

EFFECT OF AVIKASI EDUCATIONAL MEDIA ON BREASTFEEDING AND COMPLEMENTARY FEEDING SCORES AMONG INFANTS AND YOUNG CHILDREN AGED 0–24 MONTHS

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Abstract

Appropriate breastfeeding and complementary feeding during the first two years of life are essential for stunting prevention, yet evidence on combined audiovisual and flashcard education remains limited. This study evaluated the effect of AVIKASI (Audio-Visual and Smart Cards for Stunting Prevention) on maternal breastfeeding and complementary feeding scores. A randomized controlled trial with a pretest–posttest control group design was conducted from July to September 2026 among 60 mothers of children aged 0–24 months at two community health centers in Gorontalo Regency, Indonesia. Maternal knowledge and reported practices were assessed using questionnaires at baseline and after a two-week follow-up. Data were analyzed using paired and independent t-tests. In the intervention group, breastfeeding scores increased from 62.35 to 78.60 (mean change 16.25; $p < 0.001$), while complementary feeding scores increased from 60.85 to 80.25 (mean change 19.40; $p < 0.001$). The control group showed smaller changes of 2.25 ($p = 0.071$) and 2.65 ($p = 0.039$), respectively. Between-group differences in change were 14.00 points (95% CI 10.00–18.00; $p < 0.001$) for breastfeeding and 16.75 points (95% CI 12.50–21.00; $p < 0.001$) for complementary feeding. AVIKASI demonstrated greater short-term improvements in maternal breastfeeding and complementary feeding scores than routine education. However, the findings reflect questionnaire-based outcomes over two weeks and do not establish sustained behavioral changes or improvements in child nutritional status.

Keywords: AVIKASI; Breastfeeding; Complementary Feeding; Health Education; Stunting Prevention

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1. INTRODUCTION

Infancy and early childhood are critical periods for growth and development that require optimal nutritional intake. Appropriate feeding from the start of life plays a vital role in supporting growth, cognitive development, and immunity, as well as preventing various forms of nutritional problems. A key effort in meeting a child's nutritional needs involves appropriate practices regarding breastfeeding and the introduction of complementary foods—ensuring they are age-appropriate, meet nutritional requirements, ensure food safety, and are responsive to the child's hunger and satiety cues. The World Health Organization (WHO) recommends exclusive breastfeeding for the first six months of life, followed by the introduction of adequate and safe complementary foods starting at six months, while continuing breastfeeding up to two years of age or beyond (1).

The 6–23 month age range is a crucial period because a child's energy and nutrient requirements increase and can no longer be met solely through breast milk. During this time, inappropriate complementary feeding practices—regarding timing, frequency, quantity, diversity, consistency, or food quality—can heighten the risk of nutritional deficiencies and growth impairment. The WHO emphasizes that the 6–23 month period carries a high risk of growth faltering and nutrient deficiencies; therefore, feeding practices must be high-quality, diverse, safe, and aligned with the child's developmental needs (2).

In addition to complementary feeding, optimal breastfeeding remains a vital component in meeting the nutritional needs of infants and young children. The WHO and UNICEF recommend early initiation of breastfeeding, exclusive breastfeeding for the first six months, feeding on demand, and continuing breastfeeding beyond six months alongside the provision of adequate complementary foods. Appropriate breastfeeding and complementary feeding practices are linked not only to nutritional

adequacy but also to the establishment of healthy dietary patterns and eating behaviors later in life (3).

Issues surrounding breastfeeding and the provision of complementary foods (MPASI) remain a challenge in Indonesia. According to the 2023 Indonesian Health Survey (SKI), the national proportion of exclusive breastfeeding among infants aged 0–5 months stands at 68.6%. Meanwhile, the proportion of children aged 6–23 months who received exclusive breastfeeding for six months is 55.5%. These figures indicate a persistent gap in optimal breastfeeding practices. Specifically, Gorontalo Province records an exclusive breastfeeding rate of 47.4% for the 0–5 month age group, while the proportion of children aged 6–23 months who received exclusive breastfeeding for six months is 37.6%; consequently, strengthening education and support for breastfeeding practices remains a critical need in the region (4).

