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THE EFFECT OF INTERACTIVE VISUAL-BASED NUTRITION EDUCATION ON NUTRITION LITERACY AMONG PREGNANT WOMEN

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ABSTRACT

Maternal nutrition literacy plays an important role in determining nutritional behavior during pregnancy. Inadequate nutrition literacy may increase the risk of chronic energy deficiency, anemia, low birth weight, and other adverse pregnancy outcomes. Interactive visual-based nutrition education has been developed as an innovative approach to improve understanding and retention of nutrition-related information among pregnant women. This study aimed to determine the effect of interactive visual-based nutrition education on nutrition literacy among pregnant women at Tambak Agung Auxiliary Health Center, Mojokerto. A quasi-experimental study with a one-group pretest-posttest design was conducted among 33 pregnant women selected through purposive sampling. Data were collected using the Nutrition Literacy Assessment Instrument for Pregnant Women (NLAI-P). The intervention consisted of PowerPoint videos, posters, 3D pop-up flipcharts, and "Isi Piringku" Velcro puzzle activities. Data were analyzed using a Paired Sample t-test with a significance level of 0.05. The results showed that the proportion of respondents with good nutrition literacy increased from 12.1% before the intervention to 72.7% after the intervention. The mean nutrition literacy score increased from 51.21 ± 11.42 to 76.85 ± 8.96. Statistical analysis revealed a significant difference between pretest and posttest scores ($p < 0.001$). Interactive visual-based nutrition education significantly improved nutrition literacy among pregnant women. This educational model can be considered an effective strategy to strengthen maternal nutrition promotion programs in primary healthcare settings.

Keywords

nutrition literacy; pregnant women; nutrition education; visual learning; maternal nutrition.

INTRODUCTION

Maternal nutritional problems remain a significant public health concern because they directly affect pregnancy outcomes and child growth and development. Inadequate nutritional status during pregnancy increases the risk of anemia, chronic energy deficiency, low birth weight (LBW), and other adverse maternal and neonatal outcomes. Adequate nutrition literacy is essential for supporting healthy dietary practices and improving pregnancy outcomes. Previous studies have demonstrated that nutrition education can significantly improve pregnant women's nutritional knowledge and health-related behaviors (Permatasari et al., 2021). However, the effectiveness of nutrition education is strongly influenced by the methods used to deliver information, particularly among women with varying educational backgrounds and health literacy levels (Suryani et al., 2022).

According to UNICEF (2025), maternal nutritional status in Indonesia remains suboptimal. The prevalence of chronic energy deficiency among pregnant women decreased only slightly from 17.3% to 16.9%, while anemia prevalence remained at 27.7%, exceeding the World Health Organization threshold for a moderate public health problem. Similarly, the prevalence of low birth weight infants remained relatively unchanged between 2018 and 2024. In contrast, previous studies reported substantial improvements in nutritional knowledge following visual-based educational interventions. Audio-visual education significantly increased nutritional knowledge scores among pregnant women, while infographic-based education increased the proportion of mothers with good nutritional knowledge from 33.5% to 76.2% (Elsanti & Sumarmi, 2023; Patty et al., 2023). These findings suggest that visual learning approaches have considerable potential to improve nutrition literacy among pregnant women.

Recent developments in health education have shifted from conventional information delivery toward more interactive and participatory learning approaches. Interactive visual media enable pregnant women not only to receive information but also to better understand, evaluate, and apply nutrition-related knowledge in their daily lives. Despite growing evidence supporting visual educational strategies, structured and scientifically evaluated interactive visual-based nutrition education models for pregnant women remain limited. Therefore, this study aimed to examine the effectiveness of an Interactive Visual-Based Nutrition Education Model in improving nutrition literacy among pregnant women.

METHOD

This study employed a quasi-experimental one-group pretest-posttest design to evaluate the effectiveness of an Interactive Visual-Based Nutrition Education Model in improving nutrition literacy among pregnant women. The study was conducted in May 2026 at Tambak Agung Auxiliary Health Center, Mojokerto Regency, Indonesia. The population consisted of 35 pregnant women. Using purposive sampling, thirty-three pregnant women who met the inclusion criteria participated in the study.

