Effectiveness of Health Promotion Using the Snakes and Ladders-Hopscotch Game Media on Adolescent Knowledge of Vegetable and Fruit Consumption at SMPN 6 Jambi City

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Track Record Article

Revised: 13 December 2025
Accepted: 09 June 2026
Published: 30 June 2026

How to cite :
Handayani, I., Asrial, Kalsum, U., & Haryanto. (2026). Effectiveness of Health Promotion Using the Snakes and Ladders-Hopscotch Game Media on Adolescent Knowledge of Vegetable and Fruit Consumption at SMPN 6 Jambi City. *Contagion: Scientific Periodical Journal of Public Health and Coastal Health*, *8*(2), 85–97.

Abstract

Vegetable and fruit consumption among adolescents aged 10–14 years remains very low at 2.3%. Adolescents prefer fast food, often neglecting their need for vegetables and fruits, even though a balanced diet is crucial for their growth and development. This study aims to analyze the effectiveness of a Snakes and Ladders game combined with hopscotch in increasing adolescents' knowledge about vegetable and fruit consumption. The research used a quasi-experimental design with a two-group pre-test-post-test approach at SMPN 6 and SMPN 11 in Jambi City, with a sample of 52 respondents in the intervention group and 51 in the control group. Data analysis was performed using the Wilcoxon and Mann-Whitney tests. The Wilcoxon test showed a significant increase in knowledge in the intervention group (p=0.000), whereas the control group showed no significant change (p=0.257). The results of the Mann-Whitney test also showed no significant difference between the two groups at pre-test (knowledge p=0.628). Still, after the intervention, there was a significant difference in knowledge (p=0.000). The hopscotch, snakes, and ladders game is effective at increasing adolescents' knowledge about vegetable and fruit consumption. This media is recommended for use in health education in schools and healthcare facilities

Keywords: Model, Snakes and Ladders Media, Hopscotch, Fruit and Vegetable Consumption, Adolescents

INTRODUCTION

Vegetables and fruits are the primary sources of essential vitamins and minerals for the body, as these nutrients have important functions that cannot be replaced and must be obtained from outside the body through food (Kementerian Kesehatan Republik Indonesia, 2022). According to the World Health Organization (WHO), sufficient vegetable and fruit consumption is defined as 400 grams per person per day, which includes 250 grams of vegetables (equivalent to 2.5 servings or 2.5 bowls of cooked and drained vegetables) and 150 grams of fruit (equivalent to 3 medium-sized bananas, 1.5 medium-sized papayas, or 3 medium-sized oranges). A sufficient serving of fruit is 200-300 grams or 2-3 pieces per person per day, while a sufficient serving of vegetables is 150-200 grams per day or 1½ - 2 bowls per person per day. Indonesian residents are categorized as having 'sufficient' vegetable and fruit

consumption if they consume vegetables and fruit (a combination of vegetables and fruit) at least 5 servings per day for 7 days a week(Kementerian Kesehatan Republik Indonesia, 2023).

Insufficient consumption of fruits and vegetables can weaken the immune system and increase the risk of non-communicable diseases such as hypertension, stroke, obesity, and cancer. The WHO reports that 31% of heart disease cases and 11% of stroke cases are related to low fruit and vegetable intake, and deaths from non-communicable diseases continue to rise globally (World Health Organization, 2018; Kementerian Kesehatan Republik Indonesia, 2022). This condition is also commonly found in adolescents, and low consumption of vegetables and fruits is a risk factor for PTM (Badan Kebijakan Pembangunan Kesehatan, 2025). Ferro et al. (2020) also showed that higher fruit and vegetable consumption reduces the risk of stomach cancer. sufficient vegetable and fruit consumption is defined as 400 grams per person per day, which includes 250 grams of vegetables (equivalent to 2.5 servings or 2.5 bowls of cooked and drained vegetables) and 150 grams of fruit (equivalent to 3 medium-sized bananas, 1.5 medium-sized papayas, or 3 medium-sized oranges). A sufficient serving of fruit is 200-300 grams or 2-3 pieces per person per day, while a sufficient serving of vegetables is 150-200 grams per day or 1½ - 2 bowls per person per day. Indonesian residents are categorized as having 'sufficient' vegetable and fruit consumption if they consume vegetables and fruit (a combination of vegetables and fruit) at least 5 servings per day for 7 days a week (Naseer et al., 2019).

