

## RESEARCH STUDY

English Version

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# Effectiveness of an E-booklet on Exclusive Breastfeeding in Enhancing Knowledge and Attitudes of Third-Trimester Pregnant Women

## Efektivitas E-booklet Tentang ASI Eksklusif dalam Peningkatan Pengetahuan dan Sikap Ibu Hamil Trimester III

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**ABSTRACT**

**Background:** Knowledge and attitudes of third-trimester pregnant women significantly affect the success of exclusive breastfeeding. This period is critical for mothers to prepare for childbirth, including understanding infant nutrition. Enhancing knowledge and attitudes requires effective media aligned with technological advancements, such as an E-booklet.

**Objectives:** To evaluate the impact of an E-booklet on exclusive breastfeeding in enhancing the knowledge and attitudes of third-trimester pregnant women in the Tuntungan Health Center area.

**Methods:** This quasi-experimental study used a pre-test and post-test design with a control group. A total of 60 third-trimester pregnant women (30 in the experimental group and 30 in the control group) were chosen through purposive sampling. The intervention consisted of distributing an E-booklet over a two-week period. Changes in knowledge and attitudes were evaluated using the Wilcoxon and Mann-Whitney tests.

**Results:** Most participants in both groups were aged 20–25 years (50.0% and 56.7%), had higher education (73.3% and 70.0%), parity ≤2 (63.3% and 66.7%), were unemployed (63.3% and 56.7%), and had high incomes (60.0% and 56.7%). The experimental group showed a mean knowledge score increase of 5.70 (SD=2.57) compared to 0.86 (SD=1.37) in the control group. Attitude scores increased by 8.87 (SD=3.37) in the experimental group compared to 1.43 (SD=3.65) in the control group. Mann-Whitney analysis indicated that the E-booklet significantly improved knowledge and attitudes (p-value=0.001).

**Conclusions:** The E-booklet effectively enhanced the knowledge and attitudes of third-trimester pregnant women regarding exclusive breastfeeding. It is a promising educational tool to promote exclusive breastfeeding in communities.

**INTRODUCTION**

Breast milk, commonly referred to as ASI, serves as the main source of nutrition for every baby from birth until the age of two years. Exclusive breastfeeding is recommended from the first day of birth until the baby is six months old, without the addition of any other foods or drinks<sup>1</sup>. Breast milk can be given directly or through other methods, except in specific conditions requiring the administration of medication or vitamins<sup>2</sup>. Breast milk offers irreplaceable benefits for supporting a baby's growth and development. Its bioactive components help protect babies from infections, strengthen the immune system, and support the development of their organs<sup>3</sup>. In addition to being a nutritional source, breast milk plays a

vital role in boosting immunity, enhancing intelligence, and fostering a strong emotional bond between mother and baby<sup>4</sup>. Babies who are breastfed not only achieve optimal physical health but also experience better emotional, social, and spiritual development<sup>5</sup>. The nutrients in breast milk are essential for brain development and provide all the necessary components such as proteins, fats (lipids), vitamins, and minerals tailored to a baby's needs at every stage of growth. Furthermore, breast milk is easily digestible by a baby's digestive system, reducing the risk of colic and constipation, and contains natural probiotics that help maintain digestive health<sup>6</sup>.

According to the 2018 Basic Health Research (RISKESDAS) report, the percentage of infants receiving exclusive breastfeeding in Indonesia remained low at only 37.3%<sup>7</sup>. On the other hand, the 2022 Indonesia Health Profile showed an increase in exclusive breastfeeding coverage, reaching 61.5%. Although this figure signifies advancement compared to the prior data, numerous provinces still lag behind the national target of 45.0%. Nine provinces recorded exclusive breastfeeding rates below the national target, one of which is North Sumatra Province (44.5%). A primary cause is the lack of education and awareness among mothers regarding the importance of exclusive breastfeeding. Mothers who must return to work shortly after childbirth often lack the opportunity to sustain exclusive breastfeeding. Many of them work in informal sectors that do not provide maternity leave or breastfeeding facilities in the workplace, leading them to replace breast milk with formula milk or other foods<sup>12,13</sup>.

