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(IJEPC)**<https://gaexcellence.com/ijepe>**IMPROVING MOTHERS' KNOWLEDGE, ATTITUDES,
AND PRACTICES ON GROWTH MONITORING
THROUGH AN INTERACTIVE MULTIMEDIA NUTRITION
EDUCATION MODULE: A QUASI-EXPERIMENTAL
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Abstract:

Growth monitoring is a key component of child health care as it helps in the early detection of faltering growth and timely intervention to prevent stunting. Mothers are important to ensure children receive regular growth monitoring services. However, barriers in effective utilisation of these services may include lack of knowledge, negative attitude and inappropriate practices. The aim of this study was to evaluate the impact of the Interactive Multimedia Nutrition Education Module (IMNEM) on the knowledge, attitude, and practice of mothers regarding growth monitoring among mothers of stunted children. A quasi-experimental study was conducted among mothers of stunted children involved in the IMNEM intervention. Maternal knowledge, attitude, and practice regarding growth monitoring were assessed before and after intervention using validated questionnaire. Changes in maternal knowledge, attitudes and practices after the intervention were assessed by appropriate statistical methods. Both groups showed improved knowledge over time, while the intervention group demonstrated greater improvements in attitudes and practices than the control group following completion of the IMNEM programme. At follow-up mothers had better understanding of child growth monitoring

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and had more positive attitudes towards the regular growth assessment and adopted the appropriate growth monitoring practices compared with baseline. The findings suggest that multi-media based nutritional education is an effective education strategy for increasing maternal participation in growth monitoring activities and promoting early detection of growth problems in children at risk of stunting. The integration of interactive multimedia education into routine maternal and child health services may improve the implementation of growth monitoring programmes and support ongoing efforts to reduce childhood stunting. Further studies are needed to determine the long-term sustainability of the intervention and its effectiveness in different community settings.

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Keywords:

Growth Monitoring, Interactive Multimedia Nutrition Education Module, Maternal Knowledge, Attitudes, Practices, Stunting.



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Introduction

Childhood stunting remains one of the most persistent public health challenges worldwide. Although considerable progress has been made in improving maternal and child nutrition, millions of children continue to experience impaired linear growth during the critical early years of life. Stunting reflects chronic undernutrition and has lifelong consequences, including poorer cognitive development, reduced educational achievement, lower productivity in adulthood, and an increased risk of chronic diseases (Black et al., 2013; de Onis & Branca, 2016; Victora et al., 2021). While the global prevalence of stunting has declined over recent decades, the pace of improvement remains insufficient to achieve the World Health Assembly nutrition targets and Sustainable Development Goal 2.2 (United Nations Children's Fund et al., 2023; World Health Organization, 2023).

Malaysia faces a similar challenge. Despite continued investment in maternal and child health services, stunting remains a significant concern among children under five years of age. The National Health and Morbidity Survey 2022 reported that 21.2% of Malaysian children under five were stunted, a figure that remains well above the national target outlined in the National Plan of Action for Nutrition (Institute for Public Health, 2023; National Coordinating Committee on Food and Nutrition, 2016). These findings suggest that strengthening existing nutrition programmes requires not only improved healthcare services but also greater support for caregivers in recognising and responding to early growth problems.

Growth monitoring is a key component of child healthcare because it enables healthcare providers to assess a child's physical growth regularly and identify growth faltering at an early stage. Regular measurement of weight and height allows deviations from expected growth patterns to be detected before more serious nutritional problems develop, creating opportunities

for timely intervention and appropriate follow-up. Since growth during the first five years of life is particularly sensitive to nutritional and environmental influences, effective growth monitoring plays an important role in promoting healthy child development and preventing long-term growth impairment (World Health Organization Multicentre Growth Reference Study Group, 2006; World Health Organization, 2007).

The success of growth monitoring depends not only on the availability of health services but also on the active involvement of mothers. As primary caregivers, mothers are responsible for attending routine child health visits, understanding growth information, and applying healthcare advice at home. When mothers have limited knowledge or do not appreciate the importance of growth monitoring, opportunities for early identification and management of growth problems may be missed. This highlights the need for educational strategies that encourage positive attitudes and sustainable caregiving behaviours rather than simply increasing knowledge (Bandura, 1986; Mitra et al., 2023).

