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EFFECTIVENESS OF AN EDUCATIONAL SNAKES AND LADDERS GAME ON KNOWLEDGE AND ATTITUDES TOWARD ANEMIA PREVENTION AMONG ADOLESCENT GIRLS

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Abstract

The prevalence of anemia among adolescent girls in Indonesia is currently estimated at 15.5%. This condition is associated with impaired immune function, reduced cognitive performance, and lower academic achievement. These outcomes are partly attributable to insufficient knowledge and suboptimal attitudes toward anemia prevention and management among adolescent girls. This study aimed to evaluate the effectiveness of an educational intervention using an educational *Snakes and Ladders* game in improving knowledge and attitudes related to anemia prevention among adolescent girls at SMAN 14 Padang. A quasi-experimental quantitative design with a pretest–posttest non-equivalent control group was employed. A total of 66 female students were recruited and allocated into three groups: an educational *Snakes and Ladders* group, a leaflet group, and a control group. Data on knowledge and attitudes were collected using a structured questionnaire. Statistical analyses included the paired sample t-test, Wilcoxon test, and Kruskal–Wallis test. Significant improvements were observed in both knowledge ($p < 0.001$) and attitudes ($p < 0.001$) among participants following nutrition education delivered through the educational *Snakes and Ladders* game and leaflets. Furthermore, significant differences in knowledge and attitudes were identified between the educational *Snakes and Ladders* group and the control group ($p < 0.001$). The gain scores for the educational *Snakes and Ladders* intervention were 0.9 (high) for knowledge and 0.4 (moderate) for attitudes, exceeding those achieved with the leaflet intervention. In conclusion, nutrition education delivered through the educational *Snakes and Ladders* game was more effective than leaflet-based education in enhancing knowledge and attitudes related to anemia prevention among adolescent girls.

Keywords: Adolescent Girls, Anemia, Game-based education, Nutrition Education,

Introduction

Adolescence is a critical period for physical, psychological, and behavioral development. During this stage, individuals undergo substantial biological and social changes, including increased nutritional requirements. Many health problems among adolescents arise from lifestyle transitions and dietary habits. One of the major public health concerns affecting adolescents in Indonesia is anemia, particularly among adolescent girls (Damayanti et al., 2017).

Anemia is a condition characterized by hemoglobin (Hb) levels below the normal threshold. Adolescent girls and women of reproductive age are classified as anemic when hemoglobin levels fall below 12 g/dL. Anemia occurs more frequently in females than in males, especially among adolescent girls (Kementrian Kesehatan RI, 2018).

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According to the World Health Organization (WHO), the global prevalence of anemia among women of reproductive age was 29.9% in 2019, indicating that more than half a billion women aged 15–49 years were affected (WHO, 2023). National data from the 2023 Indonesian Health Survey reported that 15.5% of adolescents aged 15–24 years were anemic (Kementerian Kesehatan RI, 2023).

In West Sumatra, anemia screening conducted among female students in Grade 7 of junior high school and Grade 10 of senior high school in 2023 showed a prevalence of 20.30%, with Padang City ranking eighth at 22.63%. Data from the Padang City Health Office in 2023 further indicated that among 14,580 female students who underwent hemoglobin screening, 23.7% (3,450 students) were anemic. The highest prevalence of anemia among adolescent girls in Padang City was reported in the Lubuk Kilangan Primary Health Care area, reaching 60.3%. Further screening results among junior and senior high school girls in the Lubuk Kilangan Primary Health Care catchment area in 2023 revealed that SMAN 14 Padang had the highest number of anemia cases, with a prevalence of 45% (161 students). Of these, 62 students had mild anemia (Hb 11.0–11.9 g/dL) and 99 students had moderate anemia (Hb 8.0–10.9 g/dL) (Dinas Kesehatan Kota Padang, 2023)

The occurrence of anemia among adolescent girls is influenced by low levels of knowledge, as knowledge plays a crucial role in shaping attitudes and dietary behaviors. Adolescent girls who lack awareness of anemia—including its symptoms, consequences, and preventive measures—are more likely to consume diets low in iron, resulting in inadequate iron intake (Putra et al., 2019). Data from the 2017 Survei Demografi dan Kesehatan Reproduksi Remaja showed that only 13.2% of adolescent girls were aware of what anemia is, indicating limited understanding among girls aged 15–19 years (Indriasari et al., 2022). A study in West Java reported that 70.6% of adolescent girls with poor knowledge about anemia were anemic, and 88.3% of those with negative attitudes toward anemia prevention also experienced anemia (Silitonga and Nuryeti, 2021).