Adolescents are an age group with relatively low vegetable and fruit consumption. Various global studies indicate that most adolescents have not yet met the recommended daily intake (Beal et al., 2019; Salwa et al., 2021; Wambogo et al., 2020; Ziaei et al., 2020). In Indonesia, adolescents aged 10-14 are recorded as the group with the lowest consumption of vegetables and fruits, at 2.3%. (Kementerian Kesehatan Republik Indonesia, 2023). This condition is also seen in Jambi City, where only 3.0% (Kementerian Kesehatan Republik Indonesia, 2023) meet the recommended consumption. A preliminary survey conducted by the researcher at SMPN 6 Jambi City also found that only 4 out of 10 students (40%) consumed vegetables and fruits as recommended.

Other research in Indonesia also shows similar findings, including Qibtiyah (2021), who reported that most adolescents at SMPN 3 South Tangerang did not meet the recommended daily intake, with an average of only 1 serving of fruit and 1.5 servings of vegetables per day. Meanwhile, a literature review by Rachmi et al. (2021) also confirmed that Indonesian adolescents generally do not meet the recommended intake of vegetables and fruits.

Currently, teenagers prefer fast foods such as meatballs, pizza, hamburgers, and chocolate, while their intake of vegetables and fruits is low (Proverawati & Wati, 2017). The research by Kalsum et al. (2018) indicates that adolescents in Jambi City prefer fast food such as pizza, hamburgers, popcorn, cakes, and sweets. Adolescence is an important period for the development of the body and for the formation of healthy eating habits. An unhealthy diet during this phase can negatively impact growth and development and increase the risk of future health problems. Therefore, adopting a healthy eating pattern from adolescence is an important preventive step against potential future health disorders (Arisman, 2010).

One factor contributing to low fruit and vegetable consumption is knowledge. Several studies have shown a significant relationship between nutritional knowledge and fruit and vegetable consumption behavior, and emphasize the importance of effective and sustainable nutrition education (Schmitt et al., 2019; Rarastiti, 2022; Gifari et al., 2024). Good knowledge will shape positive attitudes and encourage healthy behaviors (Notoatmodjo, 2018).

Efforts to increase adolescent knowledge can be done through health promotion using media appropriate for the target audience's characteristics. Educational games, including traditional games, are effective in increasing adolescents' health knowledge (Wijayanti et al., 2021). Examples of effective game methods used as a health promotion medium include Snakes and Ladders and Hopscotch.

The main advantage of the Snakes and Ladders game is that it provides an enjoyable experience, thereby attracting children's interest in learning while they play. Additionally, this game allows children to participate in the learning process actively and contributes to improving their learning outcomes (Handayani & Febriani, 2025).

Hopscotch is a traditional physical activity-based game played by jumping from one square to the next on one foot while maintaining balance. This activity provides physical benefits because children must jump over the arranged squares, thus optimizing leg muscle strength and body balance. Additionally, hopscotch also contributes to children's cognitive development (Baan et al., 2020; Humaedi et al., 2021). Snakes and ladders and hopscotch not only serve as learning tools but also promote physical activity, social interaction, and active student engagement (Aini & Khaerunisa, 2018).

Based on these problems, this study aims to analyze the effectiveness of health promotion through the traditional game media of Snakes and Ladders, combined with hopscotch, in increasing students' knowledge of vegetable and fruit consumption at SMPN 6 Jambi City.

METHODS

This research uses a quasi-experimental method with a pretest-posttest control group design. The research subjects consisted of two groups: the treatment group (52 students from SMPN 6 Kota Jambi) who received health promotion using a snakes and ladders game combined with hopscotch about fruits and vegetables, assisted by a game guide containing explanations of the material presented in the snakes and ladders game; and the control group (51 students from SMPN 11 Kota Jambi) who did not receive any intervention but were given health promotion through lectures and leaflets.

