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Flip Chart-based Nutrition Education to Improve Knowledge and Attitude towards Stunting among Adolescent Girls in Sleman Regency

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ABSTRACT

Background: Adolescence is a critical stage requiring adequate nutrition for long-term health. Adolescent girls are particularly vulnerable to iron deficiency, which increases the risk of anemia and stunting. Enhancing adolescent girls' knowledge of nutrition through health education, which can be delivered using tools such as flipcharts, can prevent and address stunting.

Method: This quasi-experimental study involved 541 adolescent girls aged 12–18 years, with a purposive sample of 91 participants divided into an intervention group and a control group. The intervention group received flip chart-based education, while the control group did not. The study was conducted in Kalurahan Triharjo and Pandowoharjo, Sleman, DI Yogyakarta. Data were collected using validated pre- and post-intervention questionnaires and analyzed with Wilcoxon and paired t-tests.

Result: The intervention group showed significant improvements in knowledge and attitudes about nutrition. Knowledge scores increased from 14.42 ± 2.388 at pretest to 19.36 ± 0.883 at posttest (mean difference: 4.94, $p = 0.001$). Attitude scores rose from 59.04 ± 8.512 to 75.31 ± 2.410 (mean difference: 16.27, $p = 0.001$). In the control group, smaller increases were observed for both knowledge (mean difference: 0.73, $p = 0.001$) and attitudes (mean difference: 4.13, $p = 0.036$).

Conclusion: Flip chart-based education effectively improves adolescents' knowledge and attitudes about nutrition for stunting prevention. However, external exposure to nutrition information in the control group was a limitation. Future research should minimize such exposure by limiting information to basic content for control groups.

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INTRODUCTION

Adolescence, the period from ages 10 to 19, is one of the most transformative stages of human development, marked by rapid physical, cognitive, emotional, social, and sexual changes that lay the foundation for lifelong health and well-being. The WHO Southeast Asia Region accounts for 27% of the global adolescent population, nearly 360 million young people, the highest proportion for any region (1). Adolescence is a crucial stage for physical and mental

development, characterized by an increased need for nutrition. Nutritional deficiencies during this phase can trigger problems such as anaemia, obesity, chronic energy deficiency (CED), and eating disorders. Adolescent girls, especially during menstruation, require additional iron intake to support haemoglobin production. The nutritional status of adolescents often reflects pre-existing malnutrition issues (2–5). Adolescence can be a key moment to address malnutrition conditions such as stunting or anaemia. Micronutrient deficiencies, especially iron, can hinder linear growth (6).

UNICEF findings reveal slow and threatened global progress in adolescent girls' nutrition. Globally, no country is on track to meet the 2030 global targets for reducing anaemia and low birth weight, and acute malnutrition has increased by 25% since 2020 in crisis-affected countries (7). Meanwhile, in Indonesia, the prevalence of undernutrition among adolescents aged 13-15 years is 8.7%, with 1.9% categorized as severely underweight and 6.8% as underweight. Overnutrition is 16.2%, with 12.0% categorized as overweight and 4.8% as obese (8). According to the Ministry of Health, one of the problems faced by Indonesian adolescents is micronutrient malnutrition, with around 12% of male adolescents and 23% of female adolescents suffering from anaemia, most of which is caused by iron deficiency (iron deficiency anaemia). Anaemia is more prevalent among female adolescents than male adolescents (9).

Poor nutrition is passed down from generation to generation: about half of children under 2 years old with stunting were stunted during pregnancy and the first six months of life (7). Adolescent girls who suffer from nutritional deficiencies, particularly iron and other micronutrients, may increase the risk of stunting in the children they will have in the future (10). In 2022, the WHO reported that 149 million children under the age of five were stunted globally, with nearly half of under-five deaths linked to malnutrition, especially in low- and middle-income countries, leading to widespread impacts on health, the economy, and social development (11).

