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Original Article

The "Prevent Anemia" Board Game Increases Adolescent Knowledge

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ABSTRACT

Background: Anemia remains a public health problem among adolescent girls, primarily due to low iron intake and non-compliance with iron supplementation (IBP). Anemia in adolescent girls can impact learning concentration, academic achievement, and fitness, and is at risk of continuing into pregnancy. One important factor influencing anemia prevention behavior is knowledge. The prevalence of iron supplementation among adolescent girls in South Sulawesi in 2023 was 65.5% and in Jeneponto Regency it was 73.0%, still below the national target of 75.0%. Therefore, innovative, engaging, and easily understood educational media are needed for adolescents, one of which is through board-based educational games. Interactive approaches are considered capable of increasing engagement, motivation, and understanding of adolescent girls' health.

Methods: This study employed a quantitative method with a pre-experimental one group pre-test and post-test design. The sample consisted of 80 adolescent girls at SMPN 1 Tamalatea, Jeneponto Regency, selected using a purposive sampling technique. The research instrument was a questionnaire measuring knowledge of anemia and iron supplementation, which had been tested for validity and reliability. The intervention was delivered through health education using the "Cegah Anemia" boardgame, implemented in group-based learning sessions.

Results: The findings showed that prior to the intervention, most respondents had a moderate (61.3%) or poor (37.5%) level of knowledge. After the intervention, knowledge levels increased, with the majority of respondents categorized as having good knowledge (57.5%). The Wilcoxon signed-rank test indicated a statistically significant improvement in knowledge following the intervention.

Conclusion: Health education using the "Cegah Anemia" boardgame is effective in improving adolescent girls' knowledge regarding anemia and iron supplementation at SMPN 1 Tamalatea.

INTRODUCTION

Adolescence is a transitional period from childhood to adulthood, marked by various physical and psychological changes, making it vulnerable to health problems. One common health problem in adolescent girls is anemia, caused by inadequate iron intake, menstrual blood loss, comorbidities, and poor adherence to iron supplementation (TTD) (Tarwoto et al., 2024; Kemenkes RI, 2023). Anemia can impact immunity, impaired concentration, and academic performance, and can persist into pregnancy if not treated early (Fillah, 2014).

Adolescent girls who have started menstruating are at higher risk of developing anemia due to monthly blood loss. This risk increases if adequate iron intake is not balanced. Unhealthy habits such as skipping breakfast, strict diets, and consuming fast food contribute to low intake of essential nutrients such as iron, protein, folic acid, and vitamin B12, which play a role in red blood cell formation (Kemenkes RI, 2025). Furthermore, the habit of consuming tea and coffee after meals can inhibit iron absorption in the body. Adolescent girls are at higher risk of developing anemia because they are experiencing rapid physical growth, reproductive maturation, and cognitive development, which increase the body's need for iron (DinKes Kota Bandung, 2023).

Globally, the prevalence of anemia in adolescent girls remains relatively high, reaching 30.7% in 2022 and declining to 30% in 2024. However, it remains far from the World Health Organization (WHO) target of 10% (WHO,2025). In Southeast Asia, the prevalence of anemia among adolescent girls reached 42%, with several countries, including Indonesia, categorized as a moderate to high public health problem (WHO, 2023). In Indonesia, the prevalence of anemia among adolescent girls fluctuates and will increase again to 32% in 2023, indicating that anemia remains a public health problem (Kemenkes RI, 2024).

In South Sulawesi Province, the prevalence of anemia among adolescent girls in 2023 reached 33.7%, with iron supplement consumption still below the national target of 75% (Dinas Kesehatan Sulawesi Selatan, 2024). Jeneponto Regency is one of the areas with a high prevalence of anemia and suboptimal iron supplement consumption coverage. The prevalence of anemia among adolescent girls increased from 30% in 2022 to 39.5% in 2023 (Dinkes Kabupeten Jeneponto, 2024). This situation highlights the need for more effective anemia prevention strategies in adolescent girls.

Anemia prevention efforts through iron supplement administration have not been fully optimized due to factors such as knowledge, attitudes, and behavior among adolescent girls (Kemenkes RI, 2024). Previous research has shown that a good level of knowledge is closely related to anemia prevention efforts and iron supplement consumption compliance (Budiantono & Fadhilah, 2016; Kusnadi, 2021). Therefore, an innovative educational approach tailored to the characteristics of adolescents is needed.

