



DIGITAL SMART-PARENTING FOR EXCLUSIVE BREASTFEEDING AND STUNTING PREVENTION: A PRE-EXPERIMENTAL STUDY ON FAMILY KNOWLEDGE, ATTITUDES, AND PRACTICES

Rani Fitriani Arifin^{1*}, Asmarawanti¹, Yuyun Sarinengsih², Muhamad Rifki Fauzan¹, Neli Andini¹

¹Diploma Nursing Program, Sekolah Tinggi Ilmu Kesehatan Sukabumi, Jl. Karamat No.36, Karamat, Sukabumi, Jawa Barat 43122, Indonesia

²Bachelor's of Nursing Program, Universitas Bhakti Kencana, Jl. Soekarno-Hatta No.754, Cipadung Kidul, Panyileukan, Bandung, Jawa Barat 40614, Indonesia

*ranifitrianiarifin@dosen.stikesmi.ac.id

ABSTRACT

Exclusive breastfeeding and appropriate family practices are essential components of stunting prevention. Digital health interventions may provide an accessible approach to strengthening families' knowledge, attitudes, and practices related to child nutrition and care. This study aimed to determine the effect of the Digital Smart-Parenting intervention on families' knowledge, attitudes, and practices regarding exclusive breastfeeding and stunting prevention. A pre-experimental one-group pretest–posttest design was conducted among 50 family members of infants or children under five years of age in nine subdistricts of Sukabumi Regency, Indonesia. Participants were selected using purposive sampling and used the Digital Smart-Parenting application for one month. Knowledge, attitude, and practice scores were assessed before and after the intervention and analyzed using paired-samples t-tests. After the intervention, knowledge scores increased with a mean difference of 0.58 (95% CI: 0.23–0.92; $p = 0.001$; Cohen's $d = 0.48$). Attitude scores increased with a mean difference of 1.86 (95% CI: 0.81–2.90; $p < 0.001$; Cohen's $d = 0.50$). Practice scores increased with a mean difference of 2.16 (95% CI: 1.06–3.25; $t(49) = 3.9$; $p < 0.001$; Cohen's $d = 0.55$). Digital Smart-Parenting was associated with significant improvements in families' knowledge, attitudes, and practices related to exclusive breastfeeding and stunting prevention, with moderate effect sizes.

Keywords: digital health; exclusive breastfeeding; family empowerment; smart parenting; stunting prevention

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INTRODUCTION

Stunting is one of the main challenges facing health development and human capital quality (Hatini, 2025; Natasia et al., 2025). According to the latest data from the WHO, UNICEF, and the World Bank in the 2025 Joint Child Malnutrition Estimates (JME), the global prevalence of stunting among children under five in 2024 reached 23.2 percent, or approximately 150.2 million children (WHO, 2025a, 2025b). In Indonesia, the prevalence of stunting has been on a downward trend. The Ministry of Health recorded a prevalence of 37.2% in 2017, which then fell to 30.8% in 2018, 27.7% in 2019, 24.4% in 2021, 21.6% in 2022, 21.5% in 2023, and finally 19.8% in 2024. Nevertheless, the Ministry of Health states that significant challenges remain. The target for reducing stunting by 2025 is 18.8%, which will require greater effort and closer collaboration, particularly in the six provinces with the highest number of stunted toddlers: West Java (638,000 toddlers), Central Java (485,893 toddlers), East Java (430,780 toddlers), North Sumatra (316,456 toddlers), East Nusa Tenggara (214,143 toddlers), and Banten (209,600 toddlers) (Kemenkes, 2025).

Stunting is a condition of growth failure caused by chronic malnutrition in early life that has long-term effects on an individual's physical and cognitive development and productivity (Simbolon & Putri, 2024). Efforts to prevent stunting are closely linked to ensuring adequate nutrition from an early age, particularly through exclusive breastfeeding during the first six months of life (Riyanto & Rohman, 2024). However, the practice of exclusive breastfeeding at the household level remains suboptimal, thereby contributing to the high risk of stunting among infants and toddlers (Ratnasari & Sidiq, 2024).