Stunting remains a serious health issue in Indonesia. According to the 2022 Indonesian Nutrition Status Survey (SSGI), the prevalence of stunting in children under five decreased from 27.9% in 2019 to 21.6% in 2022 (12). In the Special Region of Yogyakarta (DIY), the prevalence of stunting decreased by 0.9%, from 17.3% the previous year to 16.4% in 2022. In Sleman, a significant reduction was observed, from 16% to 15%, and by 2024, it was recorded to have further decreased to 4.41% (12). Although the decline is encouraging, continued efforts are necessary to meet national targets and improve the quality of life for Indonesian children (13).

The Ministry of Health emphasizes the importance of early stunting prevention, as once stunting occurs, its management becomes more complex and requires significant effort with a low chance of recovery. To reduce stunting rates, the Ministry has launched 11 intervention programs focused on two critical growth phases: before and after the birth of the child. In the first phase, there are two interventions: the first targets pregnant women, and the second focuses on adolescent girls in grades 7 and 10. These programs include nutrition counselling, iron supplementation, and reproductive health education to prevent anaemia, which negatively impacts pregnancy and future child growth (14). With a focus on the pre-birth phase, it is hoped that these programs will help create a healthier generation, ready to grow without developmental barriers caused by stunting.

Among adolescents, there is a connection between high curiosity and the desire to realize one's potential (15). A strong sense of curiosity drives adolescents to actively seek new information that is deemed important for self-development. With the knowledge gained, adolescents can maximize their inherent potential. When this curiosity is fulfilled, adolescents tend to feel more motivated to contribute and become individuals who are beneficial to others (16).

The Ministry of Health states that one of the key programs in stunting prevention is education, outreach, and promotion programs (14). Health education is a continuous, dynamic, and complex learning process that takes place throughout life in various contexts. This process involves a collaborative partnership between the community and healthcare providers, with the goal of facilitating and empowering individuals to change adolescent lifestyles for better health outcomes (17). With the right approach, health education can bring about significant positive changes in public health, particularly in terms of nutrition to prevent stunting. In its implementation, several factors must be considered to ensure the success of the desired behavior modification, such as a targeted approach, motivated change agents, and appropriate educational strategies in the use of media and the messages conveyed (18).

One of the key strategies implemented in stunting prevention is education through health promotion media. Promotional media, such as flip charts, leaflets, and posters, have proven effective in delivering information in an engaging and easily understood manner (19). Flip charts, in particular, are visual aids consisting of sheets of paper

with images and supporting information that facilitate audience comprehension (20). Previous studies have shown that the use of flip charts can enhance audience knowledge and attitudes regarding specific health issues, including stunting prevention. Flip charts present information visually and in a comprehensible way, thereby strengthening the audience's understanding of the material delivered (16).

In this study, flipcharts were used as a nutrition education medium for adolescent girls to prevent stunting. This medium serves as a visual aid consisting of sheets of paper with images and supporting information that facilitates audience comprehension (14). Nugraheni (2024) emphasized the urgency of investing in nutrition education as one of the strategies to support sustainable health development (23). Similarly, Lestari (2023) revealed that future nutrition intervention programs should ideally begin during the preconception phase or before pregnancy, including providing education on nutrition to enhance cognitive understanding among prospective mothers in preventing stunting (24). These two recommendations form the foundation for the researcher to implement nutrition education using flipcharts to improve the knowledge and attitudes of adolescent girls regarding stunting prevention.

METHOD

This study employed a quantitative approach with a quasi-experimental two-group design (pre-test and post-test) to examine the effect of nutrition education on improving adolescents' knowledge and attitudes regarding stunting prevention. The study population consisted of 541 adolescent girls, 91 of whom were selected as respondents through purposive sampling with a 1:1 ratio. The intervention group received flipchart-based education after the pre-test, while the control group did not. The inclusion criteria were adolescent girls aged 12–18 years, residing in Triharjo Village, Sleman, Yogyakarta (intervention group) or Pandowoharjo Village, Sleman, Yogyakarta (control group), and willing to participate in the study. The exclusion criterion was the refusal of adolescents to participate. Data collection was conducted from late August 2024 to September 2024. To minimize the effect of confounding variables such as economic status, the intervention and control groups were matched in terms of occupational distribution, ensuring similar economic conditions.