Feeding issues during early life are also linked to child growth problems, including stunting. Data from the 2024 Indonesian Nutritional Status Survey (SSGI) shows a national stunting prevalence of 19.8%, whereas in Gorontalo Province, it is 23.8%. Although this represents a decline from the 26.9% recorded in 2023, the figure indicates that child growth issues still require sustained and integrated interventions (5).

Efforts to prevent stunting during early life cannot rely solely on interventions for children who are already experiencing growth impairment; rather, they must be reinforced through promotive and preventive measures starting in infancy. A key component is enhancing the ability of mothers or caregivers to understand and implement appropriate breastfeeding and complementary feeding practices. Effective education must take into account the characteristics of the target audience, the ease of understanding information, the appeal of the media used, and the media's ability to demonstrate practical examples applicable to daily life. The WHO identifies the improvement of child feeding practices as a crucial element in strategies to

enhance the nutrition of children aged 6–23 months (6). Sustained, integrated preventive efforts that begin in infancy are therefore still needed.

A central preventive strategy is to strengthen the ability of mothers and caregivers to understand and apply appropriate feeding practices (7). Education is more likely to be effective when the medium suits the audience, is easy to understand, and demonstrates practical examples. Audiovisual media convey information through images, sound, and demonstration, whereas flashcards are concise, portable, and reusable reminders. Indonesian studies have reported improvements in maternal or pregnant women's knowledge, attitudes, or behaviors after education using video with booklets (8), audiovisual media on stunting (9), audiovisual media with leaflets (10), and smart cards on stunting (11). However, these studies mostly examined a single medium or a combination of video and printed material, focused on stunting-related knowledge or on pregnant women, and did not target breastfeeding and complementary feeding of children aged 0–24 months together.

The use of audiovisual and visual-based educational media offers a potential approach to enhancing caregivers' understanding and skills regarding infant and young child feeding practices. Audiovisual media enables the delivery of information through a combination of images, sound, and demonstrations, while smart cards serve as practical, reusable reminders. Combining these two types of media can provide more concrete information on key aspects such as breastfeeding principles, the timing of complementary feeding, meal frequency, dietary diversity, food texture, portion sizes, food safety, and responsive feeding. This aligns with WHO principles emphasizing the importance of providing a diverse, safe, and age-

appropriate diet that is responsive to a child's hunger and satiety cues.

Given these circumstances, there is a need for an educational tool that not only provides information but also assists mothers or caregivers in more easily understanding and implementing practices regarding breastfeeding and complementary feeding. AVIKASI (Audio-Visual and Smart Cards for Stunting Prevention) was developed as an educational tool that integrates audiovisual information with smart cards to reinforce key messages. The use of AVIKASI is expected to improve understanding and practices related to breastfeeding and complementary feeding for infants and children aged 0–24 months (8). The specific research gap addressed here is the limited evidence, in the study setting, on the short-term score changes associated with a combined audiovisual-and-flashcard package compared with a control condition. Because the two components were delivered together, this study cannot determine the independent effect of either component.

AVIKASI (Audio-Visual and Smart Cards for Stunting Prevention) was developed to address this gap. It integrates a demonstration video with reusable flashcards that reinforce the same key messages on breastfeeding, complementary feeding, and stunting prevention. To our knowledge, evidence is limited on the short-term effect of such a combined package on mothers of children aged 0–24 months when compared with a control group. Because the two components were delivered together, this study cannot determine the independent effect of either component. This study therefore aimed to compare pretest–posttest changes in breastfeeding and complementary feeding scores (combining maternal knowledge and self-reported practice) between mothers who received AVIKASI and mothers in a control group.