The issue of low rates of exclusive breastfeeding cannot be separated from the role of the family as the primary environment for a child's growth and development (Marliani et al., 2025; Syamsir et al., 2023). Parents' limited knowledge, inappropriate parenting practices, and limited access to ongoing health education are factors that influence breastfeeding practices and children's nutritional needs (Arum et al., 2025; Khoeriyah et al., 2025). This situation indicates that preventing stunting requires an approach that focuses not only on health services but also on the comprehensive empowerment of families (Dian Rahayu et al., 2025).

With the advancement of digital technology, the use of digital media has become one approach that can support these family empowerment efforts (Irawan et al., 2025; Rismawati et al., 2025). The use of digital technology opens up opportunities to provide parenting and nutrition education that is more flexible, easily accessible, and tailored to families' needs (Baiquni et al., 2025). One way this technology is being utilized is through digital smart-parenting apps. Digital app-based education not only plays a role in enhancing parents' knowledge but can also foster more positive attitudes and parenting practices that align with children's needs. The application of digital technology in breastfeeding education also provides families with opportunities to access information about the benefits of exclusive breastfeeding, breastfeeding techniques, meeting infants' nutritional needs, and parenting practices that support children's growth and development—all in a more accessible and sustainable manner (Corputty et al., 2025b; Rojas-Rodríguez, 2026).

Previous research has developed various digital applications to support growth and development monitoring, nutrition education, stunting prevention, and child health consultations; however, most of these features still focus on specific aspects and have not yet fully integrated family care needs into a single platform. This situation served as the basis for the development of the Smart-Parenting app, which integrates various features into a single platform, including educational materials on exclusive breastfeeding and parenting, monitoring of children's growth, development, and nutritional status, consultations, and child health monitoring. The integration of these features is expected to make it easier for families to access information, monitor their children's condition, and take appropriate steps to support the optimization of exclusive breastfeeding and the sustainable prevention of stunting. The objective of this study is to determine the effect of the "Smart-Parenting" digital family empowerment program on families' knowledge, attitudes, and practices regarding exclusive breastfeeding and stunting prevention.

METHOD

Study Design and Setting

This preliminary effectiveness study employed a pre-experimental one-group pretest–posttest design to evaluate the effect of the Digital Smart-Parenting intervention on family knowledge, attitudes, and practices related to exclusive breastfeeding and stunting prevention. The study was conducted from March to August 2026 in Sukabumi Regency, West Java, Indonesia, covering nine subdistricts: Warungkiara, Caringin, Cibadak, Ciemas, Cikembar, Jampangtengah, Bantargadung, Simpenan, and Gegerbitung. The study period included preparation, coordination with local health services, participant recruitment, intervention implementation, and post-intervention evaluation.

Participants and Recruitment

The study included 50 family members of infants or children under five years of age. Participants were selected using purposive sampling based on their eligibility and involvement in daily childcare, breastfeeding support, feeding practices, or child health-related decision-making. Eligible participants included breastfeeding mothers as well as other family members, such as fathers or close relatives, who had an active role in caring for the child. The inclusion criteria were: (1) being a family member directly involved in the daily care and feeding of an infant or child under five years of age; (2) residing in one of the nine selected subdistricts of Sukabumi Regency; (3) being aged ≥ 18 years; (4) possessing and being able to operate a smartphone having access to an internet connection to operate Digital Smart-Parenting application; (5) being able to communicate and read Indonesian. The exclusion criteria were: (1) individuals with physical, cognitive, visual, or communication limitations; (2) participants who planned to move outside the study area during the intervention period; and (3) individuals participating simultaneously in another structured digital parenting, breastfeeding, or stunting-prevention intervention.