Several external factors influence a mother's decision not to breastfeed exclusively. The formula milk industry has a significant impact in some countries, where aggressive marketing creates the perception that formula is a modern or superior alternative to breast milk<sup>14,15</sup>. Limited support from healthcare systems, particularly in areas with restricted access to health services, is another major barrier<sup>16</sup>. The lack of family and social support also plays a critical role, as mothers' decisions to breastfeed exclusively are often not encouraged by their immediate environment<sup>17,18</sup>. Studies have shown that knowledge, attitude, and education levels are closely tied to exclusive breastfeeding practices<sup>19</sup>. Research in Aceh Province further highlights that knowledge is a key factor in breastfeeding success<sup>20</sup>. Educating mothers during the third trimester of pregnancy is vital to ensure the success of exclusive breastfeeding. At this stage, mothers are preparing for childbirth, learning how to care for their babies, and provide proper nutrition. This period is essential for building awareness of breastfeeding benefits, fostering commitment to exclusive breastfeeding, and planning the necessary logistical and social support. Engaging with partners, family, or healthcare professionals during this time can ensure mothers receive the encouragement and assistance they need to breastfeed effectively after delivery<sup>21,22,23</sup>.

A mother's knowledge and attitude can be improved through effectively designed health education programs. Choosing the right medium is crucial to ensure health messages are easily understood, particularly by third-trimester pregnant women. In today's modern era, information technology is rapidly advancing, driven by society's growing need for access to communication and information across all age groups. One innovative tool that can be utilized is an e-booklet, a digital medium that functions as an electronic booklet. An e-booklet on exclusive breastfeeding has the potential to assist third-trimester pregnant women in improving their understanding and cultivating a positive attitude towards the significance of exclusive breastfeeding, particularly in the digital age. This platform enables mothers to conveniently and promptly access information via electronic devices, offering a practical solution for individuals with restricted access to healthcare facilities.

By utilizing an e-booklet, mothers can acquire valuable information regarding the advantages of exclusive breastfeeding for both mother and baby, correct breastfeeding techniques, strategies to address breastfeeding challenges, and tips for enhancing milk production. The content is delivered in an interactive and engaging format, integrating visuals like images and infographics. This method enhances the material's comprehensibility and retention compared to traditional printed brochures. The visually attractive presentation is especially advantageous for individuals unaccustomed to reading lengthy text. By adopting this method, e-booklets aim not only to increase knowledge but also to foster a more supportive attitude toward exclusive breastfeeding among mothers<sup>24,25</sup>.

The exclusive breastfeeding e-booklet provides the benefit of prompt and pertinent information updates. With the evolution of health and breastfeeding knowledge, the e-booklet can be consistently updated to guarantee mothers have access to the most recent information and practical advice. This assists in offering current advice on infant nutrition, breastfeeding techniques, and strategies to tackle challenges during breastfeeding. The e-booklet can cater to various groups, including working mothers, individuals with restricted healthcare access, and even family members who wish to support breastfeeding efforts. By fostering awareness and a supportive environment, the e-booklet aims to enhance the success of exclusive breastfeeding<sup>26,27</sup>. In North Sumatra, the coverage of exclusive breastfeeding has yet to meet national targets, with one major contributing factor being a lack of understanding and supportive attitudes toward exclusive breastfeeding. Studies have shown a significant correlation between mothers' knowledge and attitudes and their success in exclusively breastfeeding infants aged 0–6 months<sup>28-29</sup>. Interviews with Maternal and Child Health (MCH) officers and nutritionists at the Tuntungan Public Health Center, Pancur Batu District, reveal that exclusive breastfeeding practices in the area remain suboptimal, likely due to low knowledge and insufficient positive attitudes among mothers. To address this, an e-booklet was designed as an educational tool to improve the knowledge and attitudes of third-trimester pregnant women. This study aims to evaluate the effectiveness of the e-booklet in improving the knowledge and attitudes of third-trimester pregnant women regarding exclusive breastfeeding in the operational area of Tuntungan Public Health Center, Pancur Batu District.