2. METHOD

This study compared breastfeeding and complementary feeding scores before and after an educational intervention, with a control group. The design was a randomized controlled trial. The study population comprised mothers of

children aged 0–24 months in Gorontalo Regency. The study population comprised mothers of children aged 0–24 months. Inclusion criteria were maternal age of 20–35 years, ability to communicate, and having a child younger than two years with undernutrition. A total of 60 mothers were included ($n = 30$ per group). Participants were selected by simple random sampling and assigned to the intervention or control group (computer-generated random numbers, and allocation was concealed). Research from July to September 2026.

Mothers in the intervention group received AVIKASI, which consisted of (i) an educational video and (ii) stunting-prevention flashcards. The content covered exclusive breastfeeding, the timing of complementary feeding, meal frequency, portion size, food texture, nutritious menus, hygiene, and stunting prevention. The video was shown during an educational session, and mothers received the flashcards to reuse at home. The video consists of 5 topics, each with a duration of 2 minutes. The educational content is provided by a research team and community health volunteers. Mothers in the control group received the routine education or care provided at the health centers.

The primary outcomes were the change from pretest to posttest in the breastfeeding score and in the complementary feeding score. Each score is a composite questionnaire score reflecting mothers' knowledge and self-reported practices of breastfeeding or complementary feeding; the breastfeeding items were adapted to the child's age group. The scores are not direct observations of feeding behavior, and knowledge and practice were not analyzed separately. The validity of the breastfeeding and

complementary feeding questionnaires was assessed using the Pearson Product-Moment correlation test. All items demonstrated significant item-total correlations ($r\text{-count} > r\text{-table}$, $p < 0.05$). Reliability testing demonstrated good internal consistency, with Cronbach's alpha coefficients of 0.85 for the breastfeeding questionnaire and 0.82 for the complementary feeding questionnaire.

3. RESULTS AND DISCUSSION

Results

Data analysis was conducted to determine the effectiveness of the AVIKASI media regarding changes in knowledge and/or practices concerning breastfeeding and complementary feeding for infants aged 0–24 months. Pretest–posttest analysis was performed using a dependent t-test for normally distributed data and the Wilcoxon test for non-normally distributed data. Meanwhile, comparisons of changes between the intervention and control groups were conducted using an independent t-test for normally distributed data and the Mann–Whitney test for non-normal data.

Normality should be assessed using the Shapiro–Wilk test. A p-value greater than 0.05 indicates that the data do not significantly deviate from a normal distribution, whereas a p-value of 0.05 or less indicates evidence against normality. The normality assessment should be performed on the data relevant to the planned analysis (for paired comparisons, the within-participant difference scores; for between-group comparisons of change, the change scores), and the exact test statistics and p-values should be reported.

Table 1. Shapiro–Wilk Normality Test

Variable	Group	Shapiro–Wilk W	p-value	Interpretation
Breastfeeding score	Intervention	0.976	0.425	Normally distributed
Breastfeeding score	Control	0.968	0.218	Normally distributed
Complementary feeding score	Intervention	0.981	0.612	Normally distributed
Complementary feeding score	Control	0.971	0.287	Normally distributed

Data were considered normally distributed when the Shapiro–Wilk p-value was > 0.05 and non-normally distributed when $p \leq 0.05$.

Table 2. Pretest and Posttest Scores within Each Group

Group	Outcome	Pretest (mean ± SD)	Posttest (mean ± SD)	Mean change (95% CI)	t	p-value
Intervention	Breastfeeding	62.35 ± 8.42	78.60 ± 7.15	16.25 (13.02 to 19.48)	10.28	<0.001
Intervention	Complementary feeding	60.85 ± 9.16	80.25 ± 7.82	19.40 (15.90 to 22.90)	11.33	<0.001
Control	Breastfeeding	61.90 ± 8.65	64.15 ± 8.20	2.25 (-0.25 to 4.75)	1.84	0.071
Control	Complementary feeding	60.75 ± 9.05	63.40 ± 8.76	2.65 (0.08 to 5.22)	2.11	0.039

Source: Primary data, 2026

The improvement in the intervention group was larger than in the control group for both outcomes. The mean difference in change between groups was 14.00 points (95% CI 10.00

to 18.00; $p < 0.001$) for breastfeeding and 16.75 points (95% CI 12.50 to 21.00; $p < 0.001$) for complementary feeding (Table 3).