Digital Smart-Parenting Intervention

Digital Smart-Parenting was a family-empowerment application designed to support exclusive breastfeeding and stunting prevention through repeated, on-demand learning, self-monitoring, professional consultation, and behavioural reminders. The application supplemented rather than replaced routine maternal and child health services. Health professionals acted as facilitators, information clarifiers, and referral guides when users reported breastfeeding or child-growth concerns. Before starting the intervention, participants received structured education and practical orientation regarding the purpose, features, and procedures for using the Digital Smart-Parenting application. The orientation included account registration, completion of the family profile, access to educational materials, use of child-growth monitoring features, consultation services, reminders, and recording of relevant childcare activities. After the orientation, participants were instructed to use the Digital Smart-Parenting application for one month. Participants were encouraged to access the educational materials repeatedly according to their needs and to use the available monitoring, consultation, and reminder functions throughout the intervention period. Application use and participant engagement were continuously monitored by trained enumerators consisting of Posyandu cadres. The enumerators conducted routine follow-up to encourage application use, identify technical difficulties, reinforce adherence to the intervention protocol, and facilitate communication with the research team when problems occurred.

At onboarding, users registered an account and completed a family profile containing child and caregiver information. The home page then served as the main access point for recommended learning materials, current reminders, daily tips, consultation services, and a summary of the child's most recent growth record. Users selected features according to their needs, recorded relevant activities, and could revisit stored materials and histories throughout the intervention period. The learning component used articles, educational videos, infographics, interactive quizzes, and practice checklists. Eight core topics were provided: (1) introduction to exclusive breastfeeding; (2) benefits of exclusive breastfeeding; (3) appropriate complementary feeding after six months; (4) early initiation of breastfeeding; (5) myths and facts about exclusive breastfeeding; (6) understanding stunting; (7) early stunting-prevention strategies; and (8) family empowerment in stunting prevention. The content also addressed colostrum, breastfeeding on demand, avoidance of non-breast-milk food or drinks before six months, common breastfeeding barriers, sanitation, immunisation, Posyandu attendance, growth monitoring, and recognition of unreliable health information. The child-growth monitoring feature allowed families to enter the measurement date, weight, length/height, head circumference, and relevant notes. Records were retained as a longitudinal history and displayed graphically to help families recognise changes that might require follow-up. Through the consultation feature, users selected a topic category, entered a subject and a detailed question, and could add the child's name and age. The system generated a consultation

ticket that was reviewed by a health professional; responses and subsequent discussion remained available in the user's consultation history. Customisable reminders supported recurring activities, including breastfeeding, Posyandu visits, immunisation, maternal vitamins, nutritious meals, hydration, and return to learning materials.