## METHODS

This study utilized a quasi-experimental design incorporating pre-test and post-test assessments with control group approach. The participants included third-trimester pregnant women registered in the cohort book of Tuntungan Community Health Center, totaling 83 individuals. The participants included third-trimester pregnant women registered in the cohort book of Tuntungan Community Health Center, totaling 83 individuals. The sample was selected using purposive sampling based on specific inclusion and exclusion criteria. The inclusion criteria included third-trimester pregnant women who owned a smartphone with

WhatsApp access, were able to read, and resided in the Tuntungan Community Health Center working area. The exclusion criteria encompassed participants who withdrew during the study or failed to complete the questionnaire. A total of 60 respondents met the criteria and were divided into two groups. The first group was the experimental or intervention group, consisting of 30 participants who were provided with an e-booklet on exclusive breastfeeding to review over two weeks. The second group was the control group, also comprising 30 participants, who did not receive the e-booklet but underwent measurements at the same intervals as the experimental group. Respondents were allocated to the groups based on their sequential registration numbers: numbers 1–30 for the experimental group and numbers 31–60 for the control group. Data were collected to evaluate the effectiveness of the e-booklet in improving the knowledge and attitudes of third-trimester pregnant women regarding exclusive breastfeeding in the Tuntungan Community Health Center area. This study was approved by the Ethics Committee of the Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara, under approval number 1282/KEPK/FKUMSU/2024, dated September 2, 2024.

The instruments used in this study included an e-booklet and a questionnaire. The experimental group received the e-booklet after completing the pre-test questionnaire. The e-booklet was designed to be easily read and understood by the respondents, containing 14 topics related to exclusive breastfeeding. These topics covered the definition of exclusive breastfeeding, its importance, the benefits of breastfeeding for both mothers and babies, guidelines on proper techniques and timing, common myths and facts, and other information supporting a comprehensive understanding of exclusive breastfeeding.

The questionnaire used in this study was adapted from a validated instrument from previous research to ensure accuracy and reliability<sup>30</sup>. It was utilized to collect pre-test and post-test data on mothers' knowledge and attitudes regarding exclusive breastfeeding before and after receiving the e-booklet. The questionnaire consisted of three main sections: respondent characteristics, knowledge of exclusive breastfeeding, and attitudes toward exclusive breastfeeding. The respondent characteristics section gathered information such as name, age, address, pregnancy status, education level, occupation, and income. The attitude section comprised 15 statements evaluated using a Likert scale, with options ranging from strongly agree (score 4), agree (score 3), disagree (score 2), to strongly disagree (score 1). The total attitude score ranged from 15 to 60, classified into two categories: negative (<50) and positive (>50). This instrument was used to evaluate the impact of the e-booklet on changes in the knowledge and attitudes of third-trimester pregnant women regarding exclusive breastfeeding.

The research implementation process started with an explanation of the study's objectives and procedures, followed by respondents signing an informed consent form. The second stage involved all respondents completing the pre-test questionnaire. The third stage involved distributing the e-booklet to the

experimental group, while the control group did not receive it. Participants in the experimental group had two weeks to read and comprehend the e-booklet's contents. The final stage included all participants completing the post-test questionnaire. Post-test data were gathered two weeks after the e-booklet was given to the experimental group. For the control group (who did not receive the e-booklet), data collection also occurred twice—pre-test and post-test—with the same two-week interval as the experimental group.

Data was collected through direct interviews with respondents and by administering questionnaires designed to assess mothers' knowledge and attitudes about exclusive breastfeeding. Univariate analysis was performed to depict the distribution and frequency of the study variables. In bivariate analysis, the Wilcoxon test was used to detect variations in participants' knowledge and attitudes concerning exclusive breastfeeding between the experimental and control groups pre and post the e-booklet intervention. Furthermore, the Mann-Whitney test was employed to assess the effect of the e-booklet intervention on improving knowledge and attitudes in both groups.