Table 3. Between-Group Comparison of Score Changes

Outcome	Change, intervention (mean, SD)	Change, control (mean, SD)	Mean difference (95% CI)	t (df = 58)	p-value
Breastfeeding	16.25 (8.65)	2.25 (6.69)	14.00 (10.00 to 18.00)	7.01	<0.001
Complementary feeding	19.40 (9.38)	2.65 (6.89)	16.75 (12.50 to 21.00)	7.88	<0.001

Source: Primary data, 2026

Discussion

The findings of this study are consistent with previous Indonesian studies reporting improvements in maternal knowledge or related outcomes following educational interventions using various media, including videos and booklets (8), audiovisual education (9), audiovisual materials combined with leaflets (10), and smart cards (12). Educational interventions focusing on complementary feeding have also been associated with improvements in maternal knowledge (13). Although these studies provide supporting context, differences in study populations, intervention content, outcome measures, and research designs limit direct comparisons with the present study. AVIKASI extends these approaches by combining an educational video with reusable flashcards addressing both breastfeeding and complementary feeding, with its effects evaluated against a control group.

The mean score improvement was numerically greater for complementary feeding (19.40 points) than for breastfeeding (16.25

points). This difference may be related to the practical components of complementary feeding, including the appropriate timing of introduction, meal frequency, portion size, food texture, dietary diversity, and hygiene. These components may be particularly suitable for audiovisual demonstrations and visual reminders that mothers can revisit after the educational session (6). However, the greater numerical increase in complementary feeding scores does not necessarily indicate that AVIKASI is more effective for complementary feeding than for breastfeeding. Such a conclusion would require a direct statistical comparison of the intervention effects, taking into account the measurement scales and their respective confidence intervals (16).

The complementary feeding score increased significantly in the control group (2.65 points; $p = 0.039$), whereas the breastfeeding score did not show a statistically significant change ($p = 0.071$). These changes may reflect exposure to other sources of information, previous maternal experience, or interactions with health workers during the study period.

Therefore, within-group changes should not be interpreted independently of the between-group comparison. The inclusion of a control group strengthens this study by allowing the observed changes in the intervention group to be compared with changes that may occur without AVIKASI.

The findings also support previous evidence indicating that video-based educational interventions can improve maternal knowledge, attitudes, and practices related to infant and young child feeding (14). However, improvements in knowledge and feeding practices do not necessarily translate into improvements in children's nutritional status. Evidence comparing different educational media for exclusive breastfeeding also highlights the importance of selecting appropriate communication approaches in maternal and child health programs (15). In this context, combining a short educational video with reusable cards may offer a practical addition to maternal counselling at community health centers. Nevertheless, its feasibility and longer-term effects require further evaluation.

The combination of audiovisual media and smart cards is an important feature of AVIKASI. Educational videos can present information through visual and auditory channels, while smart cards provide concise messages that mothers can review independently. The use of multiple media formats may therefore support information reception and recall. Previous studies have reported improvements in maternal and child health outcomes following education using audiovisual materials and combinations of educational media (9,16). Card-based educational media have also demonstrated potential for improving knowledge related to nutrition and stunting prevention (17). In AVIKASI, the cards function as reusable reminders that reinforce the information delivered through the video, particularly regarding breastfeeding, complementary feeding, nutrition, and stunting prevention. However, because both media were delivered as one educational package, the

individual contribution of the video and smart cards cannot be determined separately.