In Malaysia, maternal and child health services routinely provide nutrition education. However, traditional approaches frequently rely on printed materials and brief counselling sessions, which may not fully engage carers or support long-term behaviour change. Advances in digital learning create new opportunities for delivering health information in a more interactive and accessible manner. Recognising this potential, the Interactive Multimedia Nutrition Education Module (IMNEM) was created using the ADDIE instructional design model, which integrates text, graphics, audio, animation, and interactive learning activities into a structured educational program. The module was developed to improve mothers' knowledge, attitudes, and practices regarding growth monitoring, while supplementing routine health education provided in primary healthcare settings (UNICEF, 2021; World Health Organization, 2019).

Although multimedia education has shown promise in improving health-related knowledge and behaviours, research on its effectiveness in promoting growth monitoring practices among Malaysian mothers of stunted children is limited. Evaluating IMNEM is therefore necessary to determine whether it can improve maternal knowledge, attitudes, and practices beyond those achieved through routine health education alone. The findings could provide evidence to support the use of interactive multimedia in maternal and child health programs. The purpose of this study was to assess the effectiveness of the Interactive Multimedia Nutrition Education Module (IMNEM) in improving mothers' knowledge, attitudes, and practices regarding growth monitoring among mothers of stunted children.

Theoretical Framework

This study was guided by Social Cognitive Theory (SCT) and the ADDIE instructional design model (Figure 1). SCT proposes that health behaviours are influenced by the interaction of personal, behavioural, and environmental factors. In this study, mothers' knowledge, attitudes, and practices (KAP) regarding growth monitoring represent the behavioural outcomes targeted by the educational intervention. The theory suggests that interactive learning can strengthen knowledge, improve confidence, and encourage positive health behaviours related to routine growth monitoring.

The Interactive Multimedia Nutrition Education Module (IMNEM) was developed using the ADDIE model (Branch, 2009), which consists of five phases: analysis, design, development, implementation, and evaluation. This systematic approach ensured that the educational content

was tailored to the learning needs of mothers with stunted children and delivered via an interactive multimedia platform. As shown in Figure 1, the intervention was expected to improve maternal knowledge, attitudes, and practices regarding growth monitoring, resulting in increased participation in growth monitoring services, earlier detection of growth faltering, and, ultimately, better child growth outcomes.

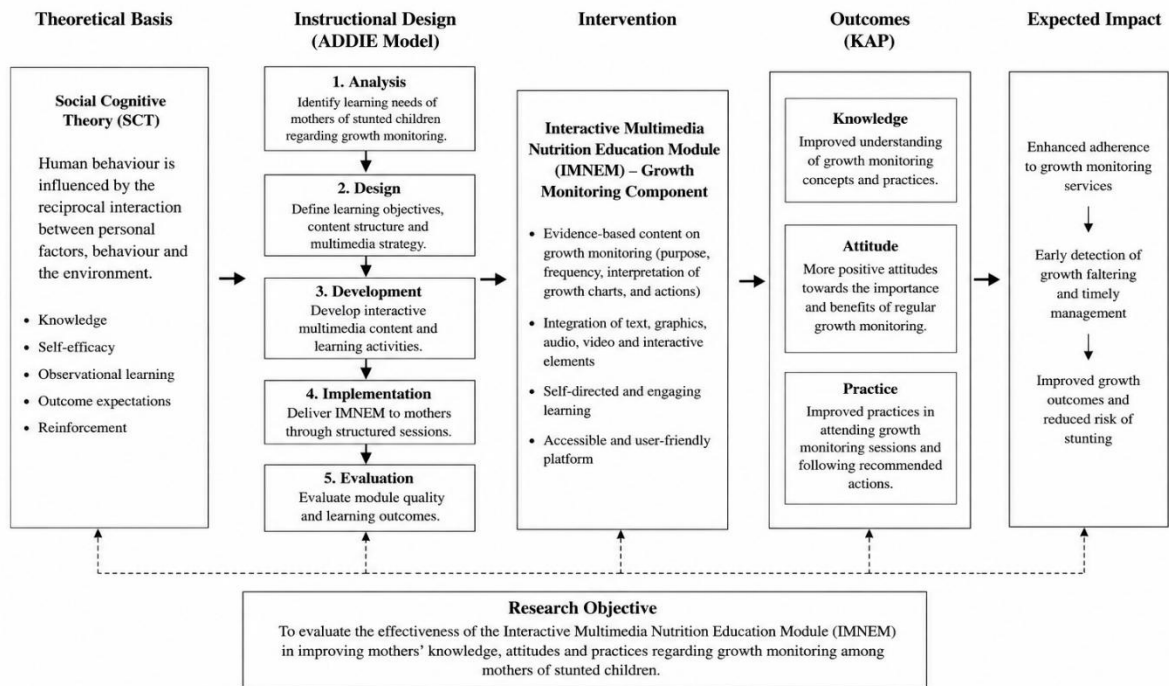


Figure 1. Theoretical framework of the study.