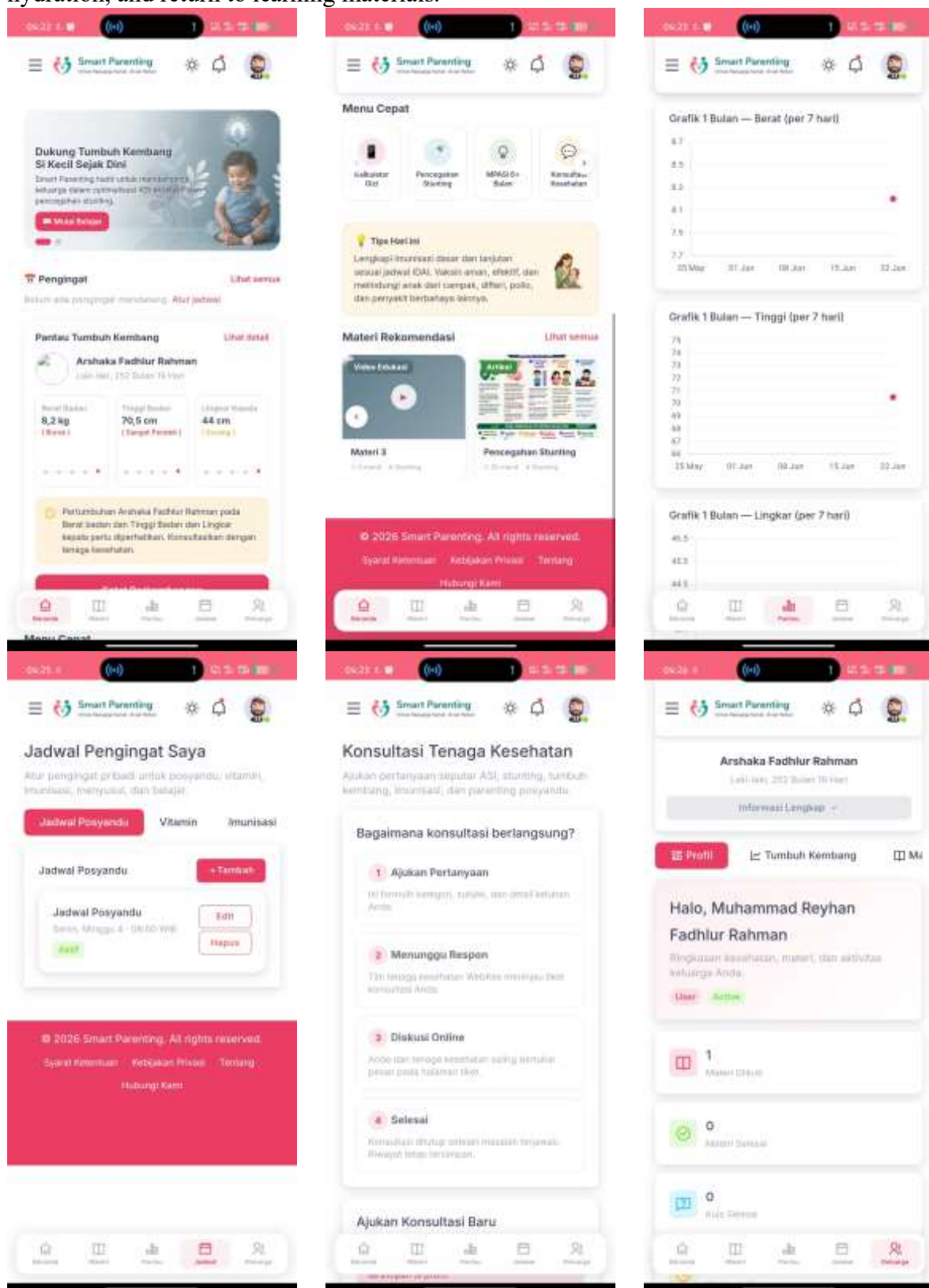


Figure 1. Overview of the Digital Smart-Parenting Application Features

Data Collection and Outcome Measures

Baseline questionnaires were administered before participants used Digital Smart-Parenting, and the same outcome domains were reassessed after the intervention. Knowledge was measured using 18 true-false statements covering the definition and duration of exclusive breastfeeding, colostrum, breastfeeding frequency, the health benefits of breastfeeding, continuation of breastfeeding with complementary feeding, stunting and its determinants, growth monitoring, age-appropriate complementary feeding, and feeding during illness. Correct responses were scored 1 and incorrect responses 0, producing a total score from 0 to 18; higher scores indicated better knowledge. Attitudes were assessed using 10 statements rated on a four-point scale from strongly disagree to strongly agree. Items addressed confidence in the adequacy of breast milk, perseverance with breastfeeding, family support, the seriousness and preventability of stunting, routine growth monitoring, evaluation of health information, and shared family responsibility. Negatively worded items were reverse-scored. Total scores ranged from 10 to 40, with higher scores indicating attitudes more supportive of exclusive breastfeeding and stunting prevention. Practices were assessed using 10 items with four response categories: never, sometimes, often, and always. The items covered exclusive breastfeeding without additional food or drinks before six months, breastfeeding on demand, avoidance of bottles or pacifiers during exclusive breastfeeding, family involvement, consultation for breastfeeding problems, monthly growth monitoring, hand hygiene, timely immunisation, family discussion of child nutrition, and adherence to health-professional advice. Total scores ranged from 10 to 40, with higher scores indicating more favourable practices.