Nutrition literacy was assessed using the Nutrition Literacy Assessment Instrument for Pregnant Women (NLAI-P) developed and validated by Zhou et al., (2022), which demonstrated excellent validity (Content Validity Index = 0.98; Content Validity Ratio = 0.97) and good reliability (Cronbach's α = 0.82). The intervention consisted of a 60-minute nutrition education session using interactive visual media, including PowerPoint videos,

posters, a 3D pop-up flipchart, and the "Isi Piringku" Velcro puzzle. Pretest and posttest assessments were conducted to measure changes in nutrition literacy. Data normality was assessed using the Shapiro-Wilk test, indicating normal distribution for both pretest ($p = 0.154$) and posttest ($p = 0.118$) scores. Therefore, data were analyzed using the Paired Sample t-test with a significance level of $\alpha = 0.05$. Ethical approval was obtained from the Health Research Ethics Committee of Universitas Bina Sehat PPNI Mojokerto and written informed consent was obtained from all participants.

RESULTS

Characteristics of Respondents

Table 1. Characteristics of Respondents

Variable	n	%
Age (years)		
<20	3	9.1
20-35	26	78.8
>35	4	12.1
Total	33	100
Parity		
Primiparous	14	42.4
Multiparous/Grande	19	57.6
Total	33	100
Education		
Primary	12	36.4
Middle	18	54.5
High	3	9.1
Total	33	100
Occupation		
Not Working (Housewife)	23	69.7
Employed	10	30.3
Total	33	100

Source: Primary Data 2026

Based on Table 1, the interpretation of respondents' characteristics is as follows: Maternal Age: The majority of respondents (78.8%) were within the safe reproductive age range of 20–35 years, while only a small proportion (9.1%) were younger than 20 years. Educational Level: More than half of the respondents (54.5%) had completed secondary education (Senior High School/Vocational High School), whereas only a small proportion (9.1%) had attained higher education. Employment Status: Most respondents (69.7%) were unemployed and identified themselves as housewives. Parity: The majority of respondents (57.6%) were multigravida, indicating that they had experienced pregnancy more than once.

Nutrition Literacy Before and After Intervention

Table 2. Nutrition Literacy Levels Before and After Intervention.

Nutrition Literacy	Pre-test		Post-test		P value
	n	%	n	%	
Good	4	12.1	24	72.7	
Moderate	11	33.3	7	21.2	< 0.001
Poor	18	54.5	2	6.1	
Total	33	100	33	100	

Source: Primary Data 2026

Based on Table 2, the interpretation of respondents' nutritional literacy levels is as follows:

Before the Intervention (Pre-test): The majority of pregnant women (54.5%) had nutritional literacy levels classified as Poor. Only a small proportion of respondents (12.1%) were categorized as having Good nutritional literacy.

After the Intervention (Post-test): Following the implementation of the interactive visual-based nutrition education model, a substantial improvement was observed. The majority of pregnant women (72.7%) achieved Good nutritional literacy levels, while only a small proportion (6.1%) remained in the Poor category.

Effect of Interactive Visual-Based Nutrition Education

Table 3. Results of the Shapiro-Wilk Normality Test

Variables	Shapiro-Wilk Statistic	p-value
Pretest Nutrition Literacy Score	0.952	0,154
Posttest Nutrition Literacy Score	0.947	0,118

Source: Primary Data 2026

Based on Table 3, The Shapiro-Wilk test indicated that both pretest ($p = 0.154$) and posttest ($p = 0.118$) nutrition literacy scores were normally distributed ($p > 0.05$). Therefore, the Paired Sample t-test was used to analyze the effectiveness of the intervention.

Table 4. Paired Sample t-test Results.

Variables	Mean	Std. Deviation	Mean Difference	p-value (Sig. 2-tailed)
Pre-test	51.21	11.42	25.64	< 0.001
Post-test	76.85	8.96		

Source: Primary Data 2026

Based on Table 4, the mean nutritional literacy score increased from 51.21 ± 11.42 before the intervention to 76.85 ± 8.96 after the intervention. The mean difference was 25.64 points, indicating an improvement in pregnant women's nutrition literacy following participation in the Interactive Visual-Based Nutrition Education Model. Paired Sample t-test analysis revealed a statistically significant difference between pretest and posttest scores ($p < 0.001$), indicating that the intervention was effective in improving nutrition literacy among pregnant women at Tambak Agung Auxiliary Health Center, Puri District, Mojokerto Regency.

DISCUSSION

Demographic Characteristics of the Respondents (Maternal Age, Educational Level, Parity, and Employment Status)

The findings from 33 pregnant women at Tambak Agung Auxiliary Public Health Center (Pustu Tambak Agung) indicate that nutritional literacy was influenced by respondents' sociodemographic characteristics, including age, educational attainment, parity, and employment status. These factors affect mothers' readiness to receive, understand, and apply nutrition-related information (Happy et al., 2023).