Note. KAP = Knowledge, Attitude, Practice; ADDIE = Analysis, Design, Development, Implementation, Evaluation; IMNEM = Interactive Multimedia Nutrition Education Module.

Figure 1: Theoretical Framework Illustrating the Relationship Between Social Cognitive Theory, the ADDIE Instructional Design Model, the Interactive Multimedia Nutrition Education Module (IMNEM), and Its Expected Effects on Maternal Knowledge, Attitudes, and Practices Regarding Growth Monitoring.

Methodology

Study Design

This study utilised a quasi-experimental, non-equivalent pre-test–post-test control group design to evaluate the effectiveness of the Interactive Multimedia Nutrition Education Module (IMNEM) in improving mothers' knowledge, attitudes, and practices (KAP) towards growth monitoring. Mothers of stunted children attending selected government maternal and child health clinics in Penang, Malaysia were recruited by convenience sampling and allocated to either the intervention or control group. Outcome measurements were obtained at pre-test, immediately after the eight-week intervention, and at a follow-up assessment conducted three months after the implementation of IMNEM.

Sample Size

Sample size was calculated using G*Power (Version 3.1.9.7), based on an effect size of 0.53 reported in previous study, a significance level of 0.05, and statistical power of 80%, requiring a minimum of 30 participants per group. Taking into consideration the 10% non-response rate, the final sample comprised of 66 mothers, 33 participants in each group. All eligible participants completed study, with no dropouts.

Research Tools

A structured self-administered questionnaire covered maternal socio-demographic characteristics, child characteristics, obstetric and illness history, anthropometric measurements, and KAP domains on growth monitoring. The questionnaire was originally developed in English and subsequently translated into Malay by using the forward and backward translation procedures to ensure linguistic equivalence. After the translation, the questionnaire underwent content and face validation, followed by pilot study before the actual study.

Eight experts in nutrition, nursing, clinical nutrition and community medicine assessed content validity using the Content Validity Index (CVI) and Content Validity Ratio (CVR). Items were evaluated for relevance, clarity, simplicity and ambiguity, resulting in an instrument with excellent content validity (S-CVI/Ave >0.90).

Subsequently, face validity was assessed with three mothers of stunted children, three nutritionists and three nursing personnel to assess clarity, readability and comprehensibility. Ambiguous items were modified or deleted based on the feedback. A pilot study was carried out on 30 mothers, and the internal consistency was found to be satisfactory with Cronbach's alpha coefficient of 0.742, 0.720 and 0.727 for knowledge, attitude and practice respectively.

Intervention

The intervention group received IMNEM in addition to routine health education and the control group received routine health education only. The module was delivered over eight weeks and focused on enhancing mothers' understanding of child growth monitoring through interactive multimedia learning materials. The same questionnaire was completed by the participants before and after the intervention.

Data Analysis

IBM SPSS Statistics version 26 was used to analyse data. Descriptive statistics were used to describe participant characteristics and KAP scores. Prior to analysis, data screening and normality tests were performed to ensure the suitability of statistical methods and the validity of the results.

Mean differences were computed to evaluate the effectiveness of the IMNEM intervention, while a mixed Analysis of Variance (ANOVA) was used to assess the between-subject effect (intervention group vs. control group), the within-subject effect (changes in KAP scores over time), and the group $\times$ time interaction effect. The primary measure of intervention effectiveness was the interaction effect, which indicated whether there was a significant

difference between the intervention and control groups in the change of KAP scores over time. The statistical significance was set at $p < 0.05$. The level of statistical significance was set at $p < 0.05$. Where significant effects were identified, post hoc pairwise comparisons with Bonferroni correction were conducted.