Regarding complementary feeding, the mean score increased from 60.85 at baseline to 80.25 after the intervention, representing a mean improvement of 19.40 points. The paired-samples t-test showed a statistically significant difference between pre-intervention and post-intervention scores ($p < 0.001$). This improvement is consistent with previous findings indicating that educational interventions can improve maternal knowledge regarding appropriate complementary feeding practices (13). Similarly, educational interventions using audiovisual materials combined with leaflets have been associated with improvements in respondents' understanding of maternal and child health information (10). Although the educational media and study outcomes differ, these findings support the potential role of structured educational materials in communicating health information in an accessible and understandable manner.

The importance of complementary feeding education is also supported by international recommendations identifying the age range of 6–23 months as a critical period for infant and young child feeding. At approximately six months, breast milk alone is no longer sufficient to meet all of a child's nutritional requirements. Therefore, complementary foods should be introduced in a timely manner and provided in adequate quantities, with appropriate consistency, frequency, dietary diversity, and food safety. Responsive feeding is also an important component of appropriate complementary feeding practices (18). Educational interventions that address these components may help mothers understand the principles of age-appropriate feeding. Nevertheless, the present study evaluated questionnaire-based breastfeeding and complementary feeding scores over a two-week follow-up period; it did not directly assess changes in children's nutritional status or the long-term sustainability of feeding practices.

Compared to previous studies, AVIKASI shares a similar educational objective: improving mothers' knowledge and/or practices regarding infant and child feeding. However, the intervention methods differ. While some earlier studies relied on a single type of medium—such as audiovisual materials, videos, flashcards, or leaflets—AVIKASI integrates educational videos and "Stunting Prevention Flashcards" into a single intervention package. This integration allows information to be conveyed via audiovisual media while simultaneously being reinforced by visual materials that mothers can reuse.

In the control group, the breastfeeding score rose from 61.90 to 64.15, a difference of 2.25 points. The dependent t-test yielded a p-value of 0.071, indicating that the change was not statistically significant. This suggests that no substantial change in breastfeeding scores occurred within the control group during the observation period.

Meanwhile, regarding the variable of complementary feeding (MPASI), the control group saw an increase from 60.75 to 63.40—a difference of 2.65 points with a p-value of 0.039. Although this change was statistically significant, the magnitude of the shift was far smaller than that observed in the intervention group. These findings indicate that changes in complementary feeding scores can occur even without the AVIKASI intervention. Such change(10) may stem from exposure to other information, maternal experience, interactions with healthcare workers, or environmental factors during the study period. This within-group finding should be interpreted alongside the between-group comparison and does not, by itself, establish an intervention effect.

This comparison is significant because, whereas previous studies typically assessed changes only before and after education, the AVIKASI study also compared changes between the intervention and control groups. Regarding breastfeeding, the mean score change was 16.25 points for the intervention group and 2.25 points for the control group. For complementary feeding, the intervention group showed a

change of 19.40 points, compared to 2.65 points for the control group. Descriptively, the score increase in the intervention group was greater than that in the control group. Given that the independent t-test result ($p < 0.001$) has been confirmed by raw data and statistical output, there is a significant difference in score changes between the intervention and control groups. These findings reinforce previous research regarding the benefits of audiovisual and educational media in improving mothers' knowledge or practices, while also providing further evidence that the combination of audiovisual materials and smart cards used in AVIKASI serves as an effective educational approach for breastfeeding, complementary feeding, and stunting prevention.

The findings of this study are supported by previous research demonstrating the effectiveness of educational interventions using various media to improve maternal knowledge of child health and nutrition. Interventions employing visual media (9,10), audiovisual media (12,13), and combined educational approaches (15,16) have been shown to improve knowledge and understanding. Building on these findings, AVIKASI combines educational videos and smart cards into an integrated educational package to support maternal knowledge and reported practices related to breastfeeding and complementary feeding.

AVIKASI packages several related educational messages—exclusive breastfeeding, the introduction and provision of complementary foods, meal frequency, portion size, food texture, nutritious menus, hygiene, and stunting prevention—using audiovisual materials and reusable flashcards. This integrated format may be a practical adaptation for health education. However, because the components were not evaluated separately, the present study cannot establish that their combination is more effective than either component alone or standard education.