Nutrition education is one of the key strategies for preventing and managing anemia among adolescent girls. Educational interventions can influence individuals' knowledge and attitudes, which in turn guide behavioral change (Soekidjo Notoatmodjo, 2014a). An effective approach to delivering nutrition education on anemia among adolescents is through game-based learning. Educational games integrate learning content into their design, thereby enhancing engagement and facilitating better understanding during the learning process (Hisanah et al., 2023).

This study was conducted as a replication of previous research, employing a different conceptual framework, design format, methodology, and study setting. The present study aimed to evaluate the effectiveness of educational *Snakes and Ladders* media and leaflets in improving knowledge and attitudes toward anemia prevention among adolescent girls.

Method

This study employed a quantitative quasi-experimental design using a pretest–posttest non-equivalent control group approach. The study population comprised female students at SMAN 14 Padang. Participants were selected using a simple random sampling technique and were required to meet the inclusion criterion of willingness to commit to and complete all stages of the intervention. A total of 66 female students were recruited and allocated into two intervention groups and one control group. The intervention groups consisted of a nutrition education group using educational *Snakes and Ladders* media and a nutrition education group using leaflets, while the control group received nutrition education without any educational media.

At baseline, both the intervention and control groups completed a pretest to assess respondents' knowledge and attitudes toward anemia prevention. The intervention period lasted for 14 days (Taamu et al., 2020). The educational *Snakes and Ladders* game and leaflet-based education were each delivered three times, with a 7-day interval between sessions.

The first intervention session focused on anemia-related topics, including the definition of anemia, causes of anemia among adolescent girls, the consequences of anemia, and strategies for the prevention and management of anemia. The second session emphasized dietary practices for anemia prevention, covering topics such as balanced plate composition (*Isi Piringku*), nutritional requirements during adolescence, iron requirements, and iron-rich foods suitable for adolescent girls. The third session addressed iron supplementation, including the definition and benefits of iron tablets, as well as the correct method of consuming iron tablets.

A posttest was administered to evaluate changes in knowledge and attitudes following the intervention. The posttest was conducted during the third intervention session, with a 14-day interval between the pretest and posttest. Data collection for the posttest was carried out in person by administering structured questionnaires to the participants.

Data were analyzed using the Shapiro–Wilk test to assess normality. The paired sample t-test or Wilcoxon signed-rank test was used to examine differences in mean knowledge and attitude scores before and after the intervention within each group. One-way analysis of variance (ANOVA) or the Kruskal–Wallis test (for non-normally distributed data) was applied to compare knowledge and attitude scores among the intervention and control groups. Gain score analysis was conducted to evaluate the effectiveness of the educational media.

Results

Characteristic of Respondents

The respondents in this study were female students of SMAN 14 Padang who received nutrition education on anemia through different intervention media, namely the educational *Snakes and Ladders* game, leaflets, and no media (control group). As shown in Table 1, the respondents were aged between 15 and 18 years, and the majority had not previously received information about anemia from schools, primary health care centers, or social media. Prior exposure to information is known to influence adolescents' knowledge of anemia, as those who have previously received information tend to have better understanding of anemia.

Table 1. Frequency Distribution of Respondents' Characteristics

Characteristics	Snake and Ladders		*Leaflet*		Control		Total (%)
	n	%	n	%	n	%	
Age							
- **15 Years**	1	4.55	2	9.9	3	13.64	9.09
- **16 Years**	15	68.18	12	54.55	7	31.82	51.52
- **17 Years**	4	18.18	4	18.18	10	45.45	27.27
- **18 Years**	2	9.09	4	18.18	2	9.09	12.12
Exposure to Anemia Related Information							
- **Exposed**	13	59.09	8	36.36	8	36.36	43.94
- **Not Exposed**	9	40.91	14	63.64	14	63.64	56.06
Total	22	100	22	100	22	100	100

Differences in Knowledge and Attitudes Before and After Nutrition Education

Based on Table 2, significant differences were observed in knowledge scores before and after the intervention using the educational *Snakes and Ladders* game and leaflets, with p-values < 0.001. Similarly, statistical analysis revealed significant differences in attitudes before and after nutrition education in both the educational *Snakes and Ladders* group and the leaflet group (p < 0.001).

