

Comparative Study of Educational Playing Cards and Animated Videos on Adolescent Girls' Knowledge and Awareness of Anemia

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Background. Adolescent girls are prone to anemia caused by puberty. The impact of anemia can be short-term or long-term which will indirectly affect economic and social development. **Purpose.** This study aims to analyze the effectiveness of educational game cards and the combination of educational game cards and animated videos on the knowledge and awareness of adolescent girls about anemia. **Method.** The design of this study uses pretest-posttest experimental control group design carried out in schools, under the auspices of the Baron Health Center which has received counseling from the health center. Participants in the blood supplement tablet (TTD) program were 201 young women with a simple random sampling technique. The control group received the treatment of educational game cards and the treatment group received a combination of educational game cards and animated videos. **Result.** The results of the Wilcoxon Test showed that there was a significant difference in the knowledge (0.000) and awareness (0.000) of adolescent girls about anemia before and after the intervention. The results of the Mann Whitney test showed that there was no significant difference between respondents who used educational game cards and a combination of educational game cards and animated videos on the knowledge (p-value: 0.686) and awareness (p-value: 0.171) of adolescent girls about anemia. **Conclusion.** The need to develop appropriate and fun educational media for young women to increase their knowledge and awareness in the treatment and prevention of anemia.

Keywords: Anemia, Educational Game Cards, Animated Videos, Knowledge, Awareness.

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1. Introduction

Anemia is still a global health problem that needs to be addressed. Anemia is a condition when the body experiences a lack of red blood cells or hemoglobin (Hb). For women, the normal limit of Hb in the body is 12g/dL while for men it is 13.5 g/dL. Adolescents with anemia will experience symptoms of fatigue, fatigue, lethargy which can affect study concentration, decreased school achievement so that there is an increase in the dropout rate. In addition, there is a risk of decreased immunity and increased infection. Other impacts, pregnant women are anemic, the possibility of intrauterine growth is stunted, low birth weight, stunting, increased mortality and morbidity of infants and mothers, which will indirectly affect economic and social development (Gedefaw *et al.*, 2015; Bindra, 2017; Sari *et al.*, 2022).

In 2021, as many as 1.92 billion people worldwide suffered from anemia with an increase of 420 million cases in three decades. Cases of anemia are higher in women (31.2%) than men (17.5%) and increase in children under 5 years old, adolescent girls, women and pregnant women (IHME, 2023). Based on Riskesdas data in 2018, the rate of anemia in adolescent girls in Indonesia is still high, namely 32% in the age group of 15 to 24 years and adolescent girls are more susceptible to anemia compared to adolescent boys by 6% (Ministry of Health of the Republic of Indonesia, 2019).

Anemia can occur in anyone from infants to adults (Mahyuddin *et al.*, 2022). The causes of anemia are multifactor, namely parental income, maternal education, knowledge, iron supplement consumption, weight, body mass index (BMI), upper arm circumference (LLA), diet or intake of less nutritious food, irregular eating habits, and also the consequences of menstruation that occurs in adolescents starting at the age of 13 to 15 years, activity and capillary blood samples to determine hemoglobin levels (Tayel and Ezzat, 2015; Budiarti *et al.*, 2021; Mulianingsih *et al.*, 2021; Pulingmuding *et al.*, 2024; Sartono, Sadiq and Kartika Sari, 2024). During the menstruation process, iron will be lost by 5-10%, causing iron deficiency which will later make the menstrual cycle abnormal and make adolescents susceptible to anemia. Iron deficiency is a common cause of anemia although folic acid deficiency, vit B12, Vit A and congenital or genetic abnormalities can also be causes of anemia (Azizah, 2020).

Screening conducted by health workers at the Baron Health Center, Nganjuk Regency found that 60.89% of adolescent girls had anemia. Various efforts have been made to overcome anemia such as health counseling and the administration of blood supplement tablets (TTD). However, the efforts made have not yielded optimal results. Based on preliminary surveys, it was found that adolescent girls' TTD adherence to drinking is still low, adolescents' knowledge and awareness of anemia is still lacking, lack of family support for anemia adolescents, and poor food consumption behavior. Ignorance and lack of awareness of the importance of iron in adolescents is one of the factors causing the high rate of anemia in adolescents (Musniati, 2022). In accordance with (Astuti and Kusumawardhani, 2023) the stated that lack of knowledge and awareness of the importance of maintaining the body to avoid anemia is also a factor causing anemia in adolescents, so it is necessary to take a food-based intervention approach and micronutrient supplementation. In addition, by providing health education, it is scientifically proven to be able to avoid anemia from anemia (Styaningrum and Metty, 2021; Hidayah N *et al.*, 2022; Rusmery AC, 2024), but many studies do not include the media used and only use one group to measure pre-post knowledge of adolescent girls about anemia.