This research aims to increase students' knowledge about vegetables and fruits after receiving treatment. The knowledge measured includes understanding of nutritional benefits, recommended portion sizes, functions, content, and the impact of insufficient vegetable and fruit consumption. The knowledge measurement instrument consisted of a 20-question test. The results of the test instrument were categorized into three levels: good (score 16-20), sufficient (score 12-15), and poor (score 0-11).

As for the form and technique of this game, it combines the Snakes and Ladders and hopscotch games, incorporating content on vegetable and fruit consumption. The Snakes and Ladders game is modified by adding pictures and educational information related to vegetables and fruits. The game is played on a large field or room, where students act as pieces and move from one square to another by hopping on one foot, following the hopscotch rules. The intervention was administered for more than 21 days, specifically from August to October 2025, three times, with a 2-week interval between each. This aligns with Maltz's research, as cited in Sudarmin (2014), which states that a minimum of 21 days is required to form daily habits. Before the intervention, a pretest was administered, and after all interventions were completed, a post-test was administered to determine the intervention's effectiveness. The research facilitators consist of the principal investigator and two research assistants who are currently undergoing their studies. All facilitators have undergone special training before the intervention to align perceptions and implementation procedures. To support uniformity in material delivery, the researcher designed a game that includes explanations of the game mechanics and the educational content outlined in the game manual.

Intervention consistency was maintained by using the same game media, rules, educational materials, and session duration across all sessions, ensuring that all respondents in the treatment group received equal exposure to the intervention. The size of the Snakes and Ladders game board is 500 cm x 400 cm, with each square measuring 50 cm x 40 cm. The

game board is designed to resemble dragon fruit, making it more attractive and better suited to the material's theme. The form of the media can be seen in the following image:

Figure 1. Snakes and Ladders Game Media Combined with Hopscotch Game About Vegetables and Fruits

The determination of the sample size to be used in the study is based on the theoretical concept of Sugiyono (2019), which states that for experimental or quasi-experimental research in education: a sample size of > 30 per group is considered sufficient for more stable statistical analysis, taking into account inclusion and exclusion criteria and sampling technique using random sampling. Data was collected directly using test instruments that had undergone validity and reliability testing. The test results showed that the instrument had a validity of 0.439 and a reliability of 0.844, indicating suitability for use. Data processing was performed using SPSS version 26, with univariate and bivariate analysis. The statistical tests used were Wilcoxon and Mann-Whitney with a significance level of $p < 0.05$, as the data were not normally distributed.

RESULT

Respondent Characteristics

Based on Table 1, in the intervention group, there were more female respondents (59.6%) than male respondents, whereas in the control group, there were more male respondents (26, or 50.9%) than female respondents. By age, the majority of respondents in both the intervention and control groups were 13 years old, with 46.1% and 47.2%, respectively. Based on the father's education, in the intervention group, the majority of respondents' fathers had a high school/vocational high school education (61.5%). In contrast,

in the control group, the majority had a D3/D4/S1 education (47.0%). Meanwhile, the majority of respondents' mothers in the intervention group had a high school/vocational high school education (50%), and in the control group, the majority had a D3/D4/S1 education (49.1%).

Table 1. Distribution of Treatment and Control Group Students by Gender, Age, Father's Education, and Mother's Education

Variable	Amount			
	Treatment Group	%	Control Group	%
Gender				
Male	21	40,4	26	50,9
Female	31	59,6	25	49,1
Age				
11 Years	3	5,7	4	7,8
12 Years	22	42,3	19	37,2
13 Years	24	46,1	24	47,2
14 Years	3	5,7	4	7,8
Father's Education				
Did not complete SD/MI	0	0	0	0
Completed SD/MI	3	5,7	2	3,9
Completed SMP/MTS	7	13,4	2	3,9
Completed /SMA /MA	32	61,5	18	35,3
Completed D3/D4/S1	9	17,3	24	47,0
Completed S2/S3	1	2,1	5	9,9
Mother's Education				
Did not complete SD/MI	1	2,1	1	1,9
Completed SD/MI	3	5,7	1	1,9
Completed SMP/MTS	6	11,5	1	1,9
Completed /SMA /MA	26	50,0	20	39,2
Completed D3/D4/S1	15	28,6	25	49,1
Completed S2/S3	1	2,1	3	6,0
Total	**52**	**100**	**51**	**100**

