sequential stages. First, potential participants were screened according to the eligibility criteria. Eligible mothers were informed about the study and provided written informed consent before participation. Baseline characteristics and pretest measurements of HBM-related health beliefs and exclusive breastfeeding practices were then obtained. Following the pretest, the intervention group participated in the virtual HBM-based health promotion programme for 4 weeks, while the control group continued to receive routine health education. Intervention delivery and participant engagement were monitored throughout the programme. Upon completion of the intervention period, both groups completed the posttest using the same measurement instruments administered at baseline. Completed questionnaires were checked for completeness and consistency before data processing. Data were subsequently coded, entered into the statistical software, cleaned, and prepared for analysis. Participant confidentiality was maintained throughout data collection and processing.

2.9 Intervention Adherence and Fidelity

Intervention adherence was monitored throughout the virtual programme using a structured monitoring record. The record included participation in scheduled educational activities, access to educational materials, engagement with virtual communication, completion of intervention components, and relevant deviations from the intervention schedule. Intervention fidelity was supported through standardized educational materials, predefined HBM-based content, a structured delivery schedule, and consistent communication procedures. Any interruption, withdrawal, or substantial deviation from the intervention protocol was documented by the research team.

2.10 Outcome Measures

The primary outcomes were changes in HBM-related health belief scores between baseline and post-intervention assessment. These outcomes included perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. The secondary outcome was exclusive breastfeeding practice. Changes in exclusive breastfeeding practice between baseline and post-intervention assessment were compared between the intervention and control groups. The principal effect of the intervention was evaluated by comparing the magnitude of change from pretest to posttest between the two study groups. This approach allowed the analysis to determine whether exposure to the virtual HBM-based programme was associated with greater improvement in health beliefs and exclusive breastfeeding practices than routine health education alone.

2.11 Statistical Analysis

Statistical analyses were performed using appropriate statistical software. Descriptive statistics were used to summarize participant characteristics and study outcomes. Categorical variables were presented as frequencies and percentages, whereas continuous variables were presented as means and standard deviations for normally distributed data or medians and interquartile ranges for non-normally distributed data. The distribution of continuous variables was assessed using the Shapiro–Wilk test. Within-group changes in HBM-related health belief scores and exclusive breastfeeding practice scores between pretest and posttest were analysed using a paired-samples *t*-test when the data met the assumptions of normality. For non-normally distributed data, the Wilcoxon signed-rank test was used.

Between-group differences in change scores were assessed using an independent-samples *t*-test for normally distributed data or the Mann–Whitney *U* test for non-normally distributed data. Change scores were calculated as the posttest score minus the pretest score. For categorical outcomes, the chi-square test or Fisher’s exact test was applied as appropriate. Because the study used a quasi-experimental design, the analysis focused primarily on changes over time and differences in changes between the intervention and control groups rather than interpreting group differences as evidence of a causal effect equivalent to a randomized trial. Effect estimates should be reported together with 95% confidence intervals where applicable. Statistical significance was determined using a two-sided *p* value of <0.05 .

2.12 Ethical Considerations

The study was conducted after obtaining ethical approval from the relevant institutional research ethics committee. The name of the ethics committee, approval number, and approval date will be reported in the final manuscript based on the official ethics approval document. Written informed consent was obtained from all participants before enrolment. Participation was voluntary, and participants were informed that they could withdraw from the study at any time without affecting their access to healthcare services. Participant confidentiality was maintained through the use of study identification codes, restricted access to research data, and secure storage of research records. All procedures involving human participants were conducted in accordance with applicable ethical principles and institutional requirements.

2.13 Data Availability

The datasets generated and/or analysed during the current study are not publicly available because they contain participant-level information and are subject to confidentiality and ethical restrictions. De-identified data may be made available from the corresponding author upon reasonable request and subject to applicable ethical and institutional requirements.

3. RESULTS AND DISCUSSION

3.1 Participant Characteristics

A total of 60 multigravida mothers who met the eligibility criteria participated in the study. Participants were allocated into an intervention group receiving the virtual health promotion programme based on the Health Belief Model (HBM) ($n = 30$) and a control group receiving routine health education ($n = 30$). The baseline characteristics of the participants are presented in Table 1.

Table 1. Baseline Characteristics of the Participants

Characteristic	Intervention, n (%)	Control, n (%)
Age		
<25 years	5 (16.7)	6 (20.0)
25–34 years	19 (63.3)	18 (60.0)
≥35 years	6 (20.0)	6 (20.0)
Educational level		
Primary	4 (13.3)	5 (16.7)
Secondary	19 (63.3)	18 (60.0)
Higher	7 (23.3)	7 (23.3)
Occupation		
Homemaker	22 (73.3)	21 (70.0)
Employed	8 (26.7)	9 (30.0)
Number of children		
2 children	21 (70.0)	20 (66.7)
≥3 children	9 (30.0)	10 (33.3)

Values are presented as frequency (percentage).

The distribution of participant characteristics was generally similar between the two groups. Most participants were aged 25–34 years, accounting for 63.3% of the intervention group and 60.0% of the control group. Secondary education was the most common educational level in both groups (63.3% and 60.0%, respectively). Most participants were homemakers (73.3% in the intervention group and 70.0% in the control group), and approximately two-thirds had two children (70.0% and 66.7%, respectively).

3.2 Changes in Overall HBM-Based Health Beliefs

The total HBM-based health belief scores before and after the intervention are presented in Table 2. In the intervention group, the mean score increased from 67.43 ± 7.25 at pretest to 83.67 ± 6.14 at posttest, corresponding to an absolute increase of 16.24 points. In comparison, the control group showed a smaller increase from 68.21 ± 7.02 to 71.18 ± 6.85 , representing an increase of 2.97 points.

Table 2. Changes in Total HBM-Based Health Belief Scores

Group	Pretest, Mean $\pm$ SD	Posttest, Mean $\pm$ SD	Mean change
Intervention	67.43 ± 7.25	83.67 ± 6.14	+16.24
Control	68.21 ± 7.02	71.18 ± 6.85	+2.97

The magnitude of improvement was therefore substantially greater in the intervention group than in the control group. Figure 2 illustrates the changes in total HBM-based health belief scores between the two groups.