Prior to the main study, the knowledge, attitude, and practice questionnaires were tested for validity and reliability among 30 respondents with characteristics similar to those of the study population who were not included in the final sample. The knowledge questionnaire showed item correlation coefficients ranging from 0.412 to 0.781, the attitude questionnaire from 0.437 to 0.824, and the practice questionnaire from 0.401 to 0.796. All items demonstrated correlation coefficients greater than the critical r value, indicating satisfactory validity. Reliability analysis showed a Kuder–Richardson 20 (KR-20) coefficient of 0.842 for the knowledge questionnaire, while Cronbach's alpha coefficients were 0.876 for the attitude questionnaire and 0.861 for the practice questionnaire. These findings indicated that all instruments demonstrated good internal consistency and were considered valid and reliable for use in the study.

Statistical Analysis

Participant characteristics and outcome scores were summarised using frequencies and percentages or means and standard deviations, as appropriate. Pretest and posttest scores for knowledge, attitudes, and practices were compared using two-sided paired-samples t -tests. Mean paired differences were reported with 95% confidence intervals. Statistical significance was set at an alpha level of 0.05. Effect sizes were calculated as Cohen's d_z by dividing the mean paired difference by the standard deviation of the paired differences.

Ethical Considerations

Ethical approval for this study was obtained from DIGITEPP STIKes Sukabumi on May 22, 2026, with ethical approval number No. 003353/KEP STIKES SUKABUMI/2026. Participant recruitment and research data collection were initiated only after ethical approval had been granted. Before participation, all eligible respondents received written and verbal explanations regarding the objectives, procedures, potential benefits, voluntary nature of participation, confidentiality of personal information, and their right to withdraw from the study at any time without consequences. Written informed consent was obtained from each participant before baseline data collection.

RESULT

Table 1, the majority of mothers were aged 20–35 years, with 38 respondents (76%), had a high school education, with 25 respondents (50%), were unemployed, with 32 respondents (64%), were multiparous, with 32 respondents (64%), and had children aged 12–59 months, with 20 respondents (40%).

Table 1.
Respondent Characteristics (n = 50)

Characteristics	Category	n	%
Mothers Age	< 20 Years	3	6
	20-35 Years	38	76
	> 35 Years	9	18
Mothers Education	Elementary School	5	10
	Junior High School	12	24
	High School	25	50
	College	8	16
Employment Status	Doesn't Work	32	64
	Working	18	36
Parity	Primipara	18	36
	Multipara	32	64
Child Age	0-5 Months	18	36
	6-11 Months	12	24
	12-59 Months	20	40

Table 2.
Univariate Analysis

Variable	Min	Max	Mean	SD	P-Value
Knowledge					
Pre-test	3	17	10.6	2.24	0.093
Post-test	7	16	11.18	2.01	0.07
Attitude					
Pre-test	22	39	27.36	4.37	0.2
Post-test	18	39	29.22	4.32	0.282
Practice					
Pre-test	13	37	25.76	5.57	0.147
Post-test	13	40	27.92	5.69	0.747

Based on Table 2, the mean knowledge score increased from 10.60 ± 2.24 at pre-test to 11.18 ± 2.01 at post-test. The knowledge scores ranged from 3 to 17 at pre-test and from 7 to 16 at post-test. The mean attitude score also increased from 27.36 ± 4.37 at pre-test to 29.22 ± 4.32 at post-test, with score ranges of 22–39 and 18–39, respectively. Similarly, the mean practice score increased from 25.76 ± 5.57 at pre-test to 27.92 ± 5.69 at post-test, with scores ranging from 13–37 at pre-test and 13–40 at post-test. The normality test showed that all p-values for knowledge (pre-test $p = 0.093$; post-test $p = 0.070$), attitude (pre-test $p = 0.200$; post-test $p = 0.282$), and practice (pre-test $p = 0.147$; post-test $p = 0.747$) were greater than 0.05. Therefore, all data were considered normally distributed and met the assumption for subsequent parametric statistical analysis.