Game-based educational media, such as board games, have been shown to be effective in increasing adolescents' knowledge, understanding, and positive attitudes toward anemia prevention and iron supplement consumption (Lolan et al., 2025; Kaltsum et al., 2025; Putri et al., 2025). However, research specifically evaluating the effectiveness of a single board game in improving adolescent girls' knowledge is still limited. Therefore, this study aims to analyze the effectiveness of the board game "Prevent Anemia" in improving adolescent girls' knowledge about anemia and iron supplement consumption.

A board game, often referred to as a board game, is a form of play that uses a board as the primary playing surface. Educational board games are designed to convey specific material or skills. The concept of these games involves a balance between educational content and engaging gameplay mechanics, allowing players to learn without feeling overwhelmed. The selection of educational board games as a medium for anemia prevention research is based on the consideration that

interactive and fun learning methods can increase adolescents' interest in learning and understanding. Adolescents tend to be more receptive to health information through media that is not boring and involves active participation. Board games allow students to learn while playing, discussing, and solving problems, thus improving their understanding of anemia, its causes, impacts, and prevention methods. Furthermore, the use of board games can also improve memory because the material is presented through an engaging play experience. It is hoped that this will increase the knowledge and awareness of adolescent girls in preventing anemia, including through the consumption of iron-fortifying tablets and the selection of iron-rich foods**.**

METHODS

This study employed a quantitative pre-experimental design using a one-group pre-test and post-test approach. In this design, respondents were given questionnaires before (pre-test) and after (post-test) the intervention, which involved education through the educational board game "Prevent Anemia."

The study was conducted at SMPN 1 Tamalatea, Tamalatea District, Jeneponto Regency in November 2025. The study population was all 99 female adolescents in grades VIII and IX, aged 13–15 years. The sample was determined using a purposive sampling technique based on inclusion and exclusion criteria. Inclusion criteria included female adolescents who were willing to participate by signing an informed consent and were in good physical and mental health. Exclusion criteria included respondents who completed the questionnaire incompletely or did not complete all stages of the study. The sample size was calculated using the Slovin formula, resulting in a total of 80 respondents. This study has received ethical clearance from the Health Research Ethics Committee under the registration number 1663/M/KEPK-PTKMS/X/2025.

The research instruments consisted of the educational board game "Prevent Anemia" and a knowledge questionnaire about anemia and iron supplements (IBF). The board game included material on the definition of anemia, its causes, signs and symptoms, impacts, prevention efforts, recommended iron supplement consumption, benefits, and side effects. This media was validated by media experts and received a score of 47 out of 50, categorized as very good. The game lasted approximately 20 minutes, with participants reading cards from the material obtained during the game. The knowledge questionnaire, which had been tested for validity and reliability, was used to measure respondents' knowledge levels before and after the intervention.

The research procedure and media use began with a preparation phase. The researchers prepared a questionnaire as the research instrument and an educational board game, "Prevent Anemia." Next, respondents were asked to complete a pre-test questionnaire to determine their initial knowledge level about anemia. The researchers then provided an educational intervention, a game, "Prevent Anemia," played in groups under the guidance of the researcher. After the activity, respondents completed a post-test questionnaire to determine changes in their knowledge levels after the education. Pre-test and post-test data were then collected and analyzed to determine differences in knowledge before and after the intervention. The intervention using board games was conducted once during the study.

Data analysis included univariate and bivariate analyses. Univariate analysis was used to describe respondent characteristics and the distribution of knowledge levels before and after the intervention. Bivariate analysis began with a normality test using the Kolmogorov–Smirnov test and continued with the Wilcoxon test because the data were not normally distributed to determine differences in knowledge levels before and after the intervention.

RESULTS

The results of the study are presented in the following table:

Table 1. Characteristics of Respondents Based on Age, Age at First Menstruation, and Experience of 5L Symptoms at SMPN 1 Tamalatea

Respondent Characteristics	*n*	%
Age		
13 years	32	40.0
14 years	36	45.0
15 years	12	15.0
Age at First Menstruation		
11 years	12	15.0
12 years	46	57.5
13 years	22	27.5
Experiencing 5L Symptoms		
Yes	6	7.5
No	74	92.5
Total	80	100.0

Table 1 shows that of the 80 respondents, the majority (45%) were aged 14 years old (36 female students). This indicates that the majority of respondents were in their middle adolescence. The majority of respondents (57.5%, 46 female students) experienced their first menstruation at age 12. A total of 92.5% (74 female students) did not experience the 5L symptoms (Weakness, Fatigue, Lethargy, Weakness, and Weakness). This indicates that the majority of adolescents are in good health, although a small number who experience these symptoms still require attention.

