Journal of Health and Nutrition Research
Vol. 5, No. 1, 2026, pg. 363-342, https://doi.org/10.56303/jhnresearch.v5i1.836
Journal homepage: https://journalmpci.com/index.php/jhnr/index

e-ISSN: **2829-9760**

Flipbook-Based Nutrition Education: A Strategy to Improve Self-Efficacy for Stunting Prevention Among Pregnant Women During the First 1,000 Days of Life

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ORIGINAL ARTICLES

Submitted: 11 September 2025

Accepted: 06 November 2025

Keywords:
Flipbook, 1,000 days of life nutrition, self-efficacy, pregnant women, stunting

ABSTRACT

Maternal self-efficacy is a critical determinant in the application of nutritional knowledge to prevent stunting during the first 1,000 days of life. Innovative educational tools are needed to bolster pregnant women's confidence in managing their nutritional needs. This study aimed to evaluate the effectiveness of a flipbook-based nutritional education intervention on pregnant women's self-efficacy in preventing stunting. This quantitative study employed a quasi-experimental design with a two-group pre-post test. A total of 40 pregnant women at the Medan Denai Health Center were selected using total sampling and randomly assigned into two groups: a treatment group (n=20) receiving flipbook-based education and a control group (n=20) receiving education without flipbooks. Self-efficacy was measured using a validated 15-item questionnaire. Data analysis was performed using the Wilcoxon and Mann-Whitney tests due to the non-normal distribution of the data. In the treatment group, self-efficacy scores significantly improved from a pre-test mean of 35.75 to a post-test mean of 51.05 (Wilcoxon test, p=0.000). The control group showed a minimal increase from 35.35 to 36.25 (Wilcoxon test, p=0.041). A comparison between the two groups revealed that the treatment group achieved a significantly higher mean rank (29.88) compared to the control group (11.13). The Mann-Whitney test confirmed a significant difference (p<0.001), indicating that the flipbook intervention was more effective in increasing maternal self-efficacy than conventional methods. Flipbook-based educational innovation is an effective and promising tool for enhancing the self-efficacy of pregnant women in practicing stunting prevention during the first 1,000 days of life.

Key Messages:

- Flipbook-based nutritional education is a promising innovation with significant potential to enhance maternal self-efficacy and strengthen stunting prevention efforts during the critical first 1,000 days of life.

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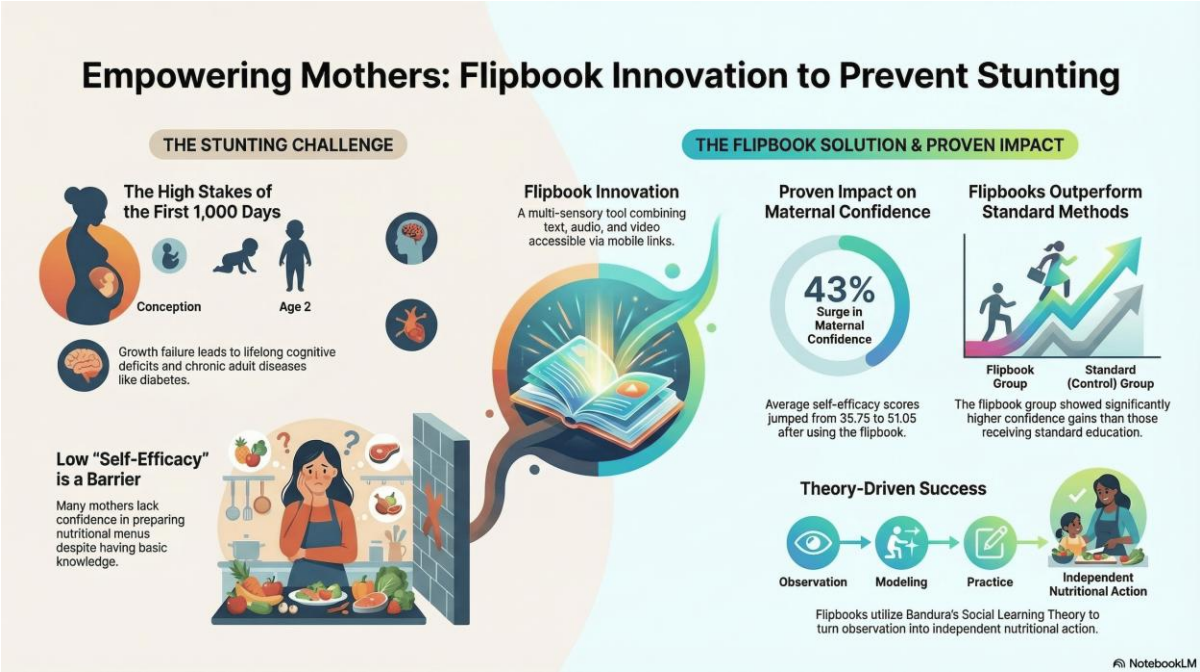
GRAPHICAL ABSTRACT