Based on this background, the researcher innovated to help increase the knowledge and awareness of adolescent girls related to anemia by creating educational game cards and animated videos that are expected to change the behavior of adolescent girls. This study aims to identify differences in adolescent girls' knowledge and awareness of anemia in 2 different groups.

2. Methods

Research ethics approval was obtained from the health research ethics committee of the STRADA Indonesia Institute of Health Sciences Number: 3836/KEPK/VI/2025. Prior to data collection, participants received research information about the research objectives, procedures and confidentiality of the data. Research approval is signed by all participants.

The design of this study uses pretest-posstest experimental control group design carried out in schools under the auspices of the Baron Health Center of Nganjuk Regency and has received counseling from the health center and participants of the blood supplement tablet (TTD) program, namely MA Al Hidayah, MTsN 4 Nganjuk, SMK Al Khoriyah, and SMPN 1 Nganjuk based on the criteria that have been. The research was conducted from June to August 2025. The sampling technique used is Cluster Random Sampling by randomly selecting 2 classes in each school (8 classes), so that the number of respondents was 201 adolescent girls.

This study was divided into 2 groups, namely the control group and the treatment group. The control group (MA Al Hidayah and MTsN 4 Nganjuk) received educational game cards that were given to 100 young women. The treatment group (SMK Al Khoriyah, and SMPN 1 Baron) received a combination of educational

game cards and animated videos to 101 young women. The educational game cards adopt from playing cards filled with material about the definition of anemia, the factors that cause anemia, the impact of anemia, how to prevent and manage anemia, while the animation video is in the form of moving images with a narrative about anemia that lasts 5 minutes and 24 seconds.

The implementation of the research began with the provision of a pretest questionnaire to find out the knowledge and awareness of adolescent girls about the treatment of anemia. The intervention was carried out for 8 weeks with a frequency of once a week for 2 hours per session. After the intervention is completed, a posttest questionnaire will be given to see if there is an increase in the knowledge and awareness of adolescent girls about anemia. Outcome measurement included adolescent girls' knowledge and awareness of anemia. Knowledge is a young woman's understanding or level of knowledge about anemia, which is measured using a questionnaire with 16 statement items and a choice of "true" and "false" answers. Awareness is a young woman's concern or concern for herself related to anemia, which is measured using a questionnaire with 12 statement items and a choice of "yes" and "no" answers. The knowledge and awareness questionnaire has been tested for validity and reliability.

There are 2 data analyses used in this study, namely the Wilcoxon test and the Whitney Mann Test. The Wilcoxon test was used to identify the knowledge and awareness of adolescent girls before and after the intervention while the Mann Whitney test was used to identify differences in the effectiveness of 2 different treatments.

3. Results and Discussion

Pre-Post Test of Knowledge and Awareness

Table 1. Average Pre-Test and Post-Test Results of Knowledge and Awareness in the Control Group and Treatment Group

Variable	Mean	p-value
Knowledge		
Control Group		
<i>Pre-test</i>	63,87	0,000
<i>Post-test</i>	74,64	
Treatment Groups		
<i>Pre-test</i>	68,84	0,000
<i>Post-test</i>	77,94	
Awareness		
Control Group		
<i>Pre-test</i>	61,94	0,000
<i>Post-test</i>	75,82	
Treatment Groups		
<i>Pre-test</i>	70,47	0,000
<i>Post-test</i>	80,95	

Data source: Primer data, 2025

Table 1 shows that in the control group, the variable knowledge value mean before intervention was 63.87 and the mean value after intervention was 74.64, which means that in the control group the level of knowledge of adolescent girls increased by 10.77 after being given an educational game card intervention. The results of the statistical test obtained a value of 0.000 (<0.05), so it can be concluded that there is a significant difference between the knowledge score before and after the intervention of the educational

game card. The treatment group, knowledge variables, mean value before intervention was 68.84 and mean value after intervention was 77.94, which means that in the treatment group, the level of knowledge of adolescent girls increased by 9.1 after being given a combination of educational game cards and animated video interventions. The results of the statistical test obtained a value of 0.000 (<0.05), so it can be concluded that there is a significant difference between the knowledge score before and after the intervention of a combination of educational game cards and animated videos.

The control group had a mean value of 61.94 and a mean value after intervention of 75.82, which means that in the control awareness group, adolescent girls increased by 13.88 after being given an educational game card intervention. The results of the statistical test obtained a value of 0.000 (<0.05), so it can be concluded that there is a significant difference between the awareness score before and after the educational game card intervention. In the treatment group, the mean value awareness variable before intervention was 70.47 and the mean value after intervention was 80.95, which means that in the awareness treatment group, adolescent girls increased by 10.48 after being given a combination of educational game cards and animated video interventions. The results of the statistical test were obtained with a value of 0.000 (<0.05), so it can be concluded that there is a significant difference between the awareness score before and after the intervention of a combination of educational game cards and animated videos.