Results

Participants' Characteristics

A total of 66 mothers of stunted children participated in the study, with 33 assigned to the intervention group and 33 to the control group. Table 1 presents the demographic characteristics of the participants. The majority of mothers in both groups were within the reproductive age range of 30-39 years, were married and housewives. SPM was the most common educational backgrounds, especially in intervention group, compare to control group who held bachelor's degree mostly. Almost half of mothers in both groups reported monthly household incomes below RM 2,500, and most families in both groups had four to five members with one to two children in a family. The characteristics of the children, including age and sex, were also similar between groups. No statistically significant differences were observed in baseline demographic characteristics, indicating that the intervention and control groups were comparable before the implementation of IMNEM.

Table 1: Mother's Sociodemographic Background

Demographic	Control group		Treatment group		Overall	
	Frequency (N = 33)	Percentage (%)	Frequency (N = 33)	Percentage (%)	Frequency (N = 66)	Percentage (%)
Age						
< 20 years	1	3.0	1	3.0	2	3.0
21-29 years	8	24.2	14	42.4	22	33.3
30-39 years	17	51.5	16	48.5	33	50.0
> 40 years	7	21.2	2	6.1	9	13.6
Race						
Malay	26	78.8	30	90.9	56	84.8
Chinese	3	9.1	1	3.0	4	6.1
Indian	3	9.1	2	6.1	5	7.6
Others	1	3.0	0	0.0	1	1.5
Education						
UPSR	2	6.1	1	3.0	3	4.5
PMR	2	6.1	2	6.1	4	6.1
SPM	12	36.4	17	51.5	29	43.9
STPM	1	3.0	3	9.1	4	6.1
Sijil/Diploma	6	18.2	8	24.2	14	21.2
Bachelor degree	8	24.2	2	6.1	10	15.2
Master degree	1	3.0	1	3.0	2	3.0
Others	1	3.0	0	0.0	1	1.5
Occupation						

Demographic	Control group		Treatment group		Overall	
	Frequency (N = 33)	Percentage (%)	Frequency (N = 33)	Percentage (%)	Frequency (N = 66)	Percentage (%)
Public sector	5	15.2	5	15.2	10	15.2
Private sector workers	7	21.2	10	30.3	17	25.8
Housewife	17	51.5	15	45.5	32	48.5
Self-employed	4	12.1	2	6.1	6	9.1
Others (Specify)	0	0.0	1	3.0	1	1.5
Marital Status						
Married	33	100.0	33	100.0	66	100.0
Monthly Income						
B1 <RM2500	16	48.5	14	42.4	30	45.5
B2 RM2501-RM3169	5	15.2	9	27.3	14	21.2
B3 RM3170-RM3969	3	9.1	1	3.0	4	6.1
B4 RM3970-RM4849	2	6.1	1	3.0	3	4.5
M1 RM4850-RM5879	1	3.0	3	9.1	4	6.1
M2 RM5880-RM5879	3	9.1	3	9.1	6	9.1
M3 RM7100-RM8699	2	6.1	1	3.0	3	4.5
T1 RM10960-RM15039	1	3.0	0	0.0	1	1.5
T2 RM15039	> 0	0.0	1	3.0	1	1.5
Family members						
2-3 people	11	33.3	10	30.3	21	31.8
4-5 people	14	42.4	16	48.5	30	45.5
> 6 people	8	24.2	7	21.2	15	22.7
Number of children						
1-2 children	19	57.6	19	57.6	38	57.6
3-4 children	9	27.3	9	27.3	18	27.3
> 5 children	5	15.2	5	15.2	10	15.2

Demographic	Control group		Treatment group		Overall	
	Frequency (N = 33)	Percentage (%)	Frequency (N = 33)	Percentage (%)	Frequency (N = 66)	Percentage (%)
Residency						
Urban	18	54.5	16	48.5	34	51.5
Rural	15	45.5	17	51.5	32	48.5

Source: Authors' analysis (2026).

Baseline Levels of Growth Monitoring Knowledge, Attitudes, and Practices

Prior to the intervention, participants' levels of knowledge of growth monitoring varied. Overall, 43.9% of the participants demonstrated good knowledge, 31.8% demonstrated moderate knowledge and 24.2% demonstrated poor knowledge. The mean attitude score was 3.95 (SD = 0.46), indicating a generally positive attitude towards growth monitoring. In contrast, the mean practice score was 3.13 (SD = 0.89), reflecting a moderate level of growth monitoring practice. Although participants generally recognised the importance of growth monitoring, the results indicate that their knowledge and positive attitudes had not yet been fully translated into consistent caregiving practices.