INTRODUCTION

Stunting is defined as a growth failure condition resulting from chronic malnutrition, inadequate psychosocial stimulation, and recurrent infections, particularly during the critical first 1,000 days of life(1). The long-term impacts of stunting include impaired motor and cognitive development, as well as an increased risk of non-communicable diseases in adulthood, such as cardiovascular disease, diabetes, and hypertension (2) (3). Globally, the prevalence of stunting reached 148 million children under five in 2022(4). In Indonesia, the incidence remains significant at 22.1%(5), while North Sumatra and Medan reported rates of 19.2% and 5.8%, respectively (3). Various determinants contribute to this issue, including insufficient maternal nutritional knowledge, maternal employment factors, and poor environmental sanitation (6). Consequently, the World Health Organization (WHO) has established a target to reduce stunting rates by 40% through enhanced nutritional interventions(7).

Despite these targets, significant barriers persist in fulfilling nutritional requirements during the first 1,000 days of life, primarily due to the lack of effective communication tools and infrastructure (8). Although interprofessional collaboration between midwives and nutritionists is implemented in Indonesian primary healthcare (Puskesmas) (9), effective communication strategies are essential to drive the behavioral changes necessary for stunting prevention (10). Visual-based education with attractive designs has been shown to facilitate easier understanding of nutritional concepts (11). Survey data from the Medan Denai Health Center in 2024-2025 indicated that cases of stunting and malnutrition continue to occur, largely due to a lack of maternal knowledge regarding early-life nutrition (3). Furthermore, many pregnant women report low confidence, or self-efficacy, in their ability to prepare nutritionally tailored menus.

Self-efficacy, rooted in Albert Bandura's theory, represents an individual's belief in their capacity to overcome challenges and manage specific life situations (12). Previous research has demonstrated that higher maternal self-efficacy is positively correlated with better child development and nutritional outcomes (13,14). Innovative educational media, such as flipbooks, offer a unique advantage by integrating textual, visual, and audio elements into a single, accessible platform. Flipbook-based interventions have shown significant potential in overcoming traditional communication barriers (15).

Based on this background, there is an urgent need to implement innovative educational strategies to support the acceleration of stunting reduction in Indonesia. Therefore, this study aims to evaluate the

https://doi.org/10.56303/jhnresearch.v5i1.836

effectiveness of a flipbook-based nutrition education intervention during the first 1,000 days of life in enhancing pregnant women's self-efficacy in preventing stunting at the Medan Denai Health Center.

METHODS

The quantitative research uses a quasi-experimental design with a two-group pre-post test. The research was conducted at the Medan Denai Community Health Center (UPT Puskesmas) and spanned from May to December 2025. The population and sample consisted of pregnant women who attended antenatal care visits at the Medan Denai Community Health Center (UPT Puskesmas) from January to March 2025, totaling 50 individuals. The inclusion criteria for this study were pregnant women who were <32 weeks pregnant and willing to participate, while the exclusion criteria were pregnant women who were >32 weeks pregnant and did not wish to participate. The number of samples in this study was 40 people using the total Sampling. The sample was divided into 2 groups; random selection was carried out (simple random). Each respondent had an equal chance, with a 1:1 distribution. The treatment group, namely, respondents, received education using the first 1.000 days of life nutrition flipbook media, and the control group, namely, respondents, received education without it.

Data collection techniques: Primary data were collected from respondents. To measure self-efficacy, a 15-question questionnaire was used, scored 1-5, with a total range of 1-75. The questionnaire contained information about the first 1.000 days of life, calorie needs during the first 1.000 days of life, menu composition/plate contents during the first 1.000 days of life, and solutions to obstacles to meeting nutritional needs during the first 1.000 days of life. The questionnaire is the result of a modification of previous research on maternal self-efficacy in nutrition for the first 1.000 days of life conducted by Nur Sakinah 2022 (16), and validity and reliability tests were repeated. The validity test value is obtained, namely r count > from r table (r count > 0.312) and its reliability and reliability Reliable Test Is if the Crombach's alpha value > 0.6 obtained Crombach's alpha value of 0.970 (> 0.6) then the questionnaire has been reliable, The questionnaire was given to the treatment and control groups then the treatment group can be educated using flipbooks about nutrition in the first 1.000 days of life and the control group education without flipbook nutrition in the first 1.000 days of life.