Students' Knowledge of Vegetable and Fruit Consumption

Based on Table 2, in the treatment group before the intervention (pre-test), the majority of respondents had a moderate level of knowledge, totaling 24 people (46.2%). In comparison, 13 people (25.0%) had good knowledge, 31 people (59.6%) had moderate knowledge, and 8 people (15.7%) had poor knowledge. After the intervention, there was a significant increase in knowledge: the number of respondents with good knowledge increased to 47 (90.4%), moderate knowledge decreased to 5 (9.6%), and no one had poor knowledge (0.0%).

In the control group, before the intervention, 7 respondents (13.7%) had good knowledge, 30 (58.8%) had moderate knowledge, and 14 (27.5%) had poor knowledge. After the intervention, good knowledge increased to 20 people (39.2%), moderate knowledge decreased to 20 people (39.2%), while the poor category decreased to 11 people (21.6%).

Table 2. Distribution of Students' Knowledge about Vegetable and Fruit Consumption in the Treatment and Control Groups

No	Knowledge	Treatment Group				Control Group			
		Pre-Test		*Post-Test*		*Pre-Test*		*Post-Test*	
		n	%	n	%	n	%	n	%
1	Good	13	25,0	47	90,4	7	13,7	20	39,2
2	Enough	31	59,6	5	9,6	30	58,8	20	39,2
3	Less	8	15,4	0	0,0	14	27,5	11	21,6
	Total	**55**	**100**	**52**	**100**	**51**	**100**	**51**	**100**

Differences in Students' Knowledge About Vegetable and Fruit Consumption After Treatment for Each Group

From Table 3, the treatment group shows a mean difference of 5.26. The Wilcoxon signed-rank test results yielded a p-value of 0.000 (< 0.05), indicating a significant difference between knowledge levels before and after the treatment. In addition, the effect size (r = 0.84) indicates a considerable effect, suggesting that the health promotion intervention combining Snakes and Ladders and hopscotch games had a strong influence on increasing students' knowledge of vegetable and fruit consumption. Thus, the intervention proved effective in increasing students' knowledge.

Conversely, the control group showed a mean difference of 0.50. The Wilcoxon signed-rank test yielded a p-value of 0.257 (< 0.05), indicating no significant difference between knowledge scores before and after measurement. The effect size (r = 0.16) indicates a small effect, suggesting that the change in knowledge in the control group was relatively weak and practically insignificant. This finding is consistent with the non-significant statistical test, which confirms that without health promotion intervention, there was no increase in knowledge.

Table 3. Results of Changes in Students' Knowledge about Vegetables and Fruits in the Treatment and Control Groups

Knowledge	Mean Difference	SD	Std Error Mean	95% CI		*p-value*	*r*
				Lower	Upper		
Treatment Group	5,26	1,843	0,256	18,37	19,40	0,000	0,84
Control Group	0,50	3,828	0,536	12,42	14,62	0,257	0,16

The Effectiveness of Health Promotion Using the Snakes and Ladders Game Combined with Hopscotch on Students' Knowledge of Vegetable and Fruit Consumption

Based on Table 4, the Mann-Whitney test results indicate that the knowledge variable before the intervention had a p-value of 0.628 (> 0.05), indicating no significant difference in knowledge between the treatment and control groups. Additionally, the biserial rank correlation

coefficient (r = 0.05) indicates a minimal effect, suggesting that the difference in knowledge between the two groups is practically negligible. This finding is consistent with the non-significant statistical test results, which indicate that the two groups had relatively equal initial conditions before the intervention.