A closed-ended questionnaire with the Guttman scale was used in this study. Knowledge was assessed through questions evaluating participants' understanding of the importance of balanced nutrition, the impacts, causes, and preventive measures of stunting. Attitudes were measured using a Likert scale, focusing on respondents' perceptions, beliefs, and readiness to support healthy eating practices in stunting prevention. The educational material covered topics such as balanced nutrition, the impacts and causes of stunting, and strategies to prevent stunting through proper nutrition.

The study began with a 10-minute pre-test, followed by a one-hour intervention session and discussion for the intervention group. The post-test was conducted on the third day after the intervention. Before analysis, the data were tested for normality, as shown in Table 2. Statistical tests included the Wilcoxon test for non-normally distributed data and the Paired T-test for normally distributed data. These analyses aimed to compare differences in knowledge and attitudes between the intervention and control groups (P-value < 0.05). This study obtained ethical approval from the Health Research Ethics Committee of the Banyuwangi Public Health School with reference number 332/04/KEPK-STIKESBWI/VIII/2024, dated August 15, 2024.

RESULTS

The characteristics of the respondents in this study include variables such as age, parental education level, and occupation. The youngest respondent is 12 years old, while the oldest is 18 years old. A detailed description of the respondents' characteristics is presented in Table 1.

Table 1. Respondent Characteristics

Variable	n	%
Age		
12 years	11	12.1
13 years	15	16.5
14 years	8	8.8
15 years	15	16.5
16 years	12	13.2

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17 years	17	18.7
18 years	13	14.3
Father's Last Education		
Middle School	16	17.6
High School	54	59.3
Bachelor's Degree	21	23.1
Mother's Last Education		
Elementary School	6	6.6
Middle School	19	20.9
High School	49	53.8
Bachelor's Degree	17	18.7
Father's Occupation		
Laborer	38	41.8
Entrepreneur	22	24.2
Merchant	5	5.5
Civil Servant	14	15.4
Police Officer	2	2.2
Teacher	4	4.4
Millitary	6	6.6
Mother's Occupation		
Laborer	7	7.7
Entrepreneur	3	3.3
Merchant	12	13.2
Civil Servant	2	2.2
Nurse	1	1.1
Teacher	9	9.9
Midwife	6	1.1
Housewife	56	61.5

Table 1 indicates that most respondents were aged between 12 and 18 years, with the highest proportion at age 17 (18.7%) and the lowest at age 14 (8.8%). The majority of fathers had a high school education (59.3%), and similarly, most mothers also completed high school as their highest level of education (53.8%). Regarding parental occupations, the largest proportion of fathers worked as labourers (41.8%), while most mothers were housewives (61.5%).

Table 2. Normality Test Results of Pretest and Posttest Differences

	Tests of Normality					
	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Knowledge Difference (Intervention)	0.205	45	0.001	0.911	45	0.001
Attitude Difference (Intervention)	0.225	45	0.001	0.843	45	0.001
Knowledge Difference (Control)	0.210	46	0.001	0.901	46	0.001
Attitude Difference (Control)	0.105	46	0.200	0.956	46	0.083

Table 2 provides the results of the normality test for the difference between pretest and posttest scores using the Shapiro-Wilk test. It shows that the difference in knowledge in the intervention group, with a significance value of 0.002, the difference in attitude in the intervention group, with a significance value of 0.001, and the difference in knowledge in the control group, with a significance value of 0.001, all do not follow a normal distribution (significance value < 0.05). This indicates that the data distribution does not meet the normality assumption. However, for the difference in attitudes in the control group, the Shapiro-Wilk test result with a significance value of 0.083 indicates that the data distribution is normal (significance value > 0.05).

Table 3. Differences Between Variables

Variable	Group	Mean ± SD		Mean Difference	Statistical Test	P-value
		Pretest	Posttest			
Knowledge	Intervention (n=45)	14.42 ± 2.388	19.36 ± 0.883	4.94	Wilcoxon	0.001
	Control (n=46)	15.70 ± 1.051	16.43 ± 1.068	0.73	Wilcoxon	0.001
Attitude	Intervention (n=45)	59.04 ± 8.512	75.31 ± 2.410	16.27	Wilcoxon	0.001
	Control (n=46)	53.59 ± 4.893	57.72 ± 3.607	4.13	Paired T Test	0.036

Table 3 shows that the educational intervention delivered through flip chart media significantly improved adolescents' knowledge and attitudes regarding stunting prevention. In the intervention group, the average knowledge score in the pretest was 14.42 with a standard deviation of 2.388, which increased to 19.36 in the post-test with a standard deviation of 0.883. The mean difference between the pretest and post-test was 4.94, and the Wilcoxon test results indicated a significant difference in respondents' knowledge after the intervention, with a p-value of 0.001 ($p < 0.05$). This indicates that the intervention successfully enhanced knowledge in a significant way.