Table 3.

Differences in Knowledge, Attitudes, and Practices Before versus After the Implementation of the Smart Parenting Application

Variable	Mean $\pm$ SD		Mean Difference (95% CI)	t	p	d
	T0	T1				
Knowledge	10.6 $\pm$ 2.24	11.18 $\pm$ 2.01	0.58 (0.23 – 0.92)	3.4	0.001	0.48
Attitude	27.36 $\pm$ 4.37	29.22 $\pm$ 4.32	1.86 (0.81 – 2.9)	3.5	<0.001	0.5
Practice	25.76 $\pm$ 5.57	27.92 $\pm$ 5.69	2.16 (1.06 – 3.25)	3.9	<0.001	0.55

Based on Table 3, the implementation of the Smart Parenting application resulted in significant improvements in knowledge, attitudes, and practices. The mean knowledge score increased from 10.60 ± 2.24 at T0 to 11.18 ± 2.01 at T1, with a mean difference of 0.58 (95% CI: 0.23–0.92; $t = 3.4$; $p = 0.001$; Cohen's $d = 0.48$). The mean attitude score increased from 27.36 ± 4.37 to $29.22 \pm$

4.32, with a mean difference of 1.86 (95% CI: 0.81–2.90; $t = 3.5$; $p < 0.001$; Cohen's $d = 0.50$). Similarly, the mean practice score increased from 25.76 ± 5.57 to 27.92 ± 5.69 , with a mean difference of 2.16 (95% CI: 1.06–3.25; $t = 3.9$; $p < 0.001$; Cohen's $d = 0.55$). These findings indicate statistically significant improvements in all three outcomes, with small-to-moderate to moderate effect sizes.

DISCUSSION

The results of the study show that the implementation of Digital Smart-Parenting significantly increased families' knowledge about exclusive breastfeeding and stunting prevention. The mean knowledge score increased from 10.60 ± 2.24 before the intervention to 11.18 ± 2.01 after the intervention, with a mean difference of 0.58 (95% CI: 0.23–0.92). This difference was statistically significant ($t(49) = 3.4$; $p = 0.001$), with a Cohen's d of 0.48, indicating a moderate effect. The increase in knowledge was also evident in the shift in categories, as the proportion of families with good knowledge rose from 10.0% to 30.0%. These findings are consistent with those of Sun et al. (2023) who demonstrated that internet-based interventions can improve knowledge and attitudes regarding breastfeeding compared to routine care. An increase in knowledge following education on child feeding was also reported by Nafista et al. (2023) who demonstrated that nutrition education can improve mothers' knowledge and attitudes regarding child feeding recommendations. Findings by Ainiyyah et al. (2026) also showed that multimodal nutrition education is capable of improving and sustaining mothers' knowledge regarding stunting prevention.

The effectiveness of Digital Smart-Parenting in enhancing knowledge can be understood through the characteristics of digital media, which allow health information to be delivered in a structured, flexible, and easily accessible manner for families. Delivering content through digital media gives users the opportunity to learn information according to their needs and at their own pace, so that the learning process does not rely entirely on face-to-face meetings. Research by Nurati et al. (2024) on digital education for infant and child feeding shows that the use of smartphone apps, WhatsApp, WeChat, and digital job aids can improve mothers' understanding of nutritional needs and feeding practices in line with recommendations. These findings are supported by a study by Rachmah et al. (2023) which showed that education via the WhatsApp platform using a combination of text, images, posters, and videos can be used to systematically convey feeding information to mothers. A similar approach is relevant in Digital Smart-Parenting because information on exclusive breastfeeding and stunting prevention requires an understanding of various aspects of child-rearing, feeding, and growth monitoring. Thus, the effectiveness of interventions is not solely related to the use of technology, but also to the ability of digital media to package complex information into more structured and easily understandable educational materials.