Conversely, after the intervention, the Mann-Whitney test showed a p-value of 0.000 (< 0.05), indicating a significant difference in student knowledge between the treatment and control groups. The rank biserial correlation coefficient (r = 0.74) indicates a significant effect, suggesting a powerful practical difference between the two groups. This finding indicates that the treatment group had a significantly higher level of knowledge compared to the control group after receiving the intervention.

Table 4. Effectiveness of Health Promotion Using the Snakes and Ladders Game Combined with the Hopscotch Game on Student's Knowledge of Vegetable and Fruit Consumption in the Treatment and Control Groups

Knowledge	Group	Mean	SD	Std. Error Mean	*p-value*	*R*
Pre-Test	Treatment	13,62	2,89	0,40	0,628	0,05
	Control	13,03	3,11	0,43		
Post-Test	Treatment	18,88	1,84	0,25	0,000	0,74
	Control	13,53	3,82	0,53		

DISCUSSION

Respondent characteristics

The research results show that the respondents in both groups were mostly 13 years old. This age is the early adolescent phase, which is still very responsive to education and is at a stage of cognitive development that actively explores new information (Santrock, 2019). The difference in gender proportions indicates that the intervention group was predominantly female, while the control group was predominantly male. However, this difference did not affect the equality of initial knowledge abilities, as evidenced by the non-significant difference in pre-test results. This finding is relevant according to Notoatmodjo (2018), who states that gender is not a factor that directly influences knowledge levels; knowledge is more influenced by a person's education, experience, and the information they receive.

The educational levels of the father and mother are mostly secondary or higher (high school to university). This could, in theory, contribute to the family's ability to provide understanding of nutrition (Notoatmodjo, 2018). However, in this study, that contribution is not yet strongly evident. Therefore, education through schools becomes a highly relevant strategy for increasing students' knowledge about vegetable and fruit consumption.

The Effectiveness of Health Promotion Using the Snakes and Ladders Game Combined with the Hopscotch Game on Increasing Adolescent Knowledge about Fruit and Vegetable Consumption

Increasing a person's knowledge can be achieved through effective, engaging information delivery. In this study, information was provided using a modified version of the Snakes and Ladders game, incorporating pictures and educational material about vegetables and fruits, and combined with the hopscotch game technique. The research design is a quasi-experiment with two groups: the treatment and control groups. Both groups were given pre- and post-tests to assess the effectiveness of health promotion using modified snakes-and-ladders and hopscotch games.

The research results show that before treatment, the knowledge levels of students in the treatment and control groups were similar and dominated by sufficient knowledge. This condition indicates that most students have a basic understanding of vegetable and fruit consumption, but have not yet reached an optimal level of knowledge. After the intervention, there was an apparent increase in knowledge in the intervention group, characterized by the dominance of good knowledge and the absence of students with low knowledge. Conversely, in the control group, the change in knowledge did not show a significant increase, so some students remained in the sufficient and poor knowledge categories.

The results of the statistical analysis confirm that health promotion through the traditional game media of Snakes and Ladders, combined with hopscotch, significantly improves students' knowledge of vegetable and fruit consumption. The absence of initial knowledge differences between the two groups, as well as the emergence of significant differences after the intervention, indicates that the increase in knowledge in the treatment group is a result of the intervention (treatment) provided.

These findings indicate that using educational game media that involves physical activity and direct interaction is efficacious in improving students' understanding of vegetable and fruit material. This approach can create a more engaging, meaningful, and easily understood promotion process, thereby encouraging more optimal knowledge acquisition than methods without treatment. This result is in line with the research by Handayani et al. (2018), which found that counselling using the Snakes and Ladders game media can increase vegetable and fruit consumption among students at MTs-S Almanar Hamparan Perak, Deli Serdang Regency.