Table 2. Description of adolescent girls' knowledge data before (pre-test) and after (post-test) the intervention.

Variables	n	*Mean* (x ± SD)	*Min-Max*
Pre-test	80	60.66 ± 10.682	36 80
Post-test	80	80.25 ± 7.920	60 96

Based on table 2, it shows that the average (mean) value of adolescent girls' knowledge about anemia before being given the intervention was 60.66. After the intervention through the board game "Prevent Anemia" media, the average value of adolescent girls' knowledge increased by 20% to 80.25. In the pre-test stage, the minimum value obtained by respondents was 36, while the maximum value was 80. Meanwhile, in the post-test stage, the minimum value increased to 60 and the maximum value reached 96. These data indicate that there was an increase in the value of adolescent girls' knowledge about anemia. The standard deviation value in the pre-test was 10.682, while in the post-test it decreased to 7.920.

Table 3. Distribution of adolescents' knowledge about anemia and iron-deficiency iron (IBF) before (pre-test) and after (post-test) the intervention using the "Prevent Anemia" board game

level of knowledge	*Pre-test*		*Post-test*	
	n	%	*n*	%
not enough (<60%)	30	(37,5)	0	(0)
Enough (60 – 79%)	49	(61,3)	34	(42,5)
Good (80 – 100%)	1	(1,3)	46	(57,5)
Total	80	100,0	80	100,0

Table 3 shows that before the intervention using the "Prevent Anemia" board game, the majority of respondents (61.3%) had sufficient knowledge. After the intervention, the majority of respondents' knowledge levels were in the good category, at 57.5% (46 respondents), followed by fair at 42.5% (34 respondents). These results indicate that after the intervention, there was a significant increase in respondents' knowledge.

Table 4. Correct answers for each pre-test and post-test question item

Knowledge	*Pre Test*		*Post test*	
	n	**%**	**n**	**%**
Understanding anemia	53	66,2	67	83,8
Symptoms of anemia	49	61,3	65	81,2
Causes of anemia	47	58,8	66	81,9
Understanding Hb	50	62,5	63	78,8
Normal Hb Values	46	57,5	71	88,7
Impact of anemia	66	80,6	63	78,8
Preventing anemia	50	62,0	67	83,8
Understanding TTD	50	62,0	68	84,4
Drinks to avoid	51	64,3	71	88,7
Recommended consumption	44	55,1	65	81,2
Risks of not consuming TTD	45	56,2	69	86,2
Benefits of TTD	45	56,2	65	81,2
Side effects	50	62,0	69	86,2

Table 4 shows that in the pre-test, the percentage of respondents' correct answers for each knowledge item varied, with the lowest percentage in the pre-test at 55.1%. After education, the percentage of correct answers in the post-test increased across all knowledge items, with the highest percentage reaching 88.7%. The most significant increase in knowledge was knowledge regarding normal Hb levels, with a score increase of 31.2%. These results demonstrate that education is effective in increasing respondents' knowledge about anemia and Iron Tablets.

Table 5. Ranks according to the Wilcoxon Signed Rank Test of the relationship between the use of the "Prevent Anemia" board game in improving adolescent girls' knowledge about anemia and Iron Tablets at SMPN 1 Tamalatea.

Variables	N	*Mean (Min-Max)*	*Negative Ranks*	*Positive Rank*	Z	*P value*
Pre-Test	80	1.64 (1-3)	0	75	-8.660[b]	.000
Post-Test	80	2.58 (2-3)				

Based on table 5 shows that the average value (Mean) before the intervention (pretest) was 1.64 and the average value (Mean) after the intervention (Posttest) was 2.58. Wilcoxon calculations show that there were no (0) respondents who experienced a decrease in knowledge, and as many as 75 respondents experienced an increase in knowledge with a sig. (2-tailed) p = 0.000. Thus, it can be concluded that there is a significant difference between the pre-test and post-test results, these

results prove that the use of board game media has an effect on increasing the knowledge of adolescent girls about anemia and iron tablets at SMPN 1 Tamalatea, Jeneponto Regency in 2025.

DISCUSSION

The study results showed that the majority of respondents were 14 years old, indicating that most were in middle adolescence. According to the Indonesian Ministry of Health, the 14–17 age group falls into the middle adolescence category, a phase during which adolescents experience accelerated physical development, reproductive function maturation, and fluctuating emotional changes, increased abstract thinking skills, a need for independence, and a strong dependence on peer groups for social support. The majority of adolescents begin menstruating at age 12. Research by Hartati et al. (2022) shows that adolescents with normal nutritional status tend to experience menarche at age 12, the most common age of menarche in the Indonesian population. These findings support the notion that 12 is a physiological age for menarche and falls within the normal range of adolescent reproductive development.