Research result this in accordance with (Natosba *et al.*, 2025) that card education containing modified content and images with topic of anemia in adolescents girls who follow the same format with card remi so that easy understood and followed by the participants . In line with (Anifah, 2020; Kordia *et al.*, 2021; Listiana and Jasa, 2023; Renata, Sulistiyani and Astuti, 2024) that education health using video media can increase adolescent girls' knowledge about anemia. Video is a medium that combines audio and visual elements that can be show movement , message with use effect certain, play a role as intermediary delivery material, creating condition where adolescents can get knowledge and skills with a fun way. Media in education health beneficial for explain material with more clear, overcome constraint space, time, and sensory, as well as help overcome attitude passive. Good adolescent girls knowledge of the prevention and treatment of anemia can increase adolescents' awareness of the impact of anemia (Abu-Baker, Eyadat and Khamaiseh, 2021; Dwiningrum and Risca Fauzia, 2022; Sungkar *et al.*, 2022).

Increasing knowledge through interactive counseling has proven to be effective because the learning methods provided are interesting including the presentation of material and video playback about anemia so as to foster the enthusiasm of participants so that they are more active in asking questions and discussing. Counseling not only provides information so as to increase knowledge but also increases adolescents' awareness and understanding in the fulfillment of correct nutrition, TTD drinking compliance, and risk of early marriage (Suminar *et al.*, 2021; Pratiwi *et al.*, 2024; Bere *et al.*, 2025).

This research is in line with research conducted by the study (Febrianti *et al.*, 2023) in which it was stated that PAKEM techniques consisting of lecture methods, group discussions, problem-solving, and simulation games (roleplay, quizzes, and matching cards) can increase the closeness between researchers and respondents which will later help them to share their thoughts freely.

Engaging, clear, and easy-to-understand learning media will strengthen cognitive processes, resulting in significant increases in knowledge. In this study, educational cards, as concrete and simple visual stimuli through images, colors, and bullet points, helped participants focus their attention and process information gradually. Meanwhile, animated videos provided dual stimulation (visual and audio) that enriched the learning experience through movement, narration, and illustrations. The videos helped strengthen concentration, enhance conceptual understanding, and facilitate long-term memory retention. Cognitive

Learning Theory also explains that participants learn more effectively when material is presented in a way that is engaging and relevant to their lives. The topic of anemia, which is relevant to adolescent girls' conditions coupled with the use of interactive media increased active engagement, thus optimizing information processing.

Effectiveness of Intervention in Control Group and Treatment Group

Table 2. Effectiveness Results Intervention in Groups Control and Group Treatment based on the Mann

Whitney Test	
Variables	p-value
Knowledge	0.686
Group control	
Group treatment	
Awareness	0.171
Group control	
Group treatment	

Data source: Primer data, 2025

Based on the results of the Whitney Mann Test, a significance result of 0.686 was obtained, which means that there was no significant difference in the average knowledge score between respondents who used educational game cards in the control group and the combination of educational game cards and animated videos in the treatment group.

The awareness variable showed a significance value of 0.171 which means that there was no difference in effectiveness between respondents who used educational game cards in the control group and the combination of educational game cards and animated videos in the treatment group.

According to a study, learning that includes visual, auditory, and kinesthetic aspects increases learning effectiveness by up to 90% compared to learning that only involves sight or hearing, which has an effectiveness of between 10% to 30%. Although there was an increase in the average score before and after the intervention, there was no difference between the control group and the treatment group, so the use of educational game cards was a fairly effective medium.. This is in line with study (Sartono, Sadiq and Kartika Sari, 2024) there is no effect of anemia education using leaflets and animated videos, so it is necessary to develop appropriate educational media that is liked by young women so that it is more acceptable in increasing knowledge and awareness about anemia. The effectiveness of educational and counseling media using a multimodal learning approach is effective in increasing awareness and attitudes about anemia and its prevention. The implementation of such interventions in the national curriculum and scale-ups can help improve the nutritional status of adolescents (Salam *et al.*, 2023).

Increased knowledge and awareness occur when participants are able to actively process information through attention, comprehension, and memory retention. The educational cards provided visual stimuli and engaging learning activities for adolescent girls, thus optimizing cognitive processes and enhancing knowledge and awareness without the need for additional media. This explains why, despite the animated video being a multisensory medium, statistical results still showed no significant difference between the two groups. Therefore, the educational cards met the participants' cognitive needs in understanding anemia material, resulting in equivalent effectiveness.

4. Conclusion

The results of this study indicate that there are differences in the level of knowledge and awareness of adolescent girls about anemia before and after the intervention in the control group and the intervention

group, and there is no significant difference between the use of educational game cards and a combination of educational game cards and animated videos in increasing knowledge and awareness. Suggestions are needed to develop educational media based on digital applications or augmented reality to increase the knowledge and awareness of adolescent girls about the treatment and prevention of anemia.

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