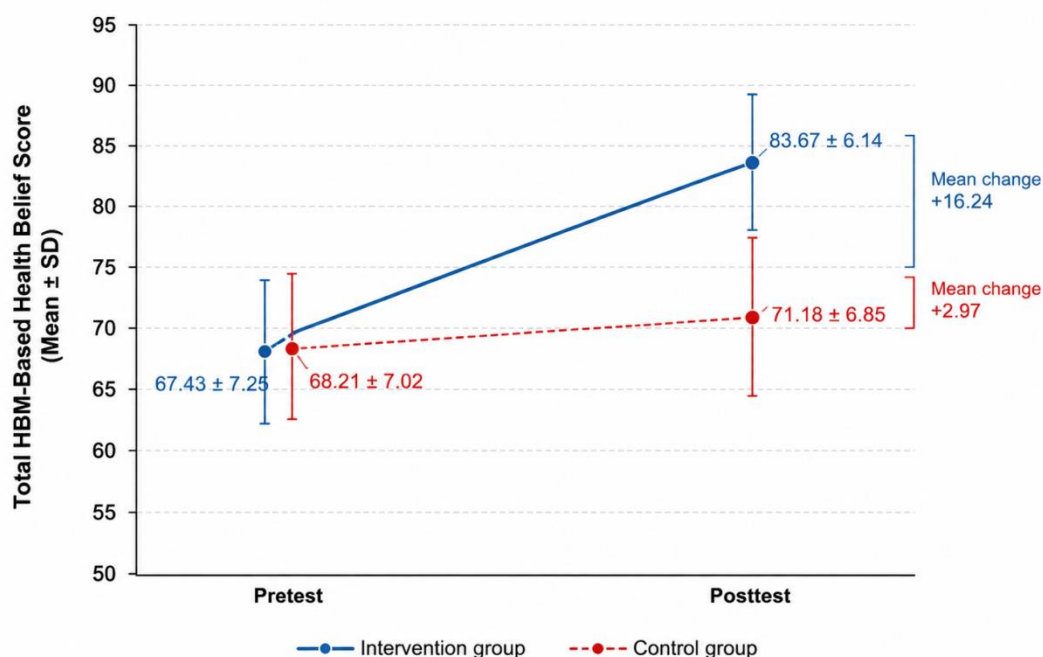


Figure 2. Changes in total HBM-based health belief scores from pretest to posttest

3.3 Changes in Individual HBM Components

Changes in the six HBM components among participants in the intervention group are presented in Table 3. All HBM components demonstrated higher mean scores following the virtual health promotion programme. Perceived susceptibility increased from 10.82 $\pm$ 2.14 to 14.16 $\pm$ 1.73, while perceived severity increased from 10.45 $\pm$ 2.06 to 14.02 $\pm$ 1.61. Perceived benefits increased from 11.63 $\pm$ 1.85 to 15.28 $\pm$ 1.42, and perceived barriers increased from 10.17 $\pm$ 2.21 to 13.54 $\pm$ 1.76. Cues to action increased from 11.24 $\pm$ 1.92 to 14.27 $\pm$ 1.51. The largest absolute improvement was observed for self-efficacy, which increased from 13.12 $\pm$ 2.03 to 17.40 $\pm$ 1.58, representing a mean increase of 4.28 points.

Table 3. Changes in HBM Components in the Intervention Group

HBM component	Pretest, Mean $\pm$ SD	Posttest, Mean $\pm$ SD	Mean change
Perceived susceptibility	10.82 $\pm$ 2.14	14.16 $\pm$ 1.73	+3.34
Perceived severity	10.45 $\pm$ 2.06	14.02 $\pm$ 1.61	+3.57
Perceived benefits	11.63 $\pm$ 1.85	15.28 $\pm$ 1.42	+3.65
Perceived barriers	10.17 $\pm$ 2.21	13.54 $\pm$ 1.76	+3.37
Cues to action	11.24 $\pm$ 1.92	14.27 $\pm$ 1.51	+3.03
Self-efficacy	13.12 $\pm$ 2.03	17.40 $\pm$ 1.58	+4.28

Mean change was calculated as posttest minus pretest.

The findings indicate that improvement occurred across all HBM domains. The greatest improvement was observed in self-efficacy (+4.28 points), followed by perceived benefits (+3.65 points) and perceived severity (+3.57 points). The changes across the six HBM components are illustrated in Figure 3.