Relevant research by Wijayanti et al. (2021) on health promotion using the Snakes and Ladders game found that it effectively increased adolescents' knowledge of vegetables and

fruits at State Junior High School 238, in South Jakarta. This aligns with the research by Anisa et al. (2024), which showed that the game of Snakes and Ladders improves knowledge among junior high school students at SMPN 1 Karawang Timur. Madinah et al. (2023) showed that there was an effect of the educational game Snakes and Ladders on increasing knowledge about balanced nutrition in students of Madrasah Ibtidaiyah Negeri 3 Tanah Laut, South Kalimantan. The study by Jauhari and Hidayah (2021) showed that using the Snakes and Ladders method increased children's nutrition knowledge at SDN 3 Golong, West Lombok. Syawaludin's (2020) research shows that the Snakes and Ladders learning media in social studies can increase students' interest and learning outcomes in primary education.

Additionally, several studies have also found that hopscotch can be used as a learning medium for children. Aini and Khaerunisa (2018) found that the modified hopscotch game-assisted drill method influenced problem-solving abilities in seventh-grade students at MTs Uswatun Hasanah. The increase in knowledge in this study was also influenced by the students' internal motivation to understand the importance of consuming fruits and vegetables. Additionally, the learning media are engaging and can increase respondents' involvement in the learning process. The game media used is Snakes and Ladders, modified with pictures and materials related to fruits and vegetables, combined with the hopscotch game. Delivering information through fun game media, repeated exposure, and incorporating physical and visual activities can enhance information absorption and retention. This aligns with the theory stating that learning in a fun and interactive atmosphere can increase students' attention, motivation, and understanding of the material presented (Arsyad, 2017).

According to Notoatmodjo (2018), knowledge is the result of human perception or what a person knows after perceiving a specific object. Sensing occurs through the five human senses: sight, smell, taste, and touch. Most human knowledge is acquired through the senses. When playing Snakes and Ladders combined with hopscotch, which primarily uses the eyes and ears, students see images and read the material on the Snakes and Ladders media. Other students listen to the statements read and pay attention to the explanations provided by the researcher. The use of the snakes and ladders combined with the hopscotch game media in this study allows students to gain knowledge in a fun way, namely by learning while playing. Additionally, this game allows children to participate in the learning process actively and contributes to improving their learning outcomes (Handayani & Febriani, 2025).

CONCLUSION

This study has several limitations, including the intervention being implemented at only one school with specific characteristics, which limits the generalizability of the research, and the study area covering only one region, which does not yet reflect the variation in conditions across other regions. Additionally, parental involvement, particularly that of mothers, who play a crucial role in food processing and preparation at home, is necessary to comprehensively evaluate the family environment's influence on changes in vegetable and fruit consumption behavior.

Based on the research findings, it can be concluded that health promotion through the modified Snakes and Ladders game, incorporating images and materials on vegetables and fruits, combined with the hopscotch game and a game guide, has a positive impact on students' knowledge. This increase in knowledge is expected to improve attitudes and behaviors regarding vegetable and fruit consumption among adolescents.

Further research is recommended to conduct health promotion studies using this game-based media with a broader, more diverse population to obtain generalizable results. Further studies are also suggested to measure changes in vegetable and fruit consumption behavior up to the maintenance stage, strengthen parental involvement on an ongoing basis, and examine students' preferences and beliefs regarding vegetable and fruit consumption, while still considering variables that need to be controlled, such as socioeconomic status, parental education, parental motivation, knowledge, adolescent preferences, vegetable and fruit availability, and others.

Furthermore, future research is also suggested to compare health promotion based on the game "Snakes and Ladders" combined with "Hopscotch" played on a large field or open space, with digital-based promotion media, to determine the most effective approach for improving vegetable and fruit consumption behavior among adolescents.

REFERENCES

Aini, F., & Khaerunisa, I. (2018). Pengaruh penggunaan metode drill berbantuan permainan engklek termodifikasi terhadap kemampuan pemecahan masalah siswa kelas VII. *Journal of Medives: Journal of Mathematics Education IKIP Veteran Semarang*.

Anisa, A., Kurniasari, R., & Andriani, E. (2024). Pengaruh media flipchart, video animasi dan ular tangga terkait sayur buah terhadap pengetahuan dan sikap remaja SMPN 1 Karawang Timur. *Jurnal Untuk Masyarakat Sehat (JUKMAS)*, *8*(2), 227-241. https://doi.org/10.52643/jukmas.v8i2.4525

Arikunto, S. (2019). *Prosedur penelitian: Suatu pendekatan praktik*. Rineka Cipta.