In the control group, a significant difference in knowledge scores was also identified before and after nutrition education (p< 0.001). Furthermore, a significant difference in attitude scores was observed in the control group between the pretest and posttest (p= 0.001).

Table 2. Differences in Knowledge and Attitudes Before and After Nutrition Education

Study Group	Baseline	Endline	Δ	*p-value*
Educational Snakes and Ladders				
Knowledge	61,11 (44,44-77,78)	97,72 (88,89-100)	36,61	<0.001*
Attitude	72,60±4,83	83,77±6,61	11,17	<0.001**
Leaflet				
Knowledge	58,33 (38,89-88,89)	88,89 (55,56-100)	30,56	<0.001*
Attitude	72,22 (62,50-83,33)	81,25 (68,06-91,67)	9,03	<0.001*
Control				
Knowledge	58,58±17,79	66,41±14,89	7,83	<0,001**
Attitude	74,74±5,64	76,95±5,93	2,21	0,001**

Note : *Uji *Wilcoxon*
**Uji *Paired Samples T-Test*

Differences in Knowledge and Attitudes Among Intervention and Control Groups

Based on Table 3, the statistical test results indicated that the difference in knowledge scores among the three groups yielded a p-value <0.001. This finding demonstrates that there were significant differences in knowledge among adolescent girls in the educational snakes and ladders group, the leaflet group, and the control group. Furthermore, the statistical analysis of attitude scores across the three groups also produced a p-value <0.001, indicating significant differences in attitudes among adolescent girls in the educational snakes and ladders group, the leaflet group, and the control group. Accordingly, further statistical analyses were conducted to identify pairwise differences in knowledge and attitudes among the study groups.

Table 3. Differences in Knowledge and Attitude Scores among Study Groups

Variables		*p-value*
Knowledge		
Educational Snakes and Ladders	33,33 (22,22-50)	
Leaflet	25 (0-55,56)	<0,001*
Control	5,56 (0-22,22)	
Attitude		
Educational Snakes and Ladders	11,11 (4,17-19,44)	
Leaflet	6,94 (4,17-19,44)	<0,001*
Control	2,56 (0-9,72)	

Notes: ***Kruskal Wallis test***

As presented in Table 4, there was a significant difference in knowledge between the educational snakes and ladders group and the leaflet group (p = 0.012) The statistical test results also revealed a

significant difference in knowledge between the educational snakes and ladders group and the control group ($p < 0.001$). In addition, a significant difference in knowledge was observed between the leaflet group and the control group ($p < 0.001$).

Table 4. **Pairwise Differences in Knowledge and Attitude Scores among Study Groups**

Group Comparison			
Knowledge	***p-value***	**Attitude**	***p-value***
Educational Snakes and Ladders vs. Leaflet	0,012*	Educational Snakes and	0,027**
Educational Snakes and Ladders vs. Control	<0,001**	**E**ducational Snakes and Ladders vs. Control	<0,001**
Leaflet vs. Control	*<0,001***	Leaflet vs. Control	<0,001**

Notes: *Uji Independent Samples T-Test
**Uji PostHoc Mann Whitney

Effectiveness of Educational Media Based on Gain Scores

Based on Table 5, the gain score for knowledge in the educational snakes and ladders group was 0.9, indicating high effectiveness. In contrast, the gain score for knowledge in the leaflet group was 0.6, which corresponds to a moderate level of effectiveness. These findings suggest that the educational snakes and ladders medium was more effective than leaflets in improving knowledge among adolescent girls.

Table 5. Gain Scores for Knowledge and Attitudes

Variable	**Mean Pre-test Score**	**Mean Post-test Score**	**Gain Score**	**Effectiveness Category**
Knowlede				
Educational Snakes and Ladders	60,85	96,21	0,9	High
Leaflet	60,35	86,86	0,6	Moderate
Attitude				
Educational Snakes and Ladders	72,60	83,77	0,4	Moderate
Leaflet	72,78	81,18	0,3	Moderate

For the attitude variable, the gain score in the educational snakes and ladders group was 0.4, indicating moderate effectiveness, while the gain score in the leaflet group was 0.3, which also reflects moderate effectiveness. Based on these results, it can be concluded that the educational snakes and ladders medium was more effective than leaflets in improving attitudes among adolescent girls, although both interventions fell within the same moderate effectiveness category.