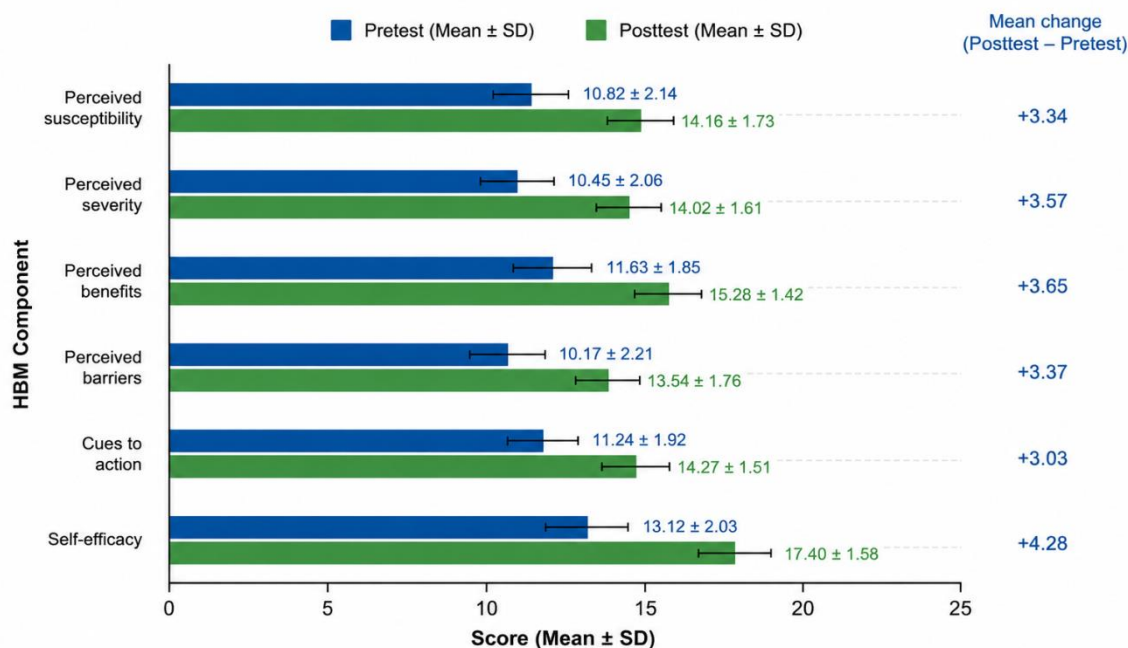


Figure 3. Changes in individual HBM component scores in the intervention group

3.4 Changes in Exclusive Breastfeeding Practices

Exclusive breastfeeding practices were classified as good or poor based on the study assessment criteria. As shown in Table 4, the proportion of participants with good exclusive breastfeeding practices increased substantially in the intervention group, from 14 participants (46.7%) at pretest to 26 (86.7%) at posttest. Conversely, the proportion classified as having poor practices decreased from 16 (53.3%) to 4 (13.3%). A smaller improvement was observed in the control group. The proportion of participants with good exclusive breastfeeding practices increased from 13 (43.3%) at pretest to 17 (56.7%) at posttest, while the proportion with poor practices decreased from 17 (56.7%) to 13 (43.3%).

Table 4. Exclusive Breastfeeding Practices Before and After the Intervention

Exclusive breastfeeding practice	Intervention Pretest, n (%)	Intervention Posttest, n (%)	Control Pretest, n (%)	Control Posttest, n (%)
Good	14 (46.7)	26 (86.7)	13 (43.3)	17 (56.7)
Poor	16 (53.3)	4 (13.3)	17 (56.7)	13 (43.3)
Total	30 (100)	30 (100)	30 (100)	30 (100)

The proportion of participants reporting good exclusive breastfeeding practices therefore increased by 40.0 percentage points in the intervention group, compared with 13.4 percentage points in the control group. Figure 4 presents the distribution of exclusive breastfeeding practices before and after the intervention.

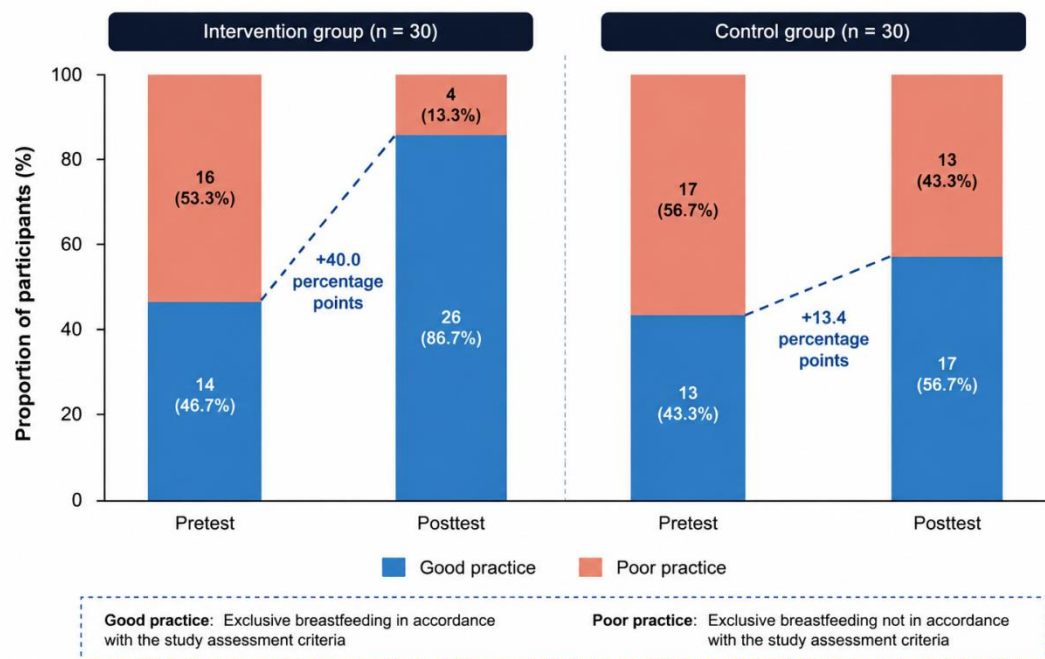


Figure 4. Distribution of good and poor exclusive breastfeeding practices before and after the intervention.

3.5 Test of Data Distribution

The Shapiro–Wilk test was used to assess the distribution of the outcome data. As shown in Table 5, all assessed variables demonstrated p-values below 0.05 at both pretest and posttest, indicating significant departures from normality.

Table 5. Shapiro–Wilk Normality Test

Variable	Group	Pretest p-value	Posttest p-value	Distribution
Total HBM-based health belief score	Intervention	0.032	0.018	Non-normal
Total HBM-based health belief score	Control	0.047	0.029	Non-normal
Exclusive breastfeeding practice	Intervention	0.021	0.014	Non-normal
Exclusive breastfeeding practice	Control	0.036	0.041	Non-normal

Based on these findings, non-parametric statistical procedures were considered appropriate for the analysis of pretest–posttest changes. The Wilcoxon signed-rank test was therefore used to assess within-group changes.

3.6 Effectiveness of the Virtual HBM-Based Health Promotion Programme on Health Beliefs

The effectiveness of the intervention in improving HBM-based health beliefs was assessed by comparing pretest and posttest scores within each group. As shown in Table 6, the intervention group demonstrated a statistically significant increase in total HBM-based health belief scores following the programme ($p < 0.001$). In contrast, the change observed in the control group was not statistically significant ($p = 0.081$).

Table 6. Within-Group Changes in Total HBM-Based Health Belief Scores

Group	Pretest, Mean $\pm$ SD	Posttest, Mean $\pm$ SD	Mean change	p-value
Intervention	67.43 $\pm$ 7.25	83.67 $\pm$ 6.14	+16.24	<0.001
Control	68.21 $\pm$ 7.02	71.18 $\pm$ 6.85	+2.97	0.081

These findings indicate that participants receiving the virtual HBM-based health promotion programme experienced a substantially greater improvement in health belief scores than participants receiving routine health education. However, because the present table reports within-group tests, the statistical significance of the difference in change between groups should be reported only if a specific between-group test of change scores has been conducted.