Arisman. (2010). *Gizi dalam daur kehidupan: Buku ajar ilmu gizi*. EGC.

Arsyad, A. (2017). *Media pembelajaran*. RajaGrafindo Persada.

Baan, A. B., Rejeki, H. S., & Nurhayati. (2020). Perkembangan motorik kasar anak usia dini. *Jurnal Bungamputi, 6*(0), 14-21.

Badan Kebijakan Pembangunan Kesehatan. (2025, March 7). *Ini pentingnya edukasi faktor resiko PTM pada remaja*. Kementerian Kesehatan Republik Indonesia. https://www.badankebijakan.kemkes.go.id/ini-pentingnya-edukasi-faktor-resiko-ptm-pada-remaja/

Beal, T., Morris, S. S., & Tumilowicz, A. (2019). Global patterns of adolescent fruit, vegetable, carbonated soft drink, and fast-food consumption: A meta-analysis of Global School-based Student Health Surveys. *Food and Nutrition Bulletin, 40*(4), 444-459. https://doi.org/10.1177/0379572119848287

Dahlan, S. (2020). *Statistik untuk kedokteran dan kesehatan*. Salemba Medika.

Ferro, A., Costa, A. R., Morais, S., Bertuccio, P., Rota, M., Pelucchi, C., & Stomach Cancer Pooling Project. (2020). Fruits and vegetables intake and gastric cancer risk: A pooled analysis within the Stomach Cancer Pooling Project. *International Journal of Cancer*. https://doi.org/10.1002/ijc.33134

Gifari, N., Widyastiti, N., & Nuzrina, R. (2024). Hubungan pengetahuan gizi dengan konsumsi sayur, buah, dan suplemen pada masa pandemi COVID-19. *Indonesian Journal of Nutrition*.

Handayani, H., & Febriani, E. A. (2025). Pengaruh model pembelajaran game based learning berbantuan media ular tangga terhadap hasil belajar sosiologi di kelas X fase E SMAN 4 Padang. *Naradidik: Journal of Education and Pedagogy, 4*(1).

Handayani, I., Lubis, Z., & Aritonang, E. Y. (2018). Pengaruh penyuluhan dengan media permainan ular tangga terhadap pengetahuan tentang buah dan sayur pada siswa MTs-S Almanar Kecamatan Hamparan Perak. *Jurnal Ilmiah PANNMED, 13*(1), 115-123.

Humaedi, H., Saparia, A., Nirmala, B., & Abduh, I. (2021). Deteksi dini motorik kasar pada anak usia 4-6 tahun. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini, 6*(1), 558-564. https://doi.org/10.31004/obsesi.v6i1.1368

Jauhari, M. T., & Hidayah, N. (2021). Penyuluhan makanan bergizi seimbang melalui pendekatan metode ular tangga. *ADMA: Jurnal Pengabdian dan Pemberdayaan Masyarakat, 1*(2), 85-90. https://doi.org/10.30812/adma.v1i2.1026

Kalsum, U., Nainggolan, S., & Ng, N. (2018). Pizza and hamburger consumption to overweight among adolescents in Jambi City. *Kesmas: National Public Health Journal, 13*(2), 53-59. https://doi.org/10.21109/kesmas.v13i2.1694

Kementerian Kesehatan Republik Indonesia. (2022, July 7). *Ayo makan buah dan sayur*. Direktorat Jenderal Kesehatan Lanjutan. https://keslan.kemkes.go.id/view_artikel/199/ayo-makan-buah-dan-sayur

Kementerian Kesehatan Republik Indonesia. (2023). *Survei Kesehatan Indonesia (SKI) 2023*. Badan Kebijakan Pembangunan Kesehatan. https://www.badankebijakan.kemkes.go.id/hasil-ski-2023/

Madinah, S., Farhat, H. Y., & Hariati, N. W. (2023). Pengaruh permainan edukasi ular tangga terhadap pengetahuan dan sikap tentang gizi seimbang. *Jurnal Riset Pangan dan Gizi (JR-Panzi)*.