The results showed that before the intervention, adolescent girls' knowledge of anemia and iron supplementation (IBT) was still in the moderate to poor range. This situation illustrates that respondents' initial understanding of anemia was suboptimal, even though all respondents were in their mid-teens and had already experienced menstruation, which physiologically increases the risk of anemia due to higher iron requirements. In addition to low levels of knowledge, adolescents in the study area were also influenced by an unbalanced diet and the habit of consuming foods low in nutrients, especially iron. Some adolescents also frequently skipped meals, such as breakfast, so their daily nutritional intake was not optimally met. For adolescent girls, this risk is even greater because they menstruate every month, which causes blood loss and increases their iron requirements. If these needs are not met through a balanced diet or iron supplementation, the risk of anemia in adolescents will increase.

After being educated through the "Prevent Anemia" board game, there was a significant increase in knowledge. The average knowledge score increased, followed by the disappearance of the "poor knowledge" category and an increase in the proportion of respondents with good knowledge. The decrease in the standard deviation in the post-test indicated an even distribution of understanding among respondents. This improvement was consistent across all questionnaire items, particularly those related to normal Hb levels, iron tablet consumption, and the risks of not taking iron tablet.

Challenges encountered during the pre-test data collection included some respondents still not understanding some of the questions in the questionnaire, requiring additional explanations to ensure proper understanding. Furthermore, some respondents lacked focus while completing the questionnaire due to the noisy classroom atmosphere and their eagerness to immediately participate in the game. These conditions can affect respondents' accuracy in answering questions, so researchers needed to guide and ensure that respondents completed the questionnaire seriously and based on their knowledge.

The pre-test data revealed that some adolescents still had limited understanding of anemia and how to prevent it. This relates to the government's efforts to address anemia in adolescents through various health programs, such as providing iron tablets (TTD) to adolescent girls in schools and health education activities. However, pre-test results indicated that the information provided through these programs was not fully understood by adolescents. Therefore, more engaging and accessible educational methods are needed, such as the use of educational games, to more effectively convey the health messages from government programs to adolescents.

This increase in knowledge indicates that the educational process is effective. According to (Notoatmodjo, 2020), knowledge is the result of a sensory process that forms the basis for the formation of health attitudes and behaviors. The use of interactive learning media such as board games can increase adolescents' attention, interest, and active involvement, making information easier to understand and remember (Daryanto, 2016). The findings of this study align with several previous studies that have shown that educational games effectively increase adolescents' knowledge about anemia, as they create a more enjoyable and participatory learning environment compared to conventional methods.

This finding aligns with research by Mustika et al. (2021), which shows that the use of educational games effectively increases adolescents' knowledge by encouraging active involvement, group discussions, and repetition of material through game activities. Games have also been shown to increase learning motivation and concentration compared to lectures. This finding is also supported by research by (Safitri et al., 2021), which used the Anemia Monopoly Educational Game (GEMA), which found that educational games significantly increased adolescent girls' knowledge. They stated that game elements such as challenges, decision-making opportunities, and engaging visuals contributed to increased knowledge about anemia.

Another study by (Dinayarti et al., 2022), among vocational high school students in South Jakarta, also reported that an educational anemia board game effectively improved adolescents' knowledge and attitudes about anemia prevention. They concluded that the game provided a fun learning experience, making health material easier to understand than conventional methods.

CONCLUSION

The effectiveness of the "Prevent Anemia" board game in improving adolescent girls' knowledge about anemia and iron supplements at SMP Negeri 1 Tamalatea, it can be concluded that education using the "Prevent Anemia" board game has proven effective in increasing adolescent girls' knowledge, as indicated by an increase in the average pre-test and post-test scores from 1.64 to 2.58. There was an increase in knowledge after the education using the board game, with the majority of students in the good category and none in the poor category. 3) Effectiveness of the board game.

Adolescent girls are advised to continue improving their knowledge and adherence to taking iron tablets through the use of engaging educational media, such as board games, to support anemia prevention efforts. Furthermore, schools and teachers are expected to integrate interactive educational media into learning activities and school health programs to make the educational process more effective and tailored to the characteristics of adolescents. Furthermore, health workers are encouraged to utilize board games as an educational method in adolescent health promotion activities, particularly regarding anemia and iron tablets, as they have been shown to significantly increase knowledge.

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