Table 2: Baseline Levels of Growth Monitoring Knowledge, Attitudes, and Practices

Variable	Mean $\pm$ SD	Level	n (%)
Knowledge	5.00 $\pm$ 1.85	Poor	16 (24.2%)
		Moderate	21 (31.8%)
		Good	29 (43.9%)
Attitude	3.95 $\pm$ 0.46	High	-
Practice	3.13 $\pm$ 0.89	Moderate	-

Source: Authors' analysis (2026).

Effect of IMNEM on Growth Monitoring Knowledge

The effectiveness of the Interactive Multimedia Nutrition Education Module on growth monitoring knowledge was evaluated using a mixed-design analysis of variance (ANOVA). Knowledge scores improved across all three assessment points, with greater improvements observed among participants in the intervention group than in the control group. Post hoc Bonferroni comparisons revealed that knowledge scores improved significantly from pre-test to post-test, and that these improvements were sustained at follow-up. The observed changes over time show that the multimedia-based educational intervention effectively improved mothers' knowledge of growth monitoring.

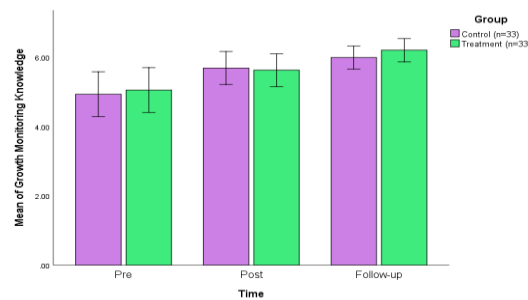


Figure 2: Mean Knowledge Scores at Pre-Test, Post-Test, and Follow-Up for the Intervention and Control Groups

Effect of IMNEM on Growth Monitoring Attitudes

Mixed-design ANOVA found a significant main effect of time on growth monitoring attitudes ($F(2, 128) = 12.798, p < 0.001$), indicating that attitude scores changed significantly over the study period. However, the main effect of group was not statistically significant ($F(1, 64) = 1.389, p = 0.243$), indicating that the intervention and control groups had similar overall attitude scores when averaged across all measurement occasions. There was a significant interaction effect between time and group ($F(2, 128) = 8.836, p < 0.01$), indicating that the two groups' patterns of change over time differed. Bonferroni post hoc comparisons revealed that attitude scores in the intervention group improved significantly from pre-test to post-test and remained significantly higher at follow-up, whereas only minor changes were observed in the control group. These results suggest that IMNEM was effective in improving maternal attitudes towards growth monitoring.

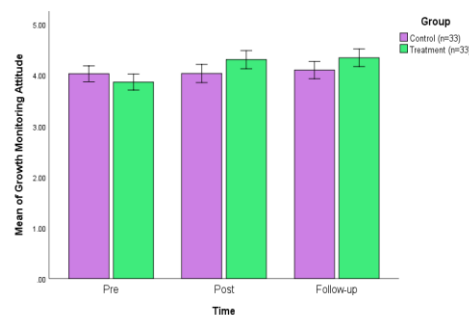


Figure 3: Mean Attitude Scores at Pre-Test, Post-Test, and Follow-Up for the Intervention and Control Groups

Effect of IMNEM on Growth Monitoring Practices

The mixed-design ANOVA also revealed a significant main effect of time on growth monitoring practices ($F(2, 128) = 24.487, p < 0.001$), indicating significant improvements across all three assessment points. There was a significant main effect of group ($F(1, 64) = 7.946, p < 0.01$), indicating differences in practice scores between the intervention and control groups. There was a significant interaction effect between time and group ($F(2, 128) = 10.144, p < 0.01$), indicating that changes in practice varied by group. A Bonferroni post hoc analysis revealed that participants in the intervention group improved significantly in practice from pre-test to post-test, and these improvements were maintained at follow-up. In contrast, the control

group showed only a minor improvement during the follow-up assessment. These findings show that IMNEM significantly improved mothers' growth monitoring practices over time.

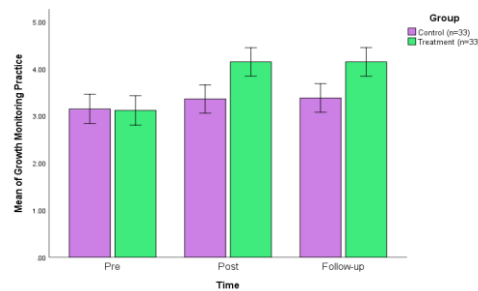


Figure 4: Mean Practice Scores at Pre-Test, Post-Test, and Follow-Up for the Intervention and Control Groups.