3.7 Effectiveness of the Virtual HBM-Based Health Promotion Programme on Exclusive Breastfeeding Practices

The distribution of exclusive breastfeeding practices also improved following the intervention. In the intervention group, the proportion of participants classified as having good exclusive breastfeeding practices increased from 46.7% at pretest to 86.7% at posttest. In the control group, the corresponding proportion increased from 43.3% to 56.7%. The intervention group therefore showed a 40.0-percentage-point increase in good exclusive breastfeeding practices, whereas the control group showed a 13.4-percentage-point increase. The available data indicate a more pronounced improvement in the intervention group; however, the statistical significance of the between-group difference should be reported using the appropriate categorical test, such as McNemar's test for within-group paired categorical data and an appropriate between-group comparison of change, if these analyses were performed.

Table 7. Changes in Exclusive Breastfeeding Practices

Group	Good practice at pretest, n (%)	Good practice at posttest, n (%)	Absolute change
Intervention	14 (46.7)	26 (86.7)	+40.0 percentage points
Control	13 (43.3)	17 (56.7)	+13.4 percentage points

Overall, the results demonstrate a consistent pattern favouring the virtual HBM-based health promotion programme. The intervention group showed a marked increase in overall HBM-based health belief scores, improvements across all six HBM components, and a substantial increase in the proportion of participants reporting good exclusive breastfeeding practices. The largest improvement among the HBM components was observed for self-efficacy, suggesting that the programme particularly strengthened mothers' confidence in their ability to maintain exclusive breastfeeding.

3.8 DISCUSSION

Principal Findings

This quasi-experimental study demonstrated that a virtual health promotion programme based on the Health Belief Model (HBM) was associated with substantial improvements in HBM-based health beliefs and exclusive breastfeeding practices among multigravida mothers. The intervention group showed an increase in the total HBM-based health belief score from 67.43 ± 7.25 at pretest to 83.67 ± 6.14 at posttest, representing a mean increase of 16.24 points. In contrast, the control group showed a smaller increase of 2.97 points, from 68.21 ± 7.02 to 71.18 ± 6.85 . The within-group change was statistically significant in the intervention group ($p < 0.001$), whereas the change in the control group was not statistically significant ($p = 0.081$). Improvements were also observed across all six HBM components, with the largest increase occurring in self-efficacy (+4.28 points), followed by perceived benefits (+3.65 points) and perceived severity (+3.57 points).

The improvement in health beliefs was accompanied by a marked improvement in exclusive breastfeeding practices. In the intervention group, the proportion of mothers classified as having good exclusive breastfeeding practices increased from 46.7% at pretest to 86.7% at posttest, whereas the corresponding increase in the control group was smaller, from 43.3% to 56.7%. Taken together, these findings suggest that integrating HBM constructs into a virtually delivered health promotion programme may provide a more comprehensive approach to breastfeeding support than routine health education alone. Importantly, the findings indicate that the intervention was associated not only with changes in mothers' perceptions but also with an improvement in a behaviourally relevant breastfeeding outcome.

Effect of the Intervention on HBM-Based Health Beliefs

The substantial increase in total HBM-based health belief scores in the intervention group may be explained by the theory-driven structure of the programme, which addressed the psychological determinants underlying mothers' decisions and confidence regarding exclusive breastfeeding rather than providing general information alone. The programme incorporated

perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy, thereby addressing multiple stages of health-related decision-making. According to the HBM, health behaviour is influenced by perceptions of susceptibility and severity, expected benefits, perceived barriers, cues to action, and confidence in one's ability to perform the behaviour. In the context of exclusive breastfeeding, mothers may therefore be more likely to initiate and maintain the recommended practice when they understand the consequences of suboptimal feeding, recognize the benefits of exclusive breastfeeding, perceive breastfeeding barriers as manageable, receive appropriate reminders or encouragement, and believe they are capable of breastfeeding successfully. The present findings are consistent with the theoretical proposition that modifying these perceptions may contribute to subsequent behavioural change.

The findings are also consistent with studies [19-21], which identified associations between several HBM constructs including perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action and exclusive breastfeeding behaviour. They are also consistent with studies [22-25], which reported beneficial effects of HBM-oriented education on breastfeeding-related perceptions and behaviours. These findings support theory-based health promotion that targets specific behavioural determinants rather than relying solely on factual information. Importantly, all six HBM components improved in the present study, with the largest increase observed in self-efficacy, suggesting that the programme may have particularly strengthened mothers' confidence in providing exclusive breastfeeding. This is clinically relevant because breastfeeding knowledge does not necessarily translate into successful practice, as mothers may still experience perceived insufficient milk, nipple or breast discomfort, infant attachment difficulties, fatigue, or competing household responsibilities. Addressing these concerns within an HBM framework may therefore help transform breastfeeding information into greater perceived capability and behavioural readiness.

Role of Virtual Health Promotion in Changing Maternal Perceptions

The mode of intervention delivery may also have contributed to the observed improvement. The programme used virtual communication and digital educational materials, allowing mothers to access information without being restricted by the timing and location of face-to-face health services. Videos, educational messages, digital materials, and ongoing communication can provide opportunities for repeated exposure to key breastfeeding messages. Such repetition may be particularly useful when mothers need to recall information while facing breastfeeding-related concerns.

Virtual delivery may also function as a mechanism for reinforcing cues to action. Reminders and ongoing communication can maintain mothers' attention to breastfeeding goals and encourage them to apply previously discussed strategies. In addition, digital communication provides opportunities for clarification and reinforcement when mothers encounter difficulties. Thus, the potential advantage of virtual health promotion may not simply lie in its ability to deliver information, but in its capacity to provide repeated, accessible, and timely reinforcement of behaviour-related messages.

This approach may be particularly relevant in primary healthcare settings, where routine education is often delivered during scheduled encounters [26-28]. Although conventional health education remains important, opportunities for repeated contact may be limited. The present findings suggest that virtual health promotion can complement existing services by extending educational support beyond face-to-face encounters. The preliminary context of this study, in which many mothers reported using WhatsApp and social media for health information, further supports the feasibility of using familiar digital communication channels for breastfeeding promotion.