## RESULTS AND DISCUSSIONS

Table 1 presents the characteristics of the study respondents, including age (<20 years, 20–35 years, and >35 years), education level (low education: elementary and junior high school graduates; high education: senior high school and college graduates)<sup>31</sup>, number of children (parity ≤2 and >2), employment status (unemployed/housewife and employed), and family income categorized based on the Deli Serdang Regency Minimum Wage (low: <Rp3,505,076; high: ≥Rp3,505,076). Univariate analysis revealed that in the experimental group, the majority of third-trimester pregnant women were aged 20–35 years, totaling 15 participants (50.0%). Similarly, in the control group, the majority of respondents also belonged to the 20–35 age category, comprising 17 participants (56.7%). The age range of 20–35 years is often considered ideal for pregnancy and childbirth, representing the peak reproductive years. Women in this age group generally have optimal physical conditions for breastfeeding and greater psychological readiness to embrace their role as mothers. Emotional and physical stability in this age range also significantly contributes to the success of exclusive breastfeeding<sup>32</sup>. These findings align with research by Assriyah et al. (2020), which reported that the majority of respondents in their study, totaling 74 participants (77.9%), were also in the 20–35 age range<sup>33</sup>.

The results of this study indicate that in the experimental group, the majority of third-trimester pregnant women had a high level of education, with 22 participants (73.3%). A similar trend was observed in the control group, where the majority also had a high educational background, totaling 21 participants (70.0%). Education plays a critical role in shaping mothers' understanding of the benefits of exclusive breastfeeding, raising awareness of proper breastfeeding practices, and influencing their decision to provide exclusive breastfeeding during the first six months of an infant's life. Mothers with higher education levels typically have

better access to information about exclusive breastfeeding<sup>34</sup>. Furthermore, higher education is often associated with the ability to comprehend and apply complex health information. Educated mothers are more likely to recognize the importance of exclusive breastfeeding in supporting the health and growth of their babies. Education also provides insight into the long-term benefits of breastfeeding, such as reducing the risk of diseases in infants and strengthening the psychological bond between mother and child. Moreover, education helps mothers understand and follow global health organization recommendations, such as those from WHO and UNICEF, which advocate for exclusive breastfeeding during the first six months<sup>35</sup>. Other studies also highlight that mothers with higher education levels are more aware of the benefits of exclusive breastfeeding, including enhancing the baby's immune system, supporting optimal growth, and reducing the risk of infections<sup>36</sup>.

The study results revealed that in the experimental group, most third-trimester pregnant women had a parity of  $\leq 2$  children, totaling 19 participants (63.3%). A similar condition was observed in the control group, where the majority of respondents also had a parity of  $\leq 2$  children, with 20 participants (66.7%). Mothers with previous childbirth experience or at least one child are generally more confident in providing exclusive breastfeeding. Their prior experience equips them with a better understanding of proper breastfeeding techniques and the ability to address challenges such as latching difficulties or issues with milk production<sup>37</sup>.

This study showed that the majority of third-trimester pregnant women in the experimental group were unemployed and chose to be homemakers, totaling 19 participants (63.3%). A similar trend was observed in the control group, where most respondents were also unemployed and opted to be homemakers, with 17 participants (56.7%). Working mothers frequently encounter time constraints that restrict their capacity to

breastfeed directly. Insufficient provision of time and space for pumping breast milk in workplaces can impede the achievement of exclusive breastfeeding. Moreover, work-related stress can affect milk production. Mothers experiencing stress or feeling overwhelmed at work may encounter decreased milk supply, thereby impacting their capability to offer exclusive breastfeeding. The decision to work or not is an important consideration for mothers striving to achieve exclusive breastfeeding<sup>19</sup>.

Family income is a key factor influencing the success of exclusive breastfeeding. The study revealed that the majority of mothers in the experimental group belonged to high-income families, comprising 18 participants (60.0%). A comparable situation was noted in the control group, with 17 participants (56.7%) falling within the same income bracket. Family income levels play a significant role in dietary patterns and access to nutritious foods. Breastfeeding mothers from high-income families typically have improved access to quality nutrition, thereby enhancing the quality of breast milk. In contrast, mothers from low-income families may face challenges in acquiring the necessary healthy foods to sustain optimal milk production. Financial pressures in low-income households may lead mothers to opt for alternatives such as formula milk, seen as more convenient despite being costlier in the long term. Work environments and family economics also have vital roles to play. Mothers from high-income families frequently have more flexible employment or the option to take extended maternity leave, granting them additional time to exclusively breastfeed their infants. Certain high-income mothers may work from home or have sufficient childcare assistance, allowing them to sustain breastfeeding. Contrastingly, mothers from low-income families may need to return to work sooner, frequently in environments that do not facilitate breastfeeding, due to factors like insufficient time and designated spaces for nursing or pumping at work. These conditions make them more likely to switch to formula milk or introduce complementary foods earlier<sup>38,39</sup>.