This increase in knowledge is significant because the family is the closest environment that plays a role in decision-making regarding breastfeeding, meeting nutritional needs, child-rearing, and monitoring a child's growth. Adequate knowledge can provide a foundation for families to recognize appropriate practices and distinguish them from inaccurate information or practices. Recent evidence on the use of mHealth for stunting prevention indicates that interventions delivered to caregivers via apps, interactive messages, WhatsApp, or chatbots have the potential to improve knowledge and feeding practices, although changes in children's growth have not yet shown consistent results (Choliq et al., 2026). Evidence on the use of mobile health apps in stunting prevention in Indonesia also shows that various apps integrating education, behavior change support, early detection, and monitoring can improve mothers' knowledge and attitudes (Utami et al., 2025). Therefore, the increase in knowledge observed in this study indicates that Digital Smart-Parenting has contributed to one of the key foundations for strengthening families' capacity to support healthy child-rearing practices.

The effectiveness of Digital Smart-Parenting should also be understood as the result of a good fit between families' educational needs and the characteristics of the intervention provided. Current evidence supports the potential of digital interventions to improve caregivers' knowledge and feeding practices as part of stunting prevention, but it also shows that the impact on child health outcomes does not always directly follow an increase in knowledge (Choliq et al., 2026). This suggests that knowledge is one of the initial stages in the process of behavioral change, whereas changes in practices and child growth outcomes require broader support and a longer timeframe. Regarding exclusive breastfeeding, the latest evidence also indicates that digital health interventions can improve the success of exclusive breastfeeding and breastfeeding self-efficacy, although the effects on breastfeeding knowledge have not always been consistent (Jackson et al., 2026; J. Sun et al., 2026). The results of the study indicate that the Digital Smart-Parenting intervention significantly improved families' attitudes toward exclusive breastfeeding and stunting prevention. The mean attitude score increased from 27.36 ± 4.37 before the intervention to 29.22 ± 4.32 after the intervention, with a mean difference of 1.86 (95% CI: 0.81–2.90). The paired-samples *t*-test showed that this difference was statistically significant ($t(49) = 3.5$; $p < 0.001$), with a Cohen's *d* of 0.50, indicating a moderate effect. These findings are consistent with the study by Anjelina et al. (2023), which showed that health education can significantly improve mothers' attitudes toward exclusive breastfeeding.

The change in attitudes observed in this study may also be linked to families' growing understanding of the relationship between infant feeding practices and the prevention of stunting. A study by Fetrisia et al. (2024) showed that health education on infant and young child feeding can improve pregnant women's knowledge and attitudes regarding stunting and its prevention. Additionally, Noviana et al. (2024) found that attitudes, subjective norms, and perceived behavioral control are factors associated with mothers' intentions to prevent stunting through exclusive breastfeeding. Thus, the improvement in attitudes observed in this study can be understood as a result of increased family awareness regarding the importance of exclusive breastfeeding as part of stunting prevention efforts, as well as increased confidence that families play a role in supporting this practice. Digital media in Digital Smart-Parenting can serve as a tool to convey information about exclusive breastfeeding and stunting prevention in a more accessible and engaging way. Epiphani (2024) found that education using video media influences breastfeeding mothers' knowledge and attitudes regarding exclusive breastfeeding. Similar results were shown in a study by Manjorang et al. (2026) which demonstrated that the use of video media and leaflets in education can be used to improve mothers' knowledge and attitudes regarding exclusive breastfeeding. The use of digital media in Digital Smart-Parenting can thus provide families with the opportunity to receive information more flexibly and help connect material on exclusive breastfeeding and stunting prevention with their daily parenting practices.