Effect of the Intervention on Exclusive Breastfeeding Practices

The improvement in exclusive breastfeeding practices provides an important behavioural dimension to the findings. In the intervention group, the proportion of mothers with good breastfeeding practices increased from 46.7% to 86.7%, representing a 40.0-percentage-point increase, whereas the control group showed a substantially smaller increase of 13.4 percentage points. This pattern suggests that the intervention may have helped translate improvements in HBM-based health beliefs into more favourable breastfeeding practices. This relationship can be understood through the interaction of perceived benefits, perceived barriers, cues to action, and self-efficacy. Mothers who recognize the benefits of exclusive breastfeeding may have stronger motivation to maintain the practice, while identifying and managing practical barriers may facilitate implementation. Cues to action may further prompt mothers to convert intentions into action, and self-efficacy may support persistence when breastfeeding becomes challenging.

The observed improvement is consistent with evidence that structured breastfeeding promotion and support can improve breastfeeding outcomes. Studies [29,30] reported beneficial effects of breastfeeding promotion and support interventions, while [31] found that virtual breastfeeding counselling may improve breastfeeding self-efficacy and exclusive breastfeeding. Similarly, studies [32,33] reported potential benefits of video-based breastfeeding support for exclusive breastfeeding and maternal self-efficacy. The present study extends this evidence by combining virtual delivery with an explicit behavioural theory. Unlike approaches that provide digital breastfeeding information without a comprehensive theoretical framework, the present programme organised virtual education and support around the major HBM constructs and psychological factors influencing breastfeeding decisions. This integration may enhance the potential of digital health promotion to translate improvements in maternal perceptions into sustained breastfeeding behaviour.

Why the Intervention May Be Particularly Relevant for Multigravida Mothers

The focus on multigravida mothers is also important. Previous pregnancy and breastfeeding experience may provide mothers with practical knowledge and familiarity with breastfeeding. However, previous experience does not necessarily guarantee successful exclusive breastfeeding in a subsequent pregnancy. Previous breastfeeding experiences may include both positive experiences and unresolved difficulties, such as perceived insufficient milk, pain, infant attachment problems, fatigue, or inadequate family support. Consequently, multigravida mothers may require interventions that do more than repeat basic breastfeeding information.

The present intervention may have been useful because it provided an opportunity to reassess previous perceptions and experiences through the HBM framework. For example, a mother who previously experienced breastfeeding difficulties may perceive barriers as highly likely to recur. Addressing such barriers and providing practical coping strategies may reduce the perceived difficulty of exclusive breastfeeding. Similarly, strengthening self-efficacy may help mothers approach a subsequent breastfeeding experience with greater confidence [34-36]. Therefore, previous breastfeeding experience should not necessarily be regarded as a protective factor; its influence may depend on whether previous experiences were successful, challenging, or inadequately supported.

This finding has implications for individualized nursing education. Rather than assuming that multigravida mothers already possess sufficient breastfeeding knowledge because of previous experience, nurses should assess individual perceptions, previous breastfeeding experiences, perceived barriers, and confidence. An HBM-based assessment may help identify specific areas requiring reinforcement and allow health promotion to be tailored to each mother's needs.

Possible Relationship Between Changes in Health Beliefs and Breastfeeding Practice

The simultaneous improvement in HBM-based health beliefs and exclusive breastfeeding practices suggests a possible behavioural pathway in which changes in maternal perceptions contribute to improved breastfeeding behaviour. The particularly large increase in self-efficacy is noteworthy because confidence in one's ability to perform a behaviour may facilitate persistence when challenges occur. Similarly, increased perceived benefits and reduced or better-managed perceived barriers may strengthen motivation to maintain exclusive breastfeeding [37,40]. However, the present study did not directly test mediation or causal pathways between individual HBM constructs and breastfeeding practices. Therefore, the apparent relationship should be interpreted as a plausible explanatory mechanism rather than as evidence that changes in a specific HBM component directly caused the observed behavioural improvement. Other factors including family support, previous breastfeeding experience, access to healthcare, maternal workload, infant-related factors, and social influences may also have contributed to breastfeeding outcomes.

This distinction is particularly important because exclusive breastfeeding is a complex behaviour that is influenced by factors operating at individual, interpersonal, healthcare, workplace, and community levels. An HBM-based intervention can address important individual-level perceptions and motivation, but it cannot by itself eliminate structural or social barriers to breastfeeding. Consequently, virtual health promotion should be viewed as a complementary component of comprehensive breastfeeding support rather than a substitute for skilled lactation assistance and broader maternal and child health services.

Clinical and Public Health Implications

The findings have several implications for nursing practice and primary healthcare. First, virtual HBM-based health promotion can potentially be incorporated into routine maternal and child health services at primary healthcare facilities.

Existing communication platforms such as WhatsApp can be used to deliver structured educational materials, reminders, and follow-up support without requiring mothers to attend additional face-to-face sessions for every educational contact. Second, the HBM provides a practical framework for nurses to move beyond knowledge-oriented education. Breastfeeding counselling can be structured to assess what mothers believe about breastfeeding risks and benefits, what barriers they anticipate, how confident they feel, and what cues or support they need to maintain the behaviour. This approach may facilitate more individualized and patient-centred health promotion.

Third, the digital format may improve continuity of support. Mothers can review educational materials repeatedly and communicate questions when difficulties arise. Such continuity may be particularly valuable during the transition from pregnancy to breastfeeding, when mothers may encounter rapidly changing needs. Nevertheless, digital interventions should complement rather than replace direct clinical assessment and professional breastfeeding support when mothers experience significant breastfeeding difficulties. From a public health perspective, the intervention may also offer a potentially scalable model for primary healthcare settings. Once standardized educational materials and intervention protocols are developed, digital delivery may allow health workers to reach larger numbers of mothers with relatively flexible scheduling. However, scalability will depend on digital literacy, smartphone ownership, internet access, health-worker capacity, and the quality of ongoing communication.