**Table 1.** Frequency Distribution of Respondents' Characteristics

Characteristics	Eksperimental Group (n=30)		Control Group(n=30)	
	n	%	n	%
<b>Age</b>				
<20 years old	4	13.3	5	16.7
20-35 years old	15	50.0	17	56.7
>35 years old	11	36.7	8	26.7
<b>Education</b>				
Low (elementary, junior high)	8	26.7	9	30.0
Tinggi (senior high, college graduate)	22	73.3	21	70.0
<b>Parity</b>				
$\leq 2$ people	19	63.3	20	66.7
>2 people	11	36.7	10	33.3
<b>Occupation</b>				
Not work	19	63.3	17	56.7
Work	11	36.7	13	43.3
<b>Family Income</b>				
Low (<District minimum wage Rp.3.505.076)	12	40.0	13	43.3
High ( $\geq$ District minimum wage Rp.3.505.076)	18	60.0	17	56.7

The knowledge of respondents, specifically third-trimester pregnant women, regarding exclusive breastfeeding in the working area of Tuntungan Public Health Center, Pancur Batu District, demonstrated a significant difference between the experimental group, which received the intervention, and the control group. Before the intervention, which involved the use of an exclusive breastfeeding e-booklet, the majority of mothers in the experimental group had low knowledge levels, with 16 individuals (53.3%). After receiving the intervention, the majority experienced an improvement, reaching the category of good knowledge, with 24 individuals (80.0%). In contrast, in the control group, before the intervention, 15 individuals (50.0%) had low knowledge levels. However, after the final measurement, most mothers in this group improved to a moderate knowledge level, with 13 individuals (43.3%). Overall, the initial knowledge levels in both groups were relatively similar, but the intervention using the exclusive breastfeeding e-booklet led to a significant improvement in the experimental group, while the control group only

experienced an improvement to a moderate level.

The assessment of the attitudes of pregnant women also showed differences between the experimental group, which received the intervention, and the control group. In the experimental group, prior to the intervention with the exclusive breastfeeding e-booklet, most mothers exhibited negative attitudes, with 24 individuals (80.0%). Following the intervention, a notable enhancement in positive attitudes was observed, with 27 individuals (90.0%) displaying these attitudes. In contrast, the control group initially had 23 individuals (76.7%) with negative attitudes. Despite a decrease in numbers after the final measurement, the majority in this group still maintained negative attitudes, with 18 individuals (60.0%). Initially, the number of mothers with positive and negative attitudes was almost equal in both groups before the intervention. However, after the intervention, the experimental group showed significant improvement with an increase in positive attitudes, whereas the control group remained predominantly characterized by negative attitudes.

**Table 2.** Level of Knowledge and Attitude of Respondents Before and After Intervention (Using E-booklet)

Variable	Eksperimental Group (n=30)				Control Group (n=30)			
	Before Intervention		After Intervention		Before Intervention		After Intervention	
	n	%	n	%	n	%	n	%
<b>Knowledge Level</b>								
Low	16	53.3	1	3.3	15	50.0	11	36.7
Moderate	11	36.7	5	16.7	11	36.7	13	43.3
Good	3	10.0	24	80.0	4	13.3	6	20.0
<b>Attitude</b>								
Negative	24	80.0	3	10.0	23	76.7	18	60.0
Positive	6	20.0	27	90.0	7	23.3	12	40.0

In the experimental group, the average knowledge score increased significantly from  $10.93 \pm 2.42$  before the intervention to  $16.63 \pm 1.82$  after the exclusive breastfeeding e-booklet was introduced, with a mean improvement of  $5.70 \pm 2.57$ . In contrast, the control group showed only a slight increase, from  $10.86 \pm 2.41$  to  $11.72 \pm 1.88$ , with an improvement of  $0.86 \pm 1.37$ . Normality tests indicated that the experimental group data were not normally distributed, so the Wilcoxon test was applied. The results showed a significant difference

in the experimental group's scores before and after the intervention ( $p$ -value = 0.001), whereas no significant change was observed in the control group ( $p$ -value = 0.201). A Mann-Whitney test further confirmed a significant difference in knowledge improvement between the two groups ( $p$ -value = 0.001), demonstrating the effectiveness of the exclusive breastfeeding e-booklet in enhancing the knowledge of third-trimester pregnant women.