In the control group, the average knowledge score in the pretest was 15.70 with a standard deviation of 1.051, increasing to 16.43 in the post-test with a standard deviation of 1.068. The mean difference between the pretest and posttest in the control group was 0.73, and the Wilcoxon test results showed a p-value of 0.001 ($p < 0.05$), also indicating a significant difference in respondents' knowledge. However, the increase observed in the control group was smaller compared to the intervention group, suggesting that the intervention had a more substantial effect on improving knowledge.

Regarding the attitude variable, the average attitude score in the pretest was 59.04 with a standard deviation of 8.512, which increased to 75.31 in the post-test with a standard deviation of 2.410. The mean difference of 16.27 indicates a significant improvement in attitudes, and the Wilcoxon test results showed a p-value of 0.001 ($p < 0.05$), signifying a significant difference in respondents' attitudes after the intervention. This suggests that the intervention effectively improved adolescents' attitudes towards stunting prevention.

In the control group, the average attitude score in the pretest was 53.59 with a standard deviation of 4.893, which increased to 57.72 in the post-test with a standard deviation of 3.607. The mean difference between the pretest and post-test was 4.13, and the paired T-test results showed a p-value of 0.036 ($p < 0.05$), indicating a significant difference in respondents' attitudes. However, the improvement in attitudes in the control group was lower than in the intervention group, which suggests that while there was an improvement in the control group, the effect was not as pronounced as in the group that received the intervention.

DISCUSSION

Knowledge and attitude are the most important domains of health behavior because they originate from the individual themselves (3,25,26). The sensory process that occurs from what happens around a person will make them more "aware," allowing them to respond with agreement or disagreement. In other words, the attitude someone has is a representation of the knowledge they previously possessed. These two domains are in the phase of educational diagnosis and ecology as predispositional factors in the Precede-Proceed model of behavior change theory by Lawrence Green in 1980. This theory suggests that health education is an effort made to identify the interrelated domains of behavior change, namely predisposition, enabling, and reinforcing factors (27).

In order to optimize the effectiveness of health education, an efficient tool or medium is required to convey information more clearly, with one such tool being a flip chart. A 2022 review of 10 articles found that flip charts are a valuable resource in health intervention programs addressing public health concerns. When used, they have been shown to enhance the audience's knowledge following the intervention. The flip chart facilitates the visual presentation of information in an easily digestible format, which in turn helps reinforce the target audience's comprehension of the content provided (21).

Adolescence is a phase where individuals begin to develop their identity, knowledge, attitudes, and habits, which will shape their future behavior. Health education for adolescents, particularly in the context of stunting prevention, is crucial for shaping their understanding and attitudes toward health issues, such as nutrition. Proper health interventions can significantly influence their knowledge and attitudes (28). Special focus on adolescent girls is important to support them in facing the physical, emotional, and social changes that occur during adolescence, as well as preparing them for reproductive health roles in the future (29). Therefore, nutrition education is a critical step in enhancing knowledge, shaping attitudes, and encouraging actions that support adolescent health in preventing stunting.

27 This study indicates that education using flip chart media significantly increased knowledge about nutrition for stunting prevention in the intervention group ($p = 0.001$; $p < 0.05$). The control group also experienced a significant increase ($p = 0.001$; $p < 0.05$), although the average improvement score was smaller, 0.73 compared to 4.94 in the intervention group (see Table 3). These results affirm the effectiveness of flip charts in enhancing adolescent girls' knowledge and strengthen the role of nutrition education in stunting prevention efforts. These findings suggest that health education through flip charts has a significant impact on improving knowledge about nutrition in the context of stunting prevention. Better knowledge of nutrition among adolescents plays a crucial role in reducing stunting rates.