Strengths and Limitations

This study has several strengths, including its two-group pretest–posttest design, theory-based intervention grounded in the six HBM constructs, and assessment of both health beliefs and exclusive breastfeeding practices. The virtual delivery through WhatsApp also offers flexibility and repeated access to educational materials, while the focus on multigravida mothers addresses a population whose previous breastfeeding experience may not eliminate persistent barriers or low confidence. Several limitations should be considered. The small sample ($n = 60$) and single-site setting may limit generalizability. The quasi-experimental design does not eliminate selection bias or residual confounding, limiting causal interpretation, and blinding was not feasible. Self-reported breastfeeding practices may also be subject to recall or social-desirability bias. In addition, smartphone access, internet connectivity, and digital literacy may have influenced intervention exposure. Finally, the follow-up period was insufficient to determine whether improvements were sustained throughout the recommended six months of exclusive breastfeeding.

Recommendations for Future Research

Future research should involve larger, multicentre samples across different primary healthcare settings to improve external validity. Randomized controlled trials would also be valuable for strengthening causal inference and minimizing selection bias. Longer follow-up extending to six months postpartum is recommended to determine whether improvements in health beliefs and breastfeeding practices are sustained over the full period of exclusive breastfeeding. Future studies should also investigate the mechanisms through which individual HBM components influence breastfeeding behaviour. Mediation analyses could determine whether changes in self-efficacy, perceived benefits, perceived barriers, or cues to action explain the relationship between the intervention and exclusive breastfeeding. Qualitative research could further explore mothers' experiences with virtual breastfeeding support and identify which digital intervention components are perceived as most useful.

In addition, future digital interventions could incorporate husbands or other family members because family support can substantially influence breastfeeding behaviour. Interactive consultation, personalized reminders, peer support, and monitoring of breastfeeding difficulties could also be incorporated into subsequent programme development. Combining virtual HBM-based health promotion with professional lactation support and routine primary healthcare services may provide a more comprehensive model for promoting sustained exclusive breastfeeding.

Overall Interpretation

Overall, the findings indicate that a virtual health promotion programme grounded in the HBM may be a promising strategy for improving maternal health beliefs and exclusive breastfeeding practices among multigravida mothers. The intervention was associated with a 16.24-point increase in total HBM-based health belief scores and a 40.0-percentage-point increase in the proportion of mothers demonstrating good exclusive breastfeeding practices. The greatest improvement among the HBM components occurred in self-efficacy, followed by perceived benefits and perceived severity. These findings support the potential value of combining a theory-driven behavioural approach with accessible digital delivery in primary healthcare.

Nevertheless, the results should be interpreted within the limitations of the quasi-experimental design, small single-site sample, and limited follow-up. The findings provide encouraging evidence for the feasibility and potential effectiveness of virtual HBM-based breastfeeding promotion, but larger randomized and longitudinal studies are needed to establish causal effects and determine whether improvements in maternal beliefs translate into sustained exclusive breastfeeding for the full recommended six-month period.

4. CONCLUSION

This quasi-experimental study showed that a virtual health promotion programme based on the Health Belief Model (HBM) was associated with improvements in health beliefs and exclusive breastfeeding practices among multigravida mothers. The intervention group demonstrated a greater increase in total HBM scores than the control group (16.24 vs. 2.97 points), with improvements across all six HBM constructs, particularly self-efficacy. The proportion of mothers reporting good exclusive breastfeeding practices increased from 46.7% to 86.7% in the intervention group, compared with an increase from 43.3% to 56.7% in the control group.

These findings suggest that integrating HBM-based content with virtual health promotion may be a feasible and flexible approach to strengthening maternal health beliefs and supporting exclusive breastfeeding practices in primary healthcare settings. However, given the quasi-experimental design, small sample size, single-site setting, and limited follow-up, the findings should be interpreted cautiously. Larger multicentre randomized studies with longer follow-up are needed to confirm the effectiveness and sustainability of this approach.

ACKNOWLEDGEMENTS

The authors sincerely thank Puskesmas Medan Tuntungan and all multigravida mothers who participated in this study. The authors also acknowledge all individuals who supported participant recruitment, intervention implementation, data collection, and completion of the study.

AUTHOR CONTRIBUTIONS

All authors contributed substantially to the conception and design of the study, intervention development, data collection, analysis, and interpretation of the findings. All authors contributed to drafting and critically revising the manuscript, approved the final version, and agreed to be accountable for the accuracy and integrity of the work.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

ETHICS STATEMENT

Ethical approval was obtained from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Sriwijaya, with certificate number 063-2026, and written informed consent was obtained from all participants.

DATA AVAILABILITY STATEMENT

The data supporting the findings of this study are available from the corresponding author upon reasonable request. The data are not publicly available to protect participant confidentiality and privacy.

REFERENCES

- [1] J. Abbass-Dick, H. K. Brown, K. T. Jackson, L. Rempel, and C.-L. Dennis, "Perinatal breastfeeding interventions including fathers/partners: A systematic review of the literature," *Midwifery*, vol. 75, pp. 41–51, 2019, doi: 10.1016/j.midw.2019.04.001.
- [2] C. T. Abihail and T. Mahmudiono, "Determinants of exclusive breastfeeding in Indonesia: Evidence from the 2017 Indonesian Demographic Health Survey (IDHS)," *Southeast Asian Journal of Tropical Medicine and Public Health*, vol. 53, pp. 447–463, 2022.
- [3] C. Britton, F. M. McCormick, M. J. Renfrew, A. Wade, and S. E. King, "Support for breastfeeding mothers," *Cochrane Database of Systematic Reviews*, no. 1, Art. no. CD001141, 2007, doi: 10.1002/14651858.CD001141.pub3.