**Table 3.** The Influence of E-booklets on Increasing Pregnant Women's Knowledge About Exclusive Breastfeeding

Knowledge Score	Eksperimental Group (n=30)		Control Group (n=30)	
	Mean±SD	p-value	Mean±SD	p-value
Before	10.93±2.42	0.001	11.27±2.79	0.201
After	16.63±1.82		11.87±2.53	
Δ Knowledge	5.70±2.57		0.86±1.37	
p-value Δ knowledge				0.001

In the experimental group, the average attitude score significantly increased from  $46.33 \pm 3.96$  before the exclusive breastfeeding e-booklet intervention to  $55.20 \pm 2.64$  afterward, with a mean improvement of  $8.87 \pm 3.37$ . In contrast, the control group only showed a slight increase, with an average improvement of  $1.43 \pm 3.65$ . Data normality tests indicated that the attitude scores in the experimental group were not normally distributed

before and after the intervention, leading to the use of the Wilcoxon test. The Wilcoxon test revealed a significant improvement in the experimental group's attitude scores ( $p$ -value = 0.001), while no significant change was observed in the control group ( $p$ -value = 0.084). A Mann-Whitney test further confirmed a significant difference in attitude improvement between the two groups ( $p$ -value = 0.001). These findings validate

the effectiveness of the exclusive breastfeeding e-booklet in improving the attitudes of third-trimester pregnant women.

**Table 4.** The Influence of E-booklets on Improving Pregnant Women's Attitudes Regarding Exclusive Breastfeeding

Attitude Score	Experimental Group (n=20)		Control Group (n=20)	
	Mean±SD	p-value	Mean±SD	p-value
Before	46.33±3.96	0.001	47.33±3.23	0.084
After	55.20±2.64		48.77±3.68	
Δ Attitude	8.87±3.37		1.43±3.65	
p-value Attitude				0.001

The use of an e-booklet as an educational tool has proven to be an effective approach for enhancing the understanding of exclusive breastfeeding among third-trimester pregnant women. Exclusive breastfeeding, which involves providing only breast milk to infants during the first six months without any additional food or drink, plays a vital role in supporting infant growth and development. However, many mothers still lack knowledge about the benefits of exclusive breastfeeding, proper feeding techniques, and its impact on maternal and infant health. In this context, the e-booklet serves as an informative resource to address these knowledge gaps. The findings of this study align with those of Dewi et al. (2022), which reported a significant difference in knowledge improvement between an experimental group receiving the exclusive breastfeeding e-booklet and a control group. The experimental group showed an average knowledge increase of 21.09, compared to only 13.91 in the control group. With a significance value of 0.032, the study demonstrated that the e-booklet is effective in improving the knowledge of third-trimester pregnant women at Wirobrajan Public Health Center<sup>40</sup>.

The e-booklet provides comprehensive and structured information, offering clear insights into various aspects of exclusive breastfeeding. Designed with concise content, it effectively explains the importance of exclusive breastfeeding, proper techniques, and the long-term benefits for both mothers and babies. As a practical digital medium, the e-booklet combines an engaging layout with accessible language, making it easier for readers to understand complex information that might be less digestible through traditional formats such as brief brochures or posters. The e-booklet delves deeper into the benefits of exclusive breastfeeding, such as strengthening an infant's immune system, protecting against respiratory and digestive infections, and enhancing cognitive development. For mothers, it highlights how exclusive breastfeeding aids postpartum recovery, reduces the risk of breast and ovarian cancers, and supports weight loss. Thus, the e-booklet provides more detailed and comprehensive information compared to traditional media<sup>41</sup>.

One of the main advantages of the e-booklet is its accessibility. Presented in a digital format, it can be accessed anytime and anywhere through various devices such as smartphones, tablets, or computers. This allows information about exclusive breastfeeding to be disseminated more widely and quickly compared to printed media. In today's digital era, many mothers, especially those in urban areas, frequently use digital devices to seek information. As a result, using an e-

booklet is more effective in reaching a broader target audience. The e-booklet also enables readers to access information independently. Mothers can download the e-booklet and read it at their convenience without relying on face-to-face educational sessions, which might be constrained by time and location. This is especially beneficial for mothers who may find it challenging to attend lactation classes or health seminars, as they can still access equally comprehensive information through the e-booklet. This feature is especially helpful for busy mothers or those with limited time<sup>24</sup>.