The study by Alviani and Dwianggitamawati aligns with this research, showing that health education is effective in improving understanding related to stunting prevention. Health education plays a strategic role in enhancing health quality, both through increasing knowledge and fostering more constructive attitude changes (22). Similarly, according to the research by Juhari and Suan, individuals with high nutrition knowledge tend to meet both micro and macro nutritional needs and ensure that their children's nutritional status is adequate (30). This understanding encourages proactive behavior in maintaining and improving adolescent nutritional status, which directly supports stunting prevention efforts.

4 Knowledge plays a crucial role in influencing an individual's attitude and actions toward stunting prevention. As found in a study in Jambi City, a deep understanding of nutrition can drive attitude changes, so individuals with higher knowledge of the importance of nutrition are more likely to demonstrate positive and proactive attitudes toward stunting prevention (31). Attitude is defined as an individual's response or reaction to a specific stimulus or object, involving cognitive, affective, and attentional aspects toward that stimulus. Attitude is not merely an instant reaction but reflects various aspects of integrated mental and emotional experiences (32).

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4 The results of this study show that education using flip chart media significantly improved adolescent girls' attitudes toward nutrition in stunting prevention, with a p-value of 0.010 ($p < 0.05$). The control group also experienced a significant increase (p-value 0.001), but the difference was smaller compared to the intervention group. The average difference in pretest and posttest scores in the intervention group reached 16.27, much higher than the 4.13 observed in the control group (see Table 3). These results confirm that flip charts are effective as an educational medium that not only delivers information but also changes perspectives and enhances attitudes regarding the importance of nutrition. These findings align with research in Surabaya, which showed an improvement in knowledge and attitudes following health education using flip charts. This health education also supports the community empowerment process to maintain and improve health, while demonstrating that flip charts are an effective tool for strengthening individuals' cognitive aspects in stunting prevention (33).

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11 However, these results contrast with the study by Fauziatin et al., which found no difference in attitude scores between the pretest and posttest in the control group regarding stunting prevention, as they did not receive education like the intervention group (34). In contrast, a study in Semarang showed that attitude improvement in the control group could occur even without direct intervention, as adolescents tend to acquire information from other sources such as social media, their environment, or discussions with peers, which also influences attitude changes (6). This discrepancy suggests that external factors, such as access to information through technology or exposure to community activities, can play a role in shaping adolescent attitudes, even in the absence of structured education.

Effective nutrition education not only increases knowledge about nutrition but also encourages attitude changes among adolescents toward health, including stunting prevention (2,35,36). Better knowledge enables adolescents to make wiser decisions regarding eating habits and lifestyle choices that support optimal growth and development. A positive attitude toward the importance of proper nutrition, if maintained in the long term, becomes a key factor in preventing stunting and supporting their future health (37).

Although the flip chart-based approach shows effectiveness, this study also faces several limitations that need to be considered. One of these is the possibility that the control group may have gained knowledge related to stunting from other sources, such as family, peers, or mass media. These external factors could influence their knowledge and attitudes, making the observed results potentially not fully reflect the effects of the educational intervention provided. Therefore, for future research, it is important to consider strategies that can control or mitigate the influence of these external factors to ensure that the obtained results are more accurate.

Recommendations for Future Research

It is important to consider local factors such as the availability of resources, accessibility, and the educational level of parents to ensure that the educational material is effectively received by the target audience. For future researchers, strategies for mitigation can be considered, such as providing general education not directly related to the research topic to the control group, to maintain their involvement without affecting the main variables. Another alternative is to use blinding methods to minimize exposure to external information during the study.

CONCLUSION

Nutrition education using flip charts is effective in improving knowledge and attitudes among adolescent girls regarding stunting prevention (p-value 0.001). The intervention group showed a significant improvement compared to the control group. Flip charts help convey information visually and in an easily understandable manner, which strengthens understanding and fosters a positive attitude toward nutrition. Although there are external factors that may influence the results, this approach has proven effective in encouraging behavioral changes that support stunting prevention.

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