Most respondents (78.8%) were within the healthy reproductive age range of 20–35 years, which may have supported the effectiveness of the intervention due to greater psychological maturity and cognitive readiness. Women in this age group tended to be more cooperative, focused, and responsive to the educational media, whereas younger mothers (<20 years) often demonstrated lower baseline literacy levels and greater dependence on family and peer influences (Amalia, 2026; Saputri, 2023).

More than half of the respondents (54.5%) had completed secondary education. Although educational attainment is generally associated with better literacy skills, most respondents still exhibited poor nutritional literacy at baseline. This finding highlights a nutrition literacy gap, whereby general reading ability does not necessarily translate into the ability to understand and apply nutritional recommendations in daily life. The use of the 3D Pop-Up Flipchart and the "My Balanced Plate" Velcro Puzzle helped bridge this gap by converting complex nutritional information into

concrete visual and tactile learning experiences that were easier to understand across educational levels (Aswita et al., 2022; Mayer, 2021; Nurleli, 2026)

Regarding parity, most respondents (57.6%) were multigravida. However, previous pregnancy experience did not guarantee higher nutritional literacy, as many mothers remained influenced by local food myths and misconceptions. In contrast, primigravida mothers (42.4%) demonstrated greater curiosity and engagement during educational activities, actively participating in discussions and simulations, which enhanced their understanding of nutritional concepts (Noer et al., 2019; Nolan & Gore, 2022).

Most respondents (69.7%) were housewives. Although employed mothers may have broader access to information, time constraints can limit their participation in maternal health education. Housewives, on the other hand, had greater flexibility to engage with the interactive educational media while waiting for antenatal care services. This approach transformed waiting time into a meaningful learning opportunity and promoted active participation, independent learning, and critical thinking regarding nutritional information (Kemenkes, 2020).

Overall, these findings suggest that the Interactive Visual-Based Nutrition Education Model effectively accommodated differences in sociodemographic characteristics and facilitated improved nutritional literacy among pregnant women through engaging visual and tactile learning experiences.

Impact of Interactive Visual-Based Nutrition Education on Nutrition Literacy Among Pregnant Women

Based on the findings of this study, the Interactive Visual-Based Nutrition Education Model significantly improved nutrition literacy among pregnant women. The mean nutrition literacy score increased from 51.21 before the intervention to 76.85 after the intervention, with a mean difference of 25.64 points ($p < 0.001$). These findings indicate that interactive visual learning strategies can effectively enhance pregnant women's ability to access, understand, evaluate, and apply nutrition-related information during pregnancy.

The effectiveness of the intervention can be explained by Mayer's Cognitive Theory of Multimedia Learning (2021), which suggests that learning is more effective when information is delivered through both visual and verbal channels. In this study, PowerPoint videos, posters, a 3D pop-up flipchart, and the "Isi Piringku" Velcro puzzle provided complementary learning experiences that facilitated information processing and knowledge retention. The use of visual and interactive media enabled participants to better understand nutritional concepts, identify misconceptions, and apply nutritional recommendations in daily life (Green & Olson, 2018).

These findings are consistent with previous studies reporting that visual and audio-visual educational interventions significantly improve maternal nutrition knowledge. Permatasari et al. (2021) found that nutrition education positively influenced maternal nutritional knowledge and health behaviors, while Elsanti and Sumarmi (2023) reported substantial improvements in nutritional knowledge following audio-visual and infographic-based education. Similarly, interactive educational strategies have been shown to enhance participant engagement, critical thinking, and positive behavioral change.

The practical advantages of this model are particularly relevant in primary healthcare settings with limited resources. The educational media can be used

repeatedly, do not require internet access, and encourage self-directed learning while pregnant women wait for antenatal care services. Therefore, the Interactive Visual-Based Nutrition Education Model may serve as an effective and feasible strategy for improving nutrition literacy among pregnant women in community-based maternal health programs.

This study has several limitations. First, the one-group pretest-posttest design did not include a control group, limiting the ability to fully attribute changes in nutrition literacy solely to the intervention. Second, the study was conducted in a single auxiliary health center with a relatively small sample size, which may limit the generalizability of the findings. Future studies should consider randomized controlled designs involving larger and more diverse populations to further evaluate the effectiveness of interactive visual-based nutrition education.

CONCLUSIONS

Interactive visual-based nutrition education significantly improves nutrition literacy among pregnant women at Tambak Agung Auxiliary Health Center, Mojokerto. The intervention increased the proportion of respondents with good nutrition literacy and significantly improved mean literacy scores. This educational model can be utilized as an innovative and effective strategy to strengthen maternal nutrition promotion programs.

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