The treatment and control research locations are in different areas within the Medan Denai Health Center UPT, and at different times on different days. In the pre-test study, respondents were given a self-efficacy questionnaire, and education was delivered via flipbooks in the treatment group and without them in the control group. Furthermore, for 2 weeks, the treatment group can learn independently from the distributed flipbooks and links shared by researchers, with follow-up by researchers on their use, while the control group learns independently without using flipbooks for nutritional information in the first 1.000 days of life. After 2 weeks, a post-test was conducted to measure self-efficacy in the treatment and control groups.

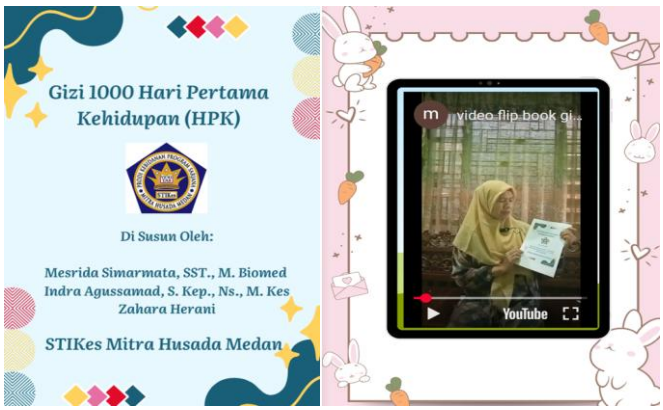


Figure 1. Flipbook contents

Research using an educational media flipbook consisting of information 1.000 days of nutrition, First life, like definition, 1.000 days period, First life, impact, needs 1.000 days of nutrition, First life, and obstacles, as well as methods to overcome the obstacles. The media includes interesting writing, images, and videos accessible via the online link.

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Figure 1 shows that the flipbook cover contains about 1,000 words of information in a concise and interesting way, with pictures and text accompanied by videos on how to prepare food for a pregnant mother, a breastfeeding mother, and a 2-year-old child. Flipbooks are also available via the link: https://heyzine.com/flip-book/7e03f9421c.html.

Data analysis was carried out using a normality test on the pre- and post-data from the treatment and control groups. It turned out that the data were not normally distributed, so the results before and after were compared within each group using the Wilcoxon test. A mean difference test was conducted again in the treatment and control groups after education. The distribution was not normal, so the Mann-Whitney test was performed. Data presentation was carried out using within-group frequency distributions and between-group mean-difference tests.

CODE OF HEALTH ETHICS

This study was conducted on pregnant women and received ethical approval from the Ethics Committee of STIKes Mitra Husada Medan (Approval No. 360/KEP-MHM/V/2025). Written informed consent was obtained from all respondents prior to their participation in the study.

RESULTS

The demographic profile of the participants indicates a homogeneous distribution across both the treatment and control groups, ensuring a comparable baseline for the study (Table 1). The majority of respondents were within the "no risk" age category (20–35 years), comprising 80% (*n*=16) of the treatment group and 65% (*n*=13) of the control group. Regarding occupational status, both cohorts were predominantly composed of housewives, accounting for 95% of the treatment group and 100% of the control group. Furthermore, the obstetric data reveal that multiple gravidity (multipara) was the most frequent status in both groups, represented by 60% of the treatment group and 70% of the control group. These nearly identical characteristics between the two groups minimize potential confounding variables and provide a robust foundation for evaluating the effectiveness of the flipbook-based nutritional intervention on maternal self-efficacy.

Table 1. Frequency Distribution of Respondent Characteristics by Group

Variables	Group			
	Treatment		Control	
	n	%	n	%
Age				
No Risk	16	80	13	65
At risk	4	20	7	35
Work				
Housewife	19	95	20	100
Private sector employee	1	5	0	0
Gravida				
Primigravida	7	35	1	5
Multiple Gravidity	12	60	14	70
Grande Multipara	1	2.5	5	25
Total	**20**	**100**	**20**	**100**

The results presented in Table 3 demonstrate a significant disparity in the progression of maternal self-efficacy between the treatment and control cohorts. In the group receiving the flipbook intervention, self-efficacy scores increased substantially and statistically significantly, with the mean rising from 35.75 to 51.05 (p=0.000). In contrast, the control group exhibited only a marginal improvement, with the mean score shifting from 35.35 to 36.25 (p=0.041). This pronounced enhancement in the treatment group suggests that the multimodal nature of flipbook-based education—which integrates visual and textual elements—is highly effective in strengthening pregnant women's confidence to implement stunting prevention strategies. Ultimately, these findings underscore the potential of flipbook-based media as a

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superior educational strategy for optimizing maternal behavioral self-regulation during the critical first 1,000 days of life.