Discussion

The findings of this study demonstrate that nutrition education delivered through both educational snakes and ladders and leaflet media significantly improved knowledge and attitudes toward anemia prevention among adolescent girls. These results are consistent with behavioral theory, which posits that increased knowledge serves as a foundational determinant of attitude formation and subsequent behavior change (Soekidjo Notoatmodjo, 2007)

The observed improvement in knowledge following the intervention may be attributed to the acquisition of new information by respondents, who transitioned from having limited baseline knowledge to a higher level of understanding. Knowledge is primarily obtained through sensory perception, especially visual and auditory stimuli, and plays a crucial role in shaping individual behavior (Soekidjo Notoatmodjo, 2007). In this context, both educational snakes and ladders and leaflets functioned as effective communication tools that facilitated the delivery of nutrition-related information and supported the learning process. This finding aligns with previous research indicating that appropriate educational media can enhance the effectiveness of nutrition education by improving information accessibility and comprehension (Safitri and Fitranti, 2017).

The significant increase in attitudes toward anemia prevention observed in this study further supports the notion that improved knowledge contributes to more positive attitudes. Nutrition education is designed not only to convey information but also to shape attitudes that may drive behavioral change. Attitude is conceptualized as a covert response to a stimulus or object, accompanied by a tendency to act (Soekidjo Notoatmodjo, 2014b). The improvement in attitudes following the intervention suggests that respondents developed more favorable perceptions of anemia prevention as a result of their enhanced understanding of nutritional information (Indriasari et al., 2022). This finding is consistent with the argument that individuals are more likely to adopt positive attitudes when they perceive more beneficial aspects of the subject being learned (Putra et al., 2019)

The superior effectiveness of the educational snakes and ladders medium compared with leaflets can be explained by its interactive and multisensory nature. Game-based learning integrates educational content into a playful format, thereby increasing learner engagement, motivation, and curiosity pembelajaran (Hisanah et al., 2023). The snakes and ladders game used in this study required active participation from respondents, encouraged peer interaction, and stimulated cognitive involvement through question cards embedded in the gameplay (Nurhapsari and Benyamin, 2015). These features likely contributed to deeper information processing and improved memory retention. This mechanism is consistent with previous findings that educational games can enhance students' motivation and enthusiasm for learning, which in turn positively influences learning outcomes (Kusuma, 2018)

Furthermore, the inclusion of question cards—such as true–false cards and scenario-based questions—played a critical role in reinforcing both knowledge and attitudes. These cards were designed to stimulate critical thinking and guide respondents toward adopting positive attitudes related to anemia prevention. The repetition of educational content across different card formats may have further strengthened memory consolidation and conceptual understanding. Similar strategies have been shown to support cognitive development and problem-solving abilities by encouraging learners to ask questions, explain information to peers, and engage in group discussions (Putri, 2016)

The gain score analysis provided additional evidence of the greater effectiveness of the educational snakes and ladders medium. The higher gain score for knowledge in the snakes and ladders group indicates a stronger learning impact compared with the leaflet group. Although both interventions produced moderate gains in attitudes, the snakes and ladders medium still demonstrated a relatively higher effectiveness. This finding suggests that interactive, game-based educational approaches may offer added value over conventional printed media in delivering nutrition education to adolescents. The results are in line with previous evidence indicating that learning through snakes and ladders media can contribute substantially to comprehension and retention of educational material (Notoatmodjo, 2014b).

The significant differences in knowledge and attitudes observed between the intervention groups and the control group further confirm the importance of structured nutrition education in anemia prevention. Educational media serve not only as information delivery tools but also as facilitators of engagement and behavioral change. By increasing interest, stimulating curiosity, and supporting faster comprehension of learning material, educational media can enhance the overall effectiveness of health education programs (Machfoedz and Suryani, 2007)

Taken together, these findings highlight the potential of educational snakes and ladders as an innovative and effective nutrition education tool for adolescent girls. Compared with conventional leaflet-based education, the game-based approach offers a more engaging learning experience that activates multiple senses and promotes active participation. This interactive format appears to be particularly well-suited for adolescents, who tend to respond more positively to experiential and socially engaging learning environments. Therefore, integrating game-based educational media into school-based nutrition education programs may represent a promising strategy for improving knowledge and attitudes toward anemia prevention among adolescent girls.

Conclusion

This study demonstrated that nutrition education delivered through both educational snakes and ladders and leaflet media significantly improved knowledge and attitudes toward anemia prevention among adolescent girls. However, the educational snakes and ladders medium showed greater effectiveness than leaflets, as reflected by higher gain scores for both knowledge and attitudes.