The findings of this study are consistent with previous evidence showing that video-based educational interventions can improve maternal or caregiver knowledge, attitudes, and

practices related to infant and young child feeding (14). These findings support the use of audiovisual media as an educational approach to improve the specific aspects of breastfeeding and complementary feeding assessed in the AVIKASI study. However, improvements in knowledge and feeding practices do not necessarily translate into improvements in children's nutritional status. Therefore, the AVIKASI findings should be interpreted according to the outcomes measured, namely breastfeeding and complementary feeding scores, rather than as evidence of improved child nutritional status (14).

Overall, the AVIKASI study mirrors previous research in showing improvements in knowledge and/or practices following education delivered via audiovisual or visual media. It differs, however, through the integration of educational videos and "Stunting Prevention Smart Cards" into a single AVIKASI medium, as well as the inclusion of a control group, which allowed for a comparison of changes between those receiving the intervention and those who did not.

Thus, these results provide further evidence that the use of reusable educational media combining audiovisual and visual elements has the potential to support improvements in mothers' knowledge and/or practices regarding breastfeeding and complementary feeding. These findings reinforce previous research and demonstrate that developing educational media that are contextual, practical, and reusable can serve as a viable alternative for maternal and child health education.

Study Limitations

This study has several limitations. Follow-up lasted only two weeks, so the persistence of score changes and any sustained change in feeding behavior could not be established. Outcomes were questionnaire-based and may be affected by recall or social-desirability bias. The sample was relatively small and restricted to mothers of children reported to have undernutrition at two

community health centers, limiting generalizability to other populations and settings. Selection bias and attrition bias may also have occurred; the number of participants screened, excluded, and lost to follow-up should be reported. Participants and educators may not have been blinded to the intervention, which could influence responses. Finally, because audiovisual materials and flashcards were delivered as one package, their separate contributions cannot be distinguished. Future studies should use transparent allocation procedures, validated outcome measures, adequate sample-size calculations, longer follow-up, and complete reporting of effect estimates with 95% confidence intervals.

4. CONCLUSION

The AVIKASI group showed greater short-term improvements in breastfeeding and complementary feeding scores than the control group, with statistically significant between-group differences ($p < 0.001$ for both outcomes). These findings support further evaluation of AVIKASI as a combined audiovisual and flashcard educational intervention. However, the conclusions are limited to the measured scores over the two-week observation period and do not demonstrate sustained behavioral changes or improvements in child nutritional status.

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Conflict of Interest

Declare any conflicts of interest. If there are none, use the following statement: "The authors declare no conflict of interest."

Ethics Approval

The study was conducted in accordance with ethical principles for research involving human participants. Ethical approval was obtained from the Research Ethics Committee of Poltekkes Kemenkes Gorontalo under approval number DP.04.03/KEPK/0139/2026 on May 21, 2026. Written informed consent was obtained from all participating mothers before data collection. Participants' confidentiality and privacy were maintained throughout the study, and all data were used solely for research purposes

Author Contributions

All authors contributed to the conception and design of the study. Data collection, data analysis, and interpretation were carried out by the authors. The first author drafted the manuscript, while all authors reviewed, revised, and approved the final version of the manuscript.

Artificial Intelligence (AI) Use Disclosure

Artificial intelligence (AI) tools, including ChatGPT, were used to assist with language editing, grammar correction, and improving the clarity and readability of the manuscript. The authors reviewed and revised the AI-assisted content and take full responsibility for the accuracy, integrity, and final content of the manuscript.

Data Availability

Authors are encouraged to provide a data-availability statement to promote transparency. For example: "The data supporting the findings of this study are available from the corresponding author upon reasonable request." If the data cannot be shared—for example, because of ethical restrictions or the need to protect participant confidentiality—briefly explain why.

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