Table 2. Mean Difference Test of Treatment and Control Groups Before and After Education Using 1.000 HPK Nutrition Flipbooks at UPT Medan Denai Community Health Center

Variables	n	Score		Mean	Standard Deviation	P. Value
		Min	Max			
Treatment						
Before	20	32	40	35.75	1.997	0.000
After	20	40	60	51.05	6.794	
Control						
Before	20	30	41	35.35	3.216	0.041
After	20	30	47	36.25	4.191	

DISCUSSION

The results of the mean difference test for the two groups showed a significant difference, indicating an increase in the self-efficacy of pregnant women after receiving the educational innovation of flipbooks on nutrition during the first 1.000 days of life. From previous research, it was found that educational media is very influential in increasing mothers' knowledge about nutrition in the first 1.000 days of life (17). In this study, self-efficacy in the treatment group was higher than in the control group. This aligns with Albert Bandura's concept of self-efficacy, a theory that combines cognitive and social factors. The higher a person's self-efficacy, the stronger a person's belief in achieving success in facing challenges (18).

Flipbooks are a mass media that can increase the knowledge or behavior of pregnant women and can be a public campaign activity in providing information, especially about nutrition in the first 1.000 days of life (19,20). From both groups, it was found that self-efficacy scores increased; however, when comparing the mean values, the Flipbook-Based Nutrition Education Innovation for the First 1.000 Days of Life is effective in increasing the self-efficacy of Pregnant Women in preventing Stunting. One of the government's efforts to address stunting is the 1.000 HPK movement. Communication plays a very active role in increasing the achievement of the 1.000 HPK movement (21). Flipbooks can increase self-efficacy. Previous research stated that booklets are better than flickr, where media that are more varied in their presentation will further improve the reader's ability to understand the contents of the education (22). In this study, flipbooks offer a unique combination of visual, textual, and accessible (online/offline) educational media that overcomes the limitations of other media in environments with limited resources. In accordance with Bandura's theory that the cognitive learning stage begins with the attention phase, namely the respondent's stage of paying attention to the information in the flipbook to fulfill the nutrition of the first 1.000 days of life, the retention phase, namely the respondent's storage stage, so the respondent stores information in the respondent's memory such as how to arrange the nutrition menu in each period of the first 1.000 days of life, the reproduction phase, namely the reproduction stage such as the respondent being able to do it independently or practice themselves how to arrange the nutrition menu for the first 1.000 days of life based on the guide in the flipbook, the motivation phase, namely the respondent already has motivation or self-efficacy in arranging nutrition for the first 1.000 days of life and is sure that the child she is carrying will avoid stunting (12).

The limitation of this study is that the researcher could not obtain a sample of pregnant women who had been pregnant from the first day of pregnancy, as at 20 weeks pregnant, the respondents could no longer meet the nutritional requirements before participating in this study. Suggestions for health workers, especially at the Medan Denai Community Health Center UPT, include using the nutrition flipbook for the first 1.000 days of life through an application that will increase pregnant women's self-efficacy in applying nutrition during this period to prevent stunting.

CONCLUSION

In conclusion, this study indicates that flipbook-based nutritional education specifically designed

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for the first 1,000 days of life is an effective intervention for significantly improving maternal self-efficacy in stunting prevention within the study population. The significant increase in self-efficacy scores among the treatment group suggests that this innovative media has substantial potential as a supportive tool to bolster pregnant women's confidence in managing early-life nutrition.

These findings suggest that integrating multimodal educational strategies into antenatal care can be a strategic component of broader public health efforts to mitigate stunting risks during critical developmental periods.

FUNDING

This research was funded by the Ministry of Education and Culture , grant number 0070/C3/AL.04/2025.

ACKNOWLEDGMENTS

We would like to thank STIKes Mitra Husada Medan for supporting this research. We would also like to thank the Medan Denai Community Health Center (UPT Puskesmas) for agreeing to host this research. We would also like to thank the pregnant women in the Medan Denai Community Health Center (UPT Puskesmas) area.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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