The interactive, game-based nature of the educational snakes and ladders medium appears to enhance learner engagement, stimulate curiosity, and promote multisensory learning, which may facilitate deeper information processing and better retention of educational content. In contrast, while leaflet-based education was also effective, its impact was relatively lower, likely due to its more passive and less interactive format.

These findings suggest that educational snakes and ladders represent a promising and innovative nutrition education tool for adolescent girls. Integrating game-based educational media into school-based health promotion programs may serve as an effective strategy to improve knowledge and attitudes related to anemia prevention. Therefore, educational stakeholders and public health practitioners are encouraged to consider incorporating interactive learning approaches into adolescent nutrition education interventions.

References

[1] Damayanti D, Pritasari, Tri N. Gizi dalam Daur Kehidupan. Jakarta: Kementrian Kesehatan RI; 2017.

[2] Dinas Kesehatan Kota Padang. Laporan Skrining Kesehatan Anak Sekolah 2023. 2023.

[3] Hisanah R, Nuryanto, Rahadiyanti A, Wijayanti HS. Pengaruh Edukasi Gizi Melalui Permainan Ular Tangga Dan Booklet Terhadap Pengetahuan, Sikap, Dan Praktik Pencegahan Anemia Pada Remaja Putri. Jurnal Nutritiom College 2023;12:301–10.

[4] Indriasari R, Srifiyayani NR, Mansur MA, Ananda Tasya. Pengetahuan, Sikap, dan Tindakan Terkait Pencegahan Anemia Pada Remaja Berlatarbelakang Sosial-ekonomi Menengah ke Bawah di Makassar. Amerta Nutrition 2022;6:256–261.

[5] Kementerian Kesehatan RI. Survei Kesehatan Indonesia 2023 Dalam Angka. 2023.

[6] Kementrian Kesehatan RI. Pedoman Pencegahan dan Penanggulangan Anemia Pada Remaja Putri dan Wanita Usia Subur (WUS). Kementrian Kesehatan RI; 2018.

[7] Kusuma OHR. PENERAPAN MEDIA PEMBELAJARAN ULAR TANGGA UNTUK MENINGKATKAN KEAKTIFAN PEMBELAJARAN SISWA PADA SISWA KELAS X SMK SUDIRMAN 1 WONOGIRI. UNIVERSITAS MUHAMMADIYAH SURAKARTA, 2018.

[8] Putra RWH, Supadi J, Wijaningsih W. PENGARUH PEMBERIAN EDUKASI GIZI TERHADAP PENGETAHUAN DAN SIKAP MENGENAI ANEMIA PADA REMAJA PUTRI. Jurnal Riset Gizi 2019;7:75–8.

[9] Putri SR. Putri, S.R. (2016). Pengaruh Permainan Monopoli Gizi (Monogi) Tentang Pola Makan Seimbang Terhadap Pengetahuan dan Sikap Siswa SDN 060902 Mangkubumi Kota Medan Tahun 2016. Jurnal Gizi, Kesehatan Reproduksi Dan Epidemiologi USU 2016;1:1–7.

[10] Safitri NRD, Fitranti DY. Pengaruh Edukasi Gizi dengan Ceramah dan Booklet terhadap Peningkatan Pengetahuan dan Sikap Gizi Remaja Overweight. Journal of Nutrition College 2017;5:374–80.

[11] Silitonga IR, Nuryeti N. Profil Remaja Putri dengan Kejadian Anemia. Jurnal Ilmiah Kesehatan (JIKA) 2021;3:184–92. https://doi.org/10.36590/jika.v3i3.199.

[12] Soekidjo Notoatmodjo. Ilmu Perilaku Kesehatan. Jakarta: Rineka Cipta; 2014a.

[13] Soekidjo Notoatmodjo. Promosi Kesehatan Teori & Aplikasi. Jakarta: Rineka Cipta; 2014b.

[14] Soekidjo Notoatmodjo. Promosi Kesehatan dan Ilmu Perilaku. Jakarta: Rineka Cipta; 2007.

[15] Taamu T, Nurjannah N-, Wijayanti F-. Penggunaan Buku Saku Sebagai Media Untuk Meningkatkan Pengetahuan Dan Keterampilan Mencuci Tangan Anak. JPP (Jurnal Kesehatan Poltekkes Palembang) 2020;15:80–7. https://doi.org/10.36086/jpp.v15i2.556.