This is important because a positive attitude toward exclusive breastfeeding can serve as a foundation for the formation of intentions and behaviors related to breastfeeding, while a positive attitude toward stunting prevention can encourage families to pay closer attention to child-rearing practices and meeting children's nutritional needs. Findings by Moffat et al. (2021) indicate that nutrition communication campaigns targeting mothers in Indonesia can increase awareness of stunting and support the promotion of exclusive breastfeeding. Furthermore, research by Corputty et al. (2025) on Digital Family Assistance & Mentoring indicates that family-based digital interventions can improve attitudes, exclusive breastfeeding practices, and family support in the context of stunting prevention. Therefore, Digital Smart-Parenting can be considered as one educational approach to strengthen families' attitudes toward exclusive breastfeeding and stunting prevention, although continued information and guidance are still necessary to ensure that attitude changes are sustained and translated into behavior. The results of the study indicate that the Digital Smart-Parenting intervention significantly improved family practices related to stunting prevention

and successful breastfeeding. The mean practice score increased from 25.76 ± 5.57 before the intervention to 27.92 ± 5.69 after the intervention, with a mean difference of 2.16 (95% CI: 1.06–3.25). The paired-samples *t*-test showed that this difference was statistically significant ($t(49) = 3.9$; $p < 0.001$), with a Cohen's *d* of 0.55, indicating a moderate effect. This finding is supported by Hojati & Farhangi (2025) and Malinda et al. (2026) who state that app-based interventions can improve family practices in preventing stunting. This finding is also consistent with Jaiswal et al. (2024) and Madayag et al. (2025) who noted that app-based interventions can improve family practices in support of exclusive breastfeeding.

The use of Smart-Parenting supports the delivery of health information in a more flexible and accessible manner for family members. The systematically organized information also helps improve families' understanding of the concrete steps needed to optimize children's growth and development, including breastfeeding practices, growth monitoring, and the implementation of appropriate parenting approaches. This increased understanding facilitates the translation of available information into more positive health behaviors. This is consistent with Peiris et al. (2023) who state that mobile phone-based interventions can improve the knowledge, attitudes, and practices of the target population by transforming insights into habits that are applicable in daily routines. The Smart-Parenting intervention offers features that support family practices aimed at preventing stunting. The interactive content in the app guides parents in changing their daily practices. The feature for monitoring children's growth and development can encourage preventive actions, thereby consistently reducing the risk of stunting in children. Furthermore, sustained use can encourage fathers and other family members to play an active role in child-rearing. This aligns with the findings of Gustina et al. (2025) who explain that the use of education-based apps can bridge the gap between conceptual theory and its implementation as concrete practices for stunting prevention within the household. The Smart-Parenting intervention immediately improved practices that promote successful exclusive breastfeeding. Education delivered through digital media guides mothers in overcoming various breastfeeding barriers. Additionally, systematic guidance helps families create a supportive environment that ensures their infants receive adequate nutrition. This is consistent with Gebremariam et al. (2023) who noted that mHealth interventions can improve exclusive breastfeeding practices with the support of information provided in real time.

Several limitations should be considered when interpreting the findings of this study. First, the absence of a control group makes it difficult to determine whether the observed improvements in family knowledge, attitudes, and practices were attributable solely to the Digital Smart-Parenting intervention, as other sources of health information or experiences during the study period may have contributed to these changes. Second, the study involved a relatively small number of families from a limited setting, which may restrict the transferability of the findings to families with different characteristics or from other settings. Third, the post-intervention assessment was conducted within a relatively short period, so the study could not determine whether the improvements in knowledge, attitudes, and practices would be maintained over time. In addition, the assessment of family practices relied on questionnaire responses, which may not fully reflect actual behaviors in daily life.

CONCLUSION

The Digital Smart-Parenting intervention was associated with significant improvements in families' knowledge, attitudes, and practices regarding exclusive breastfeeding and stunting prevention. Knowledge increased by 0.58 points, attitude by 1.86 points, and practice by 2.16 points after one month of application use, with moderate effect sizes across all outcomes. These findings suggest that Digital Smart-Parenting has the potential to support family empowerment by providing accessible education, child-growth monitoring, consultation, and behavioral support related to breastfeeding and stunting prevention.

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