The e-booklet provides greater potential for interactivity compared to brochures or printed books. It can include video tutorials, infographics, animations, or direct links to additional resources, offering readers a better understanding of breastfeeding techniques, lactation problem management, and dietary tips to maintain optimal breast milk quality. This multimedia approach enhances engagement and reduces monotony in learning. Moreover, the e-booklet can include quizzes or short knowledge tests to assist mothers in evaluating their comprehension of exclusive breastfeeding. If gaps are identified, mothers can easily revisit pertinent information. It can be produced at a relatively low cost while reaching a broad audience. This makes it an ideal tool for promoting exclusive breastfeeding education, especially for health organizations or NGOs working in maternal and child health with limited budgets<sup>43</sup>.

With its wider distribution, the e-booklet can also reach mothers in remote areas who may have restricted access to healthcare services or educational seminars on exclusive breastfeeding. They can download or receive the e-booklet via the internet and access the same high-quality information accessible to mothers in urban areas. In this context, the e-booklet not only helps improve knowledge but also reduces the information gap between different community groups<sup>41</sup>.

Besides enhancing knowledge, the e-booklet can also impact mothers' attitudes and behaviors regarding exclusive breastfeeding. Clear information and engaging visual aids motivate mothers to practice exclusive breastfeeding and comprehend the significance of following WHO guidelines, advocating exclusive breastfeeding for the initial six months. Mothers are also better prepared to tackle challenges like worries about milk supply, breastfeeding difficulties, or lack of supportive environments. These findings align with the study by Rosa et al. (2019), which reported a statistically significant improvement in scores, with a p-value < 0.001<sup>44</sup>.

An essential strength of this study lies in using the e-booklet as a contemporary educational tool customized to present technological progress. The e-booklet enables simple, adaptable, and efficient information sharing, improving the knowledge and attitudes of third-trimester pregnant women regarding the significance of exclusive breastfeeding. Furthermore, the quasi-experimental design, incorporating control and experimental groups, guarantees robust methodological validity, enabling a precise assessment of the intervention's efficacy. Given its notable outcomes, this study offers a pragmatic approach to enhancing exclusive breastfeeding prevalence in the community via technology-driven education.

Nevertheless, the study faces certain limitations, notably concerning the accessibility of the e-booklet employed as an intervention. Some third-trimester pregnant women within the Tuntungan Public Health Center's jurisdiction lacked access to Android devices essential for utilizing the e-booklet. This limitation influenced the sampling process, as only mothers with Android devices could participate, resulting in a sample that may not fully represent the broader population, especially those without digital access. Moreover, the two-week intervention period may not have been adequate to instigate profound or enduring changes in attitudes, especially in the practical application of exclusive breastfeeding after childbirth. Attitude changes frequently necessitate extended durations to manifest as tangible actions, particularly when external factors like family support, healthcare provider guidance, and personal experiences are influential. The short intervention period also limited the researchers from assessing the long-term impact of the e-booklet on exclusive breastfeeding practices.

## CONCLUSIONS

The study results indicate that before the intervention, the experimental and control groups had comparable distributions of mothers with good, moderate, and poor knowledge. Following the introduction of the exclusive breastfeeding e-booklet, the experimental group experienced a notable rise in mothers with good knowledge, whereas the control group predominantly exhibited moderate knowledge. Subsequently, the experimental group displayed more positive attitudes, whereas the control group maintained more negative attitudes. These findings illustrate that the e-booklet effectively improves both knowledge and attitudes of third-trimester pregnant women in the Tuntungan Public Health Center area.

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## AUTHOR CONTRIBUTIONS

EMP: conceptualization, investigation, methodology, supervision, data acuration; LG: methodology, visualization, validation, writing—original draft; DER: methodology; formal analysis, writing—original draft; SP: formal analysis, resources, writing—review and editing; AWN: writing—original draft, writing—review and editing, project administration.

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