- [4] C. Buckland, D. Hector, G. S. Kolt, P. Fahey, and A. Arora, "Interventions to promote exclusive breastfeeding among young mothers: A systematic review and meta-analysis," *International Breastfeeding Journal*, vol. 15, Art. no. 102, 2020, doi: 10.1186/s13006-020-00340-6.
- [5] E. M. Chetwynd, H. M. Wasser, and C. Poole, "Breastfeeding support interventions by International Board Certified Lactation Consultants: A systematic review and meta-analysis," *Journal of Human Lactation*, vol. 35, no. 3, pp. 424–440, 2019, doi: 10.1177/0890334419851482.
- [6] R. Chipojola, H.-Y. Chiu, M. H. Huda, Y.-M. Lin, and S.-Y. Kuo, "Effectiveness of theory-based educational interventions on breastfeeding self-efficacy and exclusive breastfeeding: A systematic review and meta-analysis," *International Journal of Nursing Studies*, vol. 109, Art. no. 103675, 2020, doi: 10.1016/j.ijnurstu.2020.103675.
- [7] R. Chipojola, M. Khwepeya, K. W. Gondwe, Y. A. Rias, and M. H. Huda, "The influence of breastfeeding promotion programs on exclusive breastfeeding rates in Sub-Saharan Africa: A systematic review and meta-analysis," *Journal of Human Lactation*, vol. 38, no. 3, pp. 466–476, 2022, doi: 10.1177/08903344221097689.
- [8] D. K. Creedy, C.-L. Dennis, R. Blyth, W. Moyle, J. Pratt, and S. M. De Vries, "Psychometric characteristics of the Breastfeeding Self-Efficacy Scale: Data from an Australian sample," *Research in Nursing & Health*, vol. 26, no. 2, pp. 143–152, 2003, doi: 10.1002/nur.10073.
- [9] X. Dai and C.-L. Dennis, "Translation and validation of the Breastfeeding Self-Efficacy Scale into Chinese," *Journal of Midwifery & Women's Health*, vol. 48, no. 5, pp. 350–356, 2003, doi: 10.1016/S1526-9523(03)00283-6.
- [10] P. Davie, J. Chilcot, Y.-S. Chang, S. Norton, L. D. Hughes, and D. Bick, "Effectiveness of social-psychological interventions at promoting breastfeeding initiation, duration and exclusivity: A systematic review and meta-analysis," *Health Psychology Review*, vol. 14, no. 4, pp. 449–485, 2020, doi: 10.1080/17437199.2019.1630293.
- [11] C.-L. Dennis and S. Faux, "Development and psychometric testing of the Breastfeeding Self-Efficacy Scale," *Research in Nursing & Health*, vol. 22, no. 5, pp. 399–409, 1999, doi: 10.1002/(SICI)1098-240X(199910)22:5<399::AID-NUR6>3.0.CO;2-4.
- [12] S. Dib, F. J. Fair, L. J. McCann, A. Nicholls, A. Z. Kalea, H. Soltani, and M. Fewtrell, "Effects of exclusive breastfeeding promotion interventions on child outcomes: A systematic review and meta-analysis," *Annals of Nutrition and Metabolism*, vol. 80, no. 2, pp. 57–73, 2024, doi: 10.1159/000535564.
- [13] H. D. Dodou, R. A. Bezerra, A. F. L. Chaves, C. T. M. Vasconcelos, L. P. Barbosa, and M. O. B. Oriá, "Telephone intervention to promote maternal breastfeeding self-efficacy: Randomized clinical trial," *Revista da Escola de Enfermagem da USP*, vol. 55, Art. no. e20200520, 2021, doi: 10.1590/1980-220X-REEUSP-2020-0520.
- [14] Y. V. Editia, B. Widjanarko, and A. Margawati, "Exclusive breastfeeding behavior analysis based on Health Belief Model: A cross-sectional study," *Jurnal Aisyah: Jurnal Ilmu Kesehatan*, vol. 7, no. S1, pp. 165–172, 2022, doi: 10.30604/jika.v7iS1.1115.
- [15] F. Nisa', N. A. Damayanti, F. Suhariadi, W. Herisanty, and R. K. Afyah, "Internal factors affecting the mother's psychological capital in exclusive breastfeeding during the COVID-19 pandemic," *Journal of Public Health Research*, vol. 11, no. 3, Art. no. 22799036221106619, 2022, doi: 10.1177/22799036221106619.
- [16] F. Z. Karimi, H. Heidarian Miri, T. Khadivzadeh, and N. Maleki-Saghooni, "The effect of mother-infant skin-to-skin contact immediately after birth on exclusive breastfeeding: A systematic review and meta-analysis," *Journal of the Turkish-German Gynecological Association*, vol. 21, no. 1, pp. 46–56, 2020, doi: 10.4274/jtgga.galenos.2019.2018.0138.
- [17] S. K. Kim, S. Park, J. Oh, J. Kim, and S. Ahn, "Interventions promoting exclusive breastfeeding up to six months after birth: A systematic review and meta-analysis of randomized controlled trials," *International Journal of Nursing Studies*, vol. 89, pp. 132–137, 2018, doi: 10.1016/j.ijnurstu.2018.01.004.
- [18] A. G. Koca and M. Yurdakul, "Impact of web based lactation support on exclusive breastfeeding, maternal motivation and breastfeeding challenges: A randomized controlled trial," *BMC Pregnancy and Childbirth*, vol. 26, Art. no. 269, 2026, doi: 10.1186/s12884-026-08662-9.