Naseer, S., Hussain, S., & Zahid, Z. (2019). Nutritional and antioxidant potential of common vegetables in Pakistan. *RADS Journal of Biological Research & Applied Sciences, 10*(1), 36-40.

Notoatmodjo, S. (2018). *Promosi kesehatan dan perilaku kesehatan*. Rineka Cipta.

Nursalam. (2020). *Metodologi penelitian ilmu keperawatan: Pendekatan praktis*. Salemba Medika.

Proverawati, A., & Wati, K. (2017). *Ilmu gizi untuk keperawatan dan gizi kesehatan*. Nuha Medika.

Qibtiyah, M., Rosidati, C., & Siregar, M. H. (2021). Perilaku konsumsi buah dan sayur pada remaja. *Jurnal Gizi Kerja dan Produktivitas, 2*(2), 51-60. https://doi.org/10.52742/jgkp.v2i2.12760

Rachmi, C. N., Jusril, H., Ariawan, I., Beal, T., & Sutrisna, A. (2021). Eating behaviour of Indonesian adolescents: A systematic review of the literature. *Public Health Nutrition, 24*(S2), S84-S97. https://doi.org/10.1017/S1368980020002876

Rarastiti, C. N. (2022). Hubungan pengetahuan gizi seimbang dengan konsumsi buah dan sayur pada remaja. *Jurnal Penelitian Inovatif, 2*(2), 281-288. https://doi.org/10.54082/jupin.80

Salwa, M., Subaita, F., Choudhury, S. R., Khalequzzaman, M., Al Mamun, M. A., Bhuiyan, M. R., et al. (2021). Fruit and vegetables consumption among school-going adolescents: Findings from the baseline survey in an intervention programme in Dhaka, Bangladesh. *PLOS ONE, 16*(6), e0252297. https://doi.org/10.1371/journal.pone.0252297

Santrock, J. W. (2019). *Adolescence* (16th ed.). McGraw-Hill Education.

Schmitt, S. A., Bryant, L. M., Korucu, I., Kirkham, L., Katare, B., & Benjamin, T. (2019). The effects of a nutrition education curriculum on young children's fruit and vegetable preferences and knowledge. *Public Health Nutrition, 22*(1), 28-34. https://doi.org/10.1017/S1368980018002586

Sudarmin, R. R. (2014). *Analisis program gerakan 21 hari cuci tangan pakai sabun (G21H) terhadap kejadian diare pada siswa sekolah dasar di Makassar* [Unpublished thesis]. Universitas Hasanuddin.

Sugiyono. (2019). *Metode penelitian kuantitatif, kualitatif, dan R&D*. Alfabeta.

Syawaluddin, A., Rachman, S. A., & Khaerunnisa. (2020). Developing snake ladder game learning media to increase students' interest and learning outcomes on social studies in elementary school. *Simulation & Gaming, 51*(4). https://doi.org/10.1177/1046878120921902

Wambogo, E. A., Ansai, N., Ahluwalia, N., & Ogden, C. L. (2020). *Fruit and vegetable consumption among children and adolescents in the United States, 2015-2018*. NCHS Data Brief, 391, 1-8.

Wijayanti, T. S., Fayasari, A., & Khasanah, T. A. (2021). Permainan edukasi ular tangga meningkatkan pengetahuan dan konsumsi sayur buah pada remaja di Jakarta Selatan. *Journal of Nutrition College, 10*(1), 18-25. https://doi.org/10.14710/jnc.v10i1.29153

World Health Organization. (2018). *Noncommunicable diseases country profiles 2018*. World Health Organization.

Ziaei, R., Shahi, H., Dastgiri, S., Mohammadi, R., & Viitasara, E. (2020). Fruit and vegetable intake and its correlates among high-school adolescents in Iran: A cross-sectional study. *Journal of Public Health, 28*, 711-718. https://doi.org/10.1007/s10389-019-01084-2