This study found that mothers who participated in the IMNEM programme improved their knowledge, attitudes, and practices regarding child growth monitoring over the duration of the study. Compared with mothers who received routine health education, those in the intervention group demonstrated greater improvements across all three outcome measures. These findings suggest that the use of interactive multimedia enhanced learning beyond traditional education. The use of visual content, audio explanations, and interactive activities may have helped mothers better understand growth monitoring and apply what they learned in routine childcare.

Discussion

The current study investigated the effectiveness of the Interactive Multimedia Nutrition Education Module in improving mothers' knowledge, attitudes, and practices regarding child growth monitoring. Overall, the results indicate that the module was beneficial, though the effects differed across the three outcome domains. While both the intervention and control groups' knowledge scores increased over time, mothers who received IMNEM showed greater improvements in attitudes and practices. These findings suggest that interactive multimedia may complement traditional health education by encouraging positive changes in maternal behaviour, rather than simply increasing knowledge. Both groups improved their understanding of child growth monitoring over the duration of the study. This finding suggests that mothers continued to learn from routine maternal and child health services, which include growth monitoring and nutrition counselling on a regular basis. Similar findings were reported by Daniel et al. (2017), Debuo et al. (2017), and Garner et al. (2000), who discovered that participation in routine growth monitoring programs improved maternal understanding of child growth. Although IMNEM included videos, illustrations, narration, and interactive quizzes, the improvement in knowledge was not significantly different from that achieved through routine care. Growth monitoring entails more than just remembering information; mothers also learned how to interpret growth charts and identify changes in their children's growth patterns. Healthcare providers frequently need to explain these skills multiple times and provide practical guidance. This could explain why knowledge improved consistently in both groups despite the additional multimedia intervention. The findings are consistent with Mayer's Cognitive Theory of Multimedia Learning, which states that multimedia improves understanding when learners can effectively integrate visual and verbal information, but complex concepts may still require guidance and reinforcement (Mayer, 2009, 2020). A different pattern emerged for attitudes. Mothers who received IMNEM had better attitudes toward growth monitoring than those who received routine health education. One possible

explanation is that the multimedia materials presented information in a more understandable and engaging format than traditional counselling alone. Videos, animations, narration, and illustrations may have helped mothers understand the importance of regular growth monitoring and given them the confidence to actively participate in their children's healthcare.

The weekly delivery of educational materials through WhatsApp provided mothers with repeated exposure to key messages, allowing them to review the information at their own pace. These findings are consistent with Social Cognitive Theory, which emphasises that knowledge, confidence, expectations, and the learning environment all influence behavioural change (Bandura, 1986; Glanz et al., 2008). Akinrinmade et al. (2019) reported similar improvements in maternal attitudes following structured nutrition education.

The most significant effect of IMNEM was seen in mothers' growth monitoring practices. Mothers in the intervention group reported greater improvements in recommended practices compared to those who only received routine health education. This finding suggests that the intervention assisted mothers in incorporating what they had learned into their daily childcare practices. Although both groups gained knowledge, mothers who received IMNEM may have had stronger improvement in attitudes, encouraging them to use this knowledge more consistently. This pattern is consistent with the Knowledge-Attitude-Practice model, which states that knowledge alone is frequently insufficient to produce behavioural change unless combined with positive attitudes and motivation (Habib et al., 2023). The findings emphasise the importance of educational approaches that promote healthy caregiving practices while also addressing understanding and motivation.

IMNEM's design may also have contributed to its effectiveness. The module was developed using the ADDIE instructional design framework and delivered through WhatsApp, which included short videos, narration, graphics, and interactive quizzes. This method enabled mothers to access the learning materials whenever it was convenient and to review the content as often as needed. Such flexibility is especially beneficial for mothers who must balance childcare, work, and household responsibilities. Rather than replacing routine counselling provided by healthcare professionals, multimedia learning appears to expand learning beyond the clinic by providing mothers with ongoing access to educational resources.

The findings have practical implications for maternal and child health programs. Interactive multimedia provides a practical way to enhance existing nutrition education without replacing current services. Digital learning materials can reinforce messages delivered during clinic visits, encourage home learning, and provide mothers with easy access to information when questions arise. As smartphone use grows, multimedia education may become a more effective strategy for supporting maternal learning and promoting appropriate child health practices.