- [19] J. Landim de Sousa, I. M. Martins, F. X. Vasconcelos, R. C. Torquato, L. de O. C. Lima, N. V. da Silva, M. D. I. S. Arruda, J. M. R. Sales, D. F. de França, R. C. de O. Melo, P. C. de Almeida, and L. P. Barbosa, "Effect of educational program on maternal breastfeeding self-efficacy: A randomized controlled trial," *International Journal of Community Based Nursing and Midwifery*, vol. 13, no. 3, pp. 168–179, 2025, doi: 10.30476/ijcbnm.2025.104707.2660.
- [20] C. Liu, Y. Chen, M. Pan, X. Lu, X. Hu, Z. Lin, and X. Chen, "Effects of different digital interventions on breastfeeding outcomes: A systematic review and network meta-analysis," *Nutrition Reviews*, vol. 84, no. 7, pp. 1325–1334, 2026, doi: 10.1093/nutrit/nuaf146.
- [21] K. Y. W. Lok, C. H. L. Ip, Y. Dai, Y. F. Chan, M. S. L. Choi, C. Lam, S. K. Wong, L. F. Ho, P. H. Chau, Y.-S. Chang, and D. Bick, "Video-based peer support and exclusive breastfeeding and maternal self-efficacy: A randomized clinical trial," *JAMA Network Open*, vol. 9, no. 5, Art. no. e2614490, 2026, doi: 10.1001/jamanetworkopen.2026.14490.
- [22] A. McFadden, A. Gavine, M. J. Renfrew, A. Wade, P. Buchanan, J. L. Taylor, E. Veitch, A. M. Rennie, S. A. Crowther, S. Neiman, and S. MacGillivray, "Support for healthy breastfeeding mothers with healthy term babies," *Cochrane Database of Systematic Reviews*, no. 2, Art. no. CD001141, 2017, doi: 10.1002/14651858.CD001141.pub5.
- [23] S. A. Nugraheni, S. Sulistiwati, S. Suyatno, E. Sulistyowati, M. I. Kartasurya, and N. Nandini, "Effect of short course on the knowledge and practice of housewives peer group activists as assistance to lactating mothers in providing exclusive breastfeeding," *International Journal of Preventive Medicine*, vol. 13, no. 1, Art. no. 119, 2022, doi: 10.4103/ijpvm.IJPPVM_57_20.
- [24] N. Nurani, T. Wibowo, R. Susilowati, J. Hastuti, M. Julia, and M. M. Van Weissenbruch, "Growth of exclusively breastfed small for gestational age term infants in the first six months of life: A prospective cohort study," *BMC Pediatrics*, vol. 22, Art. no. 73, 2022, doi: 10.1186/s12887-021-03080-6.
- [25] D. S. Patil, P. Pundir, V. S. Dhyani, J. B. Krishnan, S. S. Parsekar, S. M. D'Souza, N. Ravishankar, and V. Renjith, "A mixed-methods systematic review on barriers to exclusive breastfeeding," *Nutrition and Health*, vol. 26, no. 4, pp. 323–346, 2020, doi: 10.1177/0260106020942967.
- [26] D. Puharić, M. Malički, J. A. Borovac, V. Šparac, B. Poljak, N. Aračić, N. Marinović, N. Luetić, and I. Zakarija-Grković, "The effect of a combined intervention on exclusive breastfeeding in primiparas: A randomised controlled trial," *Maternal & Child Nutrition*, vol. 16, no. 3, Art. no. e12948, 2020, doi: 10.1111/mcn.12948.
- [27] M. A. Quigley and C. Carson, "Breastfeeding in the 21st century," *The Lancet*, vol. 387, no. 10033, pp. 2087–2088, 2016, doi: 10.1016/S0140-6736(16)30534-7.
- [28] N. C. Rollins, N. Bhandari, N. Hajeerhoy, S. Horton, C. K. Lutter, J. C. Martines, E. G. Piwoz, L. M. Richter, and C. G. Victora, "Why invest, and what it will take to improve breastfeeding practices?" *The Lancet*, vol. 387, no. 10017, pp. 491–504, 2016, doi: 10.1016/S0140-6736(15)01044-2.
- [29] I. M. Rosenstock, V. J. Strecher, and M. H. Becker, "Social learning theory and the Health Belief Model," *Health Education Quarterly*, vol. 15, no. 2, pp. 175–183, 1988, doi: 10.1177/109019818801500203.
- [30] N. Safaah, E. Yunitasari, B. Prasetyo, M. Triharini, and P. Feriani, "Enhancing maternal role achievement and breastfeeding success through health belief model intervention," *Healthcare in Low-resource Settings*, vol. 12, no. 1, Art. no. 11941, 2024, doi: 10.4081/hls.2024.11941.
- [31] R. N. Siregar, N. Br. Brahmana, and J. Aritonang, "Effectiveness of peer counseling education using the Health Belief Model approach to the success of exclusive breastfeeding," *Jurnal Mutiara Ners*, vol. 7, no. 1, pp. 62–67, 2024, doi: 10.51544/jmn.v7i1.4792.
- [32] E. F. C. Souza, A. A. Pina-Oliveira, and A. K. K. Shimo, "Effect of a breastfeeding educational intervention: A randomized controlled trial," *Revista Latino-Americana de Enfermagem*, vol. 28, Art. no. e3335, 2020, doi: 10.1590/1518-8345.3081.3335.

- [33] Z. Syafitri, N. A. Fajar, M. C. Munadi, E. S. Ananingsih, and M. V. I. Winta, “Analysis of perceived vulnerability based on the Health Belief Model theory toward exclusive breastfeeding in stunting prevention efforts,” *Biomedika*, vol. 16, no. 1, pp. 11–17, 2024, doi: 10.23917/biomedika.v16i1.3758.
- [34] W. Triadmajani, S. Prawitasari, and A. Wahab, “Role of proper postnatal care in continued exclusive breastfeeding among young Indonesian mothers,” *Clinical and Experimental Pediatrics*, vol. 67, no. 12, pp. 686–693, 2024, doi: 10.3345/cep.2024.00815.
- [35] J.-F. Tseng, S.-R. Chen, H.-K. Au, R. Chipojola, G. T. Lee, P.-H. Lee, M.-L. Shyu, and S.-Y. Kuo, “Effectiveness of an integrated breastfeeding education program to improve self-efficacy and exclusive breastfeeding rate: A single-blind, randomised controlled study,” *International Journal of Nursing Studies*, vol. 111, Art. no. 103770, 2020, doi: 10.1016/j.ijnurstu.2020.103770.
- [36] C. G. Victora, R. Bahl, A. J. D. Barros, G. V. A. França, S. Horton, J. Krasevec, S. Murch, M. J. Sankar, N. Walker, and N. C. Rollins, “Breastfeeding in the 21st century: Epidemiology, mechanisms, and lifelong effect,” *The Lancet*, vol. 387, no. 10017, pp. 475–490, 2016, doi: 10.1016/S0140-6736(15)01024-7.
- [37] World Health Organization, “Exclusive breastfeeding for optimal growth, development and health of infants,” WHO, Geneva, Switzerland, 2023. [Online]. Available: <https://www.who.int/tools/elena/interventions/exclusive-breastfeeding>
- [38] World Health Organization, *WHO Guideline for Complementary Feeding of Infants and Young Children 6–23 Months of Age*. Geneva, Switzerland: World Health Organization, 2023, doi: 10.1016/j.ijnurstu.2020.103770.
- [39] World Health Organization, “Breastfeeding,” WHO, Geneva, Switzerland, 2025. [Online]. Available: <https://www.who.int/health-topics/breastfeeding>
- [40] World Health Organization and United Nations Children's Fund, *Protecting, Promoting and Supporting Breastfeeding in Facilities Providing Maternity and Newborn Services: The Revised Baby-friendly Hospital Initiative 2018 Implementation Guidance*. Geneva, Switzerland: World Health Organization, 2018, ISBN: 978-92-4-151380-7.