Several limitations should be recognised. The quasi-experimental design and convenience sampling approach may limit the generalisability of the results. Furthermore, maternal practices were evaluated using self-reported questionnaires, which could be skewed by recall bias or socially desirable responses. Future research should consider randomised controlled trials with larger and more diverse populations, as well as longer follow-up periods, to determine whether behavioural changes persist over time. Incorporating interactive features, such as guided growth chart interpretation or personalised feedback, may help mothers better understand and apply growth monitoring.

In conclusion, IMNEM provided additional benefits beyond routine health education by improving mothers' attitudes and practices regarding child growth monitoring. Although both groups' knowledge increased, the multimedia intervention appeared to increase engagement with growth monitoring and support the implementation of recommended caregiving practices. These findings suggest that incorporating interactive multimedia into routine maternal and child health education could strengthen current health promotion efforts and aid in the early detection of growth problems in young children.

Conclusion

The study confirmed the Interactive Multimedia Nutrition Education Module as an effective educational strategy for improving mothers' attitudes and practices regarding child growth monitoring. Both the intervention and control groups improved their knowledge over time. The multimedia intervention significantly improved the mothers' attitudes and practices. The findings indicate that interactive multimedia could be used as a supplement to traditional health education to increase engagement, reinforce learning, and encourage positive behavioural change. This study contributes to the increasing evidence on technology-based health education, emphasising the importance of incorporating structured multimedia education into maternal and child health programs. Routine growth monitoring services could be enhanced by incorporating interactive educational sessions, which could result in better caregiving practices, increased maternal engagement, and early detection and prevention of childhood growth issues.

Implications

Theoretical Implications

The results support the use of Social Cognitive Theory and the ADDIE instructional design model in maternal health education. Improvements in maternal attitudes and practices indicate that interactive multimedia aids in behavioural change by increasing knowledge acquisition, motivation, and self-efficacy. The research also shows that well-designed digital learning materials can effectively translate educational content into positive health behaviours.

Practical Implications

The findings support the incorporation of multimedia-based growth monitoring education into routine maternal and child health services. Interactive modules can supplement face-to-face counselling for healthcare professionals by reinforcing key messages and providing flexible learning opportunities beyond clinic visits. Educators may incorporate similar multimedia resources into health promotion programs to increase learner engagement and knowledge retention. Digital education is a scalable approach that policymakers should consider improving maternal health literacy, standardise health education delivery, and improve child growth-monitoring practices, particularly in resource-constrained environments.

Recommendations for Practice

Healthcare facilities should incorporate interactive multimedia modules into routine growth monitoring services to supplement traditional health education. It is recommended that healthcare providers receive ongoing training on how to effectively use digital educational tools in order to maximise program implementation. Future health promotion interventions

should incorporate user-friendly mobile-based learning platforms to increase maternal participation and maintain growth-monitoring practices.

Limitations

The study has several limitations. The quasi-experimental design and convenience sampling may limit the generalisability of findings. Second, data on maternal knowledge, attitudes, and practices were gathered through self-reported questionnaires, which are susceptible to recall and social desirability bias. Finally, the relatively short follow-up period precluded assessing the long-term viability of the behavioural changes. It is recommended that the impact of multimedia-based growth-monitoring education be assessed further using randomised controlled designs, larger and more diverse samples, and longer follow-up periods.

Recommendations for Future Research

Future research is needed to strengthen the evidence for the effectiveness of multimedia-based growth-monitoring education by conducting randomised controlled trials with larger and more diverse samples. Longer follow-up periods are recommended to assess the long-term effectiveness of changes in maternal knowledge, attitudes, and practices. Future research in different geographic locations and health care settings would improve the generalisability of the findings. Furthermore, future research should look into how to use mobile health technologies and personalised digital learning methods to increase maternal involvement and ensure long-term compliance with recommended growth monitoring.

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Written informed consent was obtained from all participants before their enrolment in the study.
- Author Contribution Statement:** All authors have contributed significantly to the development of this manuscript. Susheela Ismail was responsible for the conceptualization of the study, development of the IMNEM, research design, data collection, data analysis, interpretation of findings and manuscript writing. Nurfarhana Diana Mohd Nor, Nurul Fadhilah Abdullah were responsible for the supervision of the study, development of the theoretical framework, methodological review, validation of findings, critical editing of the manuscript and final revision. All authors read and approved the final version of